YASKAWA

YRC1000micro OPTIONS
INSTRUCTIONS

FOR SEARCH FUNCTION IN CONTINUOUS MOTION

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
YRC1000micro INSTRUCTIONS
YRC1000micro OPERATOR'S MANUAL
YRC1000micro MAINTENANCE MANUAL
YRC1000micro ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

The YRC1000micro alarm codes above consists of "MAJOR ALARMS" and "MINOR ALARMS".

MANUAL NO.

HW1484520   1/27

⚠ DANGER

- This manual explains the search function in continuous motion of the YRC1000micro system. Read this manual carefully and be sure to understand its contents before handling the YRC1000micro. Any matter not described in this manual must be regarded as "prohibited" or "improper".

- General information related to safety are described in "Chapter 1. Safety" of the YRC1000micro INSTRUCTIONS. To ensure correct and safe operation, carefully read "Chapter 1. Safety" of the YRC1000micro INSTRUCTIONS.

⚠ CAUTION

- In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.

- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000micro.

In this manual, the Notes for Safe Operation are classified as "DANGER", "WARNING", "CAUTION", or "NOTICE".

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.
⚠ CAUTION	Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to "NOTICE".
NOTICE	NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to "NOTICE", the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury.

Even items described as "CAUTION" may result in a serious accident in some situations.
At any rate, be sure to follow these important items.

> NOTE To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "DANGER", "WARNING" and "CAUTION".

> # ⚠ DANGER
>
> - Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.
>   – Press the emergency stop button on the programming pendant or on the external control device, etc.
>   – Disconnect the safety plug of the safety fence. (when in the play mode or in the remote mode)
>
> If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.
>
> *Fig. : Emergency Stop Button*
>
>
>
> - Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.
>
> Failure to observe this instruction may cause unintended movement of the manipulator, which may result in personal injury.
>
> *Fig. : Release of Emergency Stop*
>
>
> TURN
>
> - Observe the following precautions when performing a teaching operation within the manipulator's operating range:
>   – Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
>   – View the manipulator from the front whenever possible.
>   – Always follow the predetermined operating procedure.
>   – Always keep in mind emergency response measures against the manipulator's unexpected movement toward a person.
>   – Ensure a safe place to retreat in case of emergency.
>
> Failure to observe this instruction may cause improper or unintended movement of the manipulator, which may result in personal injury.
>
> - Confirm that no person is present in the manipulator's operating range and that the operator is in a safe location before:
>   – Turning ON the YRC1000micro power
>   – Moving the manipulator by using the programming pendant
>   – Running the system in the check mode
>   – Performing automatic operations
>
> Personal injury may result if a person enters the manipulator's operating range during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop button is located on the right of the programming pendant.
>
> - Read and understand the Explanation of the Warning Labels before operating the manipulator.

<div style="border: 2px solid black;">

⚠ DANGER

- In the case of not using the programming pendant, be sure to supply the emergency stop button on the equipment. Then before operating the manipulator, check to be sure that the servo power is turned OFF by pressing the emergency stop button.
Connect the external emergency stop button to the 4-14 pin and 5-15 pin of the Safety connector (Safety).

- Upon shipment of the YRC1000micro, this signal is connected by a jumper cable in the dummy connector. To use the signal, make sure to supply a new connector, and then input it.

If the signal is input with the jumper cable connected, it does not function, which may result in personal injury or equipment damage.

</div>

<div style="border: 2px solid black;">

⚠ WARNING

- Perform the following inspection procedures prior to conducting manipulator teaching. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.

  – Check for a problem in manipulator movement.

  – Check for damage to insulation and sheathing of external wires.

- Return the programming pendant to a safe place after use.

If the programming pendant is left unattended on the manipulator, on a fixture, or on the floor, etc., the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.

</div>

Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the YRC1000micro controller, manipulator cables, the YRC1000micro programming pendant (optional), and the YRC1000micro programming pendant dummy connector (optional).

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
YRC1000micro controller	YRC1000micro
YRC1000micro programming pendant	Programming pendant (optional)
Cable between the manipulator and the controller	Manipulator cable
YRC1000micro programming pendant dummy connector	Programming pendant dummy connector (optional)

Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

Equipment		Manual Designation
Programming Pendant	Character Keys /Symbol Keys	The keys which have characters or symbols printed on them are denoted with [ ]. ex. [ENTER]
	Axis Keys /Number Keys	[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]
	Mode Key	Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH
	Button	Three buttons on the upper side of the programming pendant are denoted as follows: HOLD button START button EMERGENCY STOP button
	Displays	The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}
PC Keyboard		The name of the key is denoted. e.g. Ctrl key on the keyboard

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • •" means that the cursor is moved to the object item and [SELECT] is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and ^{TM} are omitted.

Contents

1   Search Function in Continuous Motion

The search function in continuous motion holds the data of positions where the YRC1000micro detects signals from sensors during job execution.

2   Wiring

Output signals of the sensor used in the system are connected to the YRC1000micro input port for direct-input signals. The signals that are input from this port are called direct-in signals.

The output signals of the sensor used in the system can be connected via a sequencer to the direct-in signal input port, however, processing variations may result due to scanning timing of the sequencer.

It is therefore recommended to connect the output signal of the sensor directly to the YRC1000micro input port.
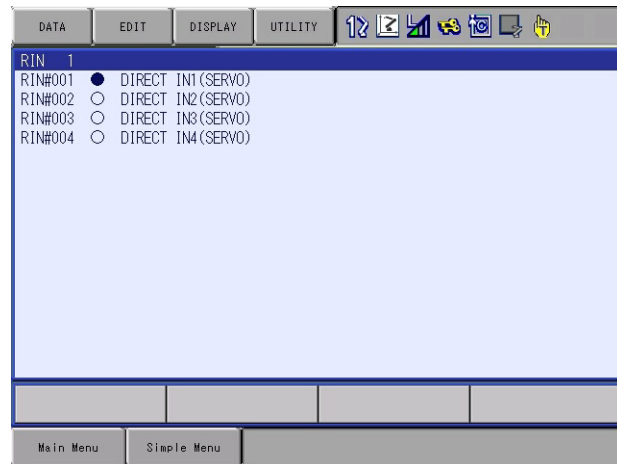
2.1   Connection of Direct-In

For the connection of the direct-in, refer to "YRC1000micro INSTRUCTIONS (RE-CTO-A222) 14.1.2 Connection of General-Purpose I/O".

2.2   Confirmation of Direct-In Signal Status

Check the status of direct-input signal on the RIN INPUT window.

2.2.1   RIN INPUT Window

1. Select {IN/OUT} under the main menu.

2. Select {RIN}.

    – The RIN INPUT window appears.

    – "●" indicates the ON status of direct IN signal.

    – "○" indicates the OFF status of direct IN signal

```
┌──────────────────────────────────────────────────────────┐
│  DATA      EDIT    DISPLAY   UTILITY   ⌦ ⊠ ⊿ ⟲ ⓚ ⊡ ✋      │
├──────────────────────────────────────────────────────────┤
│ RIN   1                                                    │
│ RIN#001  ●  DIRECT IN1(SERVO)                              │
│ RIN#002  ○  DIRECT IN2(SERVO)                              │
│ RIN#003  ○  DIRECT IN3(SERVO)                              │
│ RIN#004  ○  DIRECT IN4(SERVO)                              │
│                                                            │
│                                                            │
│                                                            │
│                                                            │
│                                                            │
│                                                            │
├──────────────────────────────────────────────────────────┤
│  Main Menu    Simple Menu                                  │
└──────────────────────────────────────────────────────────┘
```

> **NOTE**
>
> In case the system consists of multiple manipulators, every pressing of the page key changes the title of general-purpose display area as "RIN INPUT 1", "RIN INPUT 2" and so forth, and switches the window.
>
> For example, the RIN INPUT 1 window shows the direct-in signals for manipulator 1, and the RIN INPUT 2 window shows the direct-in signals for manipulator 2.

3   Functions

3.1   Starting the Search Function

- The search function will start with the execution of NSRCHON instruction.

- The search function is activated even while the robot is not moving, such as being under the statement of WAIT instruction.

3.2   Exiting from the Search Function

- The search function will be end up with the execution of NSRCHOF instruction.

3.3   Intermitting and Restarting the Search Function during the Operation

The search function will be discontinued upon the intermission of the executing of a JOB due to the following operations and factors. Restart the JOB to restart the search action.

- Hold, External Hold

- Emergency Stop, External Emergency Stop

- Mode switching operation

- When switching the operating cycle to step

- Occurrence of minor failure alarm

In case of the intermission due to the following operations and factors, the search function will not start again upon the restart of the JOB.

- Moving the cursor

- Selecting JOB

- Editing the condition file

4   Instructions on the Search Function in Continuous Motion

4.1   NSRCHON (Search ON Instruction)

The NSRCHON is an instruction to start the search function.

The followings are the additional items for the NSRCHON instruction:
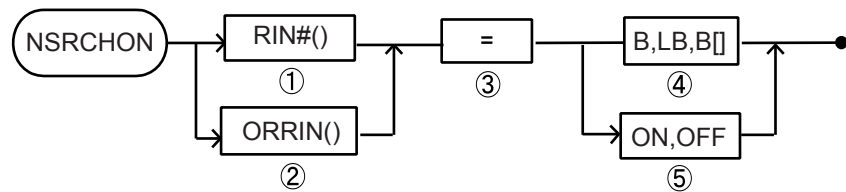
NSRCHON RIN # (Direct-in No.) = <Status>

or   ORRIN (Specified Direct-in No.) = <Status>

<Direct-in No.>: 1 - 4

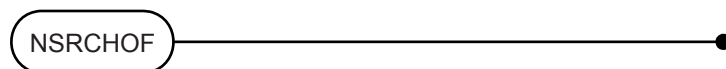<Specified Direct-in No. (applicable unit: bit)>: 1 - 15 (D0: RIN#(1), D1: RIN#(2), D2: RIN#(3), D3: RIN#(4))

<Status>: Status of Direct-in No. (Common in all signals.)
          ON/OFF, or B type variable.

4.2   NSRCHOF (Search OFF Instruction)

The NSRCHOF is an instruction to end the search function.

The followings are the additional items for the NSRCHOF instruction.

4.3 GETS (System Variable Fetch Instruction)

The GETS is an instruction to fetch the system variable ($ variable) as a user variable.

The YRC1000micro can not use system variables directly for operating instructions. Use the GETS instruction to fetch the values as a user variable.

Format: GETS <user variable> <system variable>

- The user and the system variables must be of the same type.
  <Example> GETS B000 $B000

- The position type variable can be specified by only PX variables.

- The PX variables are the position type variables that are defined in a job. In a job for a single manipulator, PX000 equals to P000.

4.3.1 System Variables

The system variables can be referred only by the GETS instruction which are written by the controller system.

System variable	Type	Explanation

$B type	$B type	$B002: Specifies detected/not detected of the NSRCHON instruction.
		     0: Not detected 1: Detected
		$B016: Numbers detected by NSRCHON.
		     (Corresponding to RIN#(1))
		$B017: Numbers detected by NSRCHON.
		     (Corresponding to RIN#(2))
		$B018: Numbers detected by NSRCHON.
		     (Corresponding to RIN#(3))
		$B019: Numbers detected by NSRCHON.
		     (Corresponding to RIN#(4))

$PX type	$PX type	PX type Positions detected by NSRCHON (Maximum detectable number: 50)

Detection Order	Detected Position of RIN#(1)		Detected Position of RIN#(2)		Detected Position of RIN#(3)		Detected Position of RIN#(4)	
	Pulse	Cartesian Data (Base Coordinated)	Pulse	Cartesian Data (Base Coordinated)	Pulse	Cartesian Data (Base Coordinated)	Pulse	Cartesian Data (Base Coordinated)
1st	$PX100	$PX150	$PX200	$PX250	$PX300	$PX350	$PX400	$PX450
50th	$PX149	$PX199	$PX249	$PX299	$PX349	$PX399	$PX449	$PX499

* The position detected in the 51st will not be set in the system variable.

4.4   CNVRT (Position Type Variable Conversion Instruction)

The CNVRT is an instruction to convert a pulse data position type variable into a Cartesian data position type variable using a specified coordinate system.

Format: CNVRT <u>\<PX variable\></u> <u>\<PX variable\></u> \<Coordinate system\>

                          B   A

\<PX variable (A)\>: Pulse data only.

\<PX variable (B)\>: Cartesian data (the converted Cartesian data are stored).

\<Coordinate system\>: Base coordinate system: BF

                          Robot coordinate system: RF

                          Tool coordinate system: TL

                          User coordinate system: UF

                          Master tool coordinate system: MTF

Specifying the master tool coordinate system is to convert into a relative position with the master manipulator only when the coordinated system is set.

4.4.1   PX Variables

The PX variables are a group of position type variables that are defined by the control group specified in the job header.

- When the control group is R1, PX000 indicates P000.

- When the control group is R1 + B1, PX000 indicates P000 and BP000.

- When the control group is R1 + B1 + ST1, PX000 indicates P000, BP000 and EX000.

- When the control group is R1 + R2 + B1 + B2 + ST1, and the master in the coordinated job is R1 + B1, PX000 indicates the following variables.

P000:	R2 (Slave)
P001:	R1 (Master)
BP000:	B2 (Slave)
BP001:	B1 (Master)
EX000:	ST1

5   Registration of Instructions

The instructions are to be registered when the cursor is in the address area in the JOB CONTENT window during the teach mode.

1. Select {JOB} under the main menu.
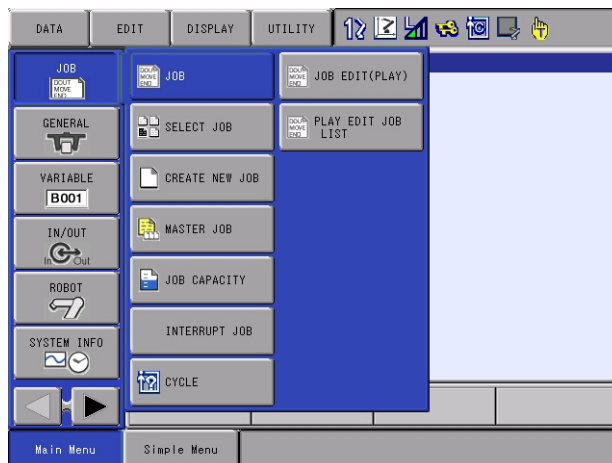
2. Select {JOB} under the submenu.

   – The JOB CONTENT window appears.

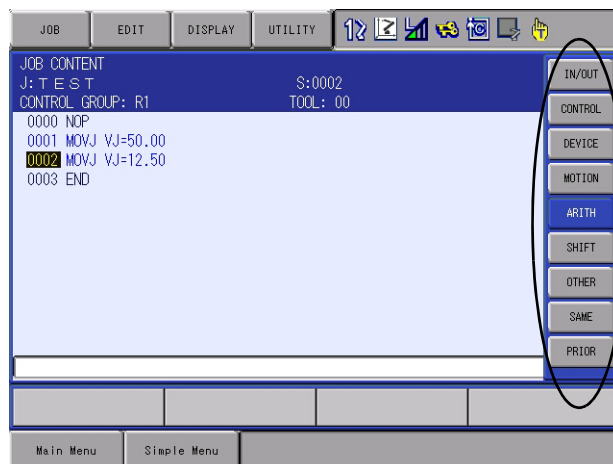3. Move the cursor to the address area.

5.1   NSRCHON Instruction (To Start Search Function)

1. Move the cursor to the address area.

2. Press [INFORM LIST] of the programming pendant.

    – The INFORM LIST dialog box appears

    – Cursor moves to the INFORM LIST dialog box, and the cursor of address area is highlighted.

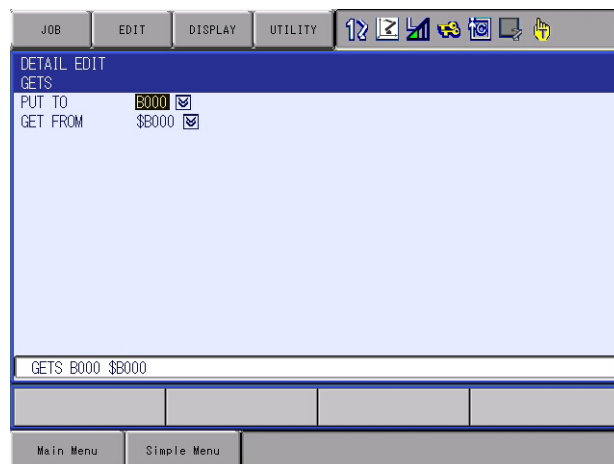

3. Select {OTHER}.
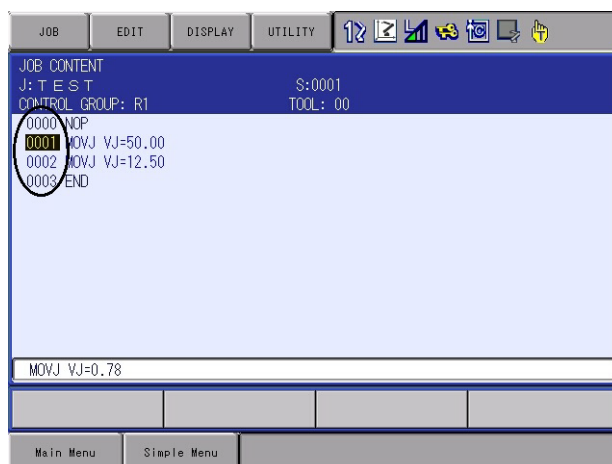
5   Registration of Instructions
5.1   NSRCHON Instruction (To Start Search Function)

4.   Select {NSRCHON}.

    – The NSRCHON instruction appears on the input buffer line.
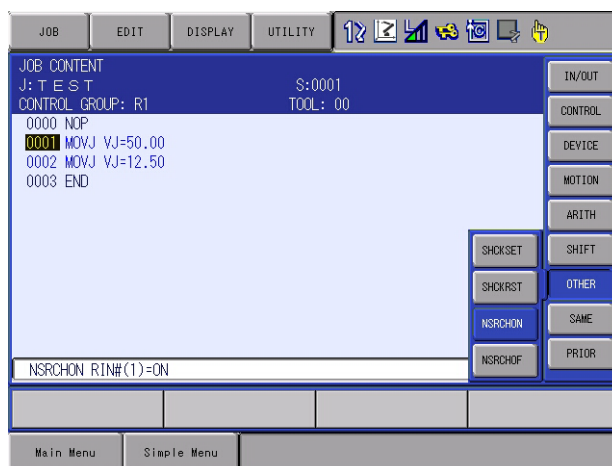
5.   Press [SELECT] to set the data for each item on the DETAIL EDIT window.
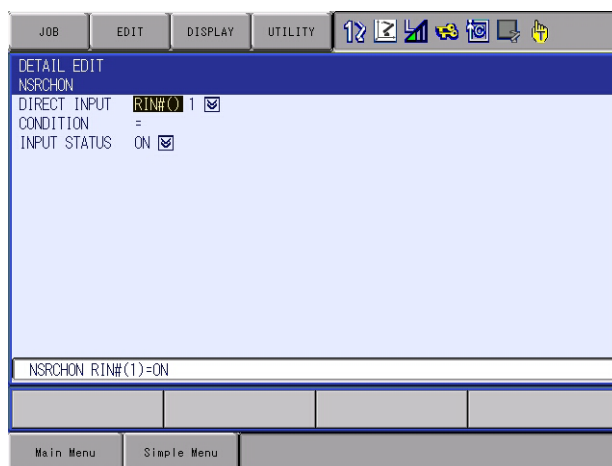
    – Move the cursor to each setting item and press [SELECT].
      Enter desired value/data into each setting item and press [ENTER].

6.   Press [ENTER]

    – The entered value/data are registered in the job.

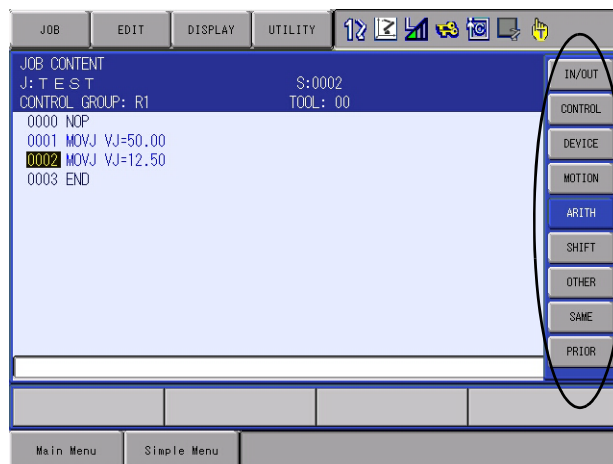## 5.2   NSRCHOF Instruction (To Exit from Search Function)

1. Move the cursor to the address area.

2. Press [INFORM LIST] of the programming pendant.

    – The INFORM LIST dialog box appears.

    – Cursor moves to the INFORM LIST dialog box, and the cursor of
       address area is highlighted.

3. Select {OTHER}.

4. Select {NSRCHOF}.

– The NSRCHOF instruction appears on the input buffer line.
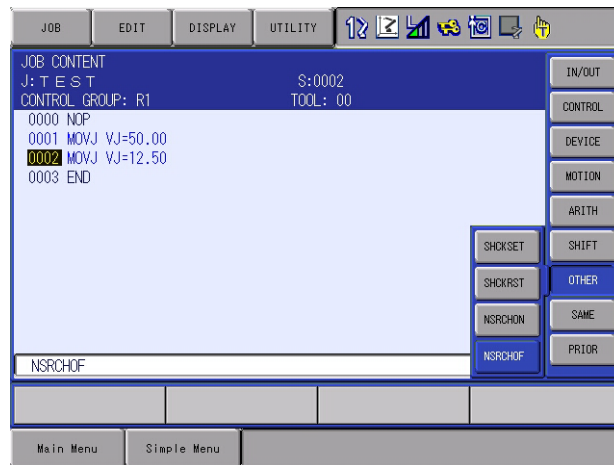
5. Press [ENTER].

– The entered value/data are registered in the job.

> **NOTE**
>
> The data of positions may not be held when signals from sensors are detected just before executing NSRCHOF.
>
> Insert the TIMER instruction just before NSRCHOF, then the data of positions can be held.

5.3 GETS Instruction

1. Move the cursor to the address area.

2. Press [INFORM LIST] of the programming pendant.

– The INFORM LIST dialog box appears.

– Cursor moves to the INFORM LIST dialog box, and the cursor of address area is highlighted.

3. Select {ARITH}.

4. Select the {GETS} instruction.

    – The GETS instruction appears on the input buffer line.

5. Press [SELECT] to set the data for each item on the DETAIL EDIT window.

    – Move the cursor to each setting item and press [SELECT].
      Enter desired value/data into each setting item and press [ENTER].

6.   Press [ENTER].

    – The entered value/data are registered in the job.

5.4   CNVRT Instruction

1. Move the cursor to the address area.

2. Press [INFORM LIST] of the programming pendant.

   – The INFORM LIST dialog box appears.

   – Cursor moves to the INFORM LIST dialog box, and the cursor of address area is highlighted.

3. Select {ARITH}.

5   Registration of Instructions
5.4   CNVRT Instruction

4. Select the {CNVRT} instruction.

    – The CNVRT instruction appears on the input buffer line.

5. Press [SELECT] to set the data for each item on the DETAIL EDIT window.

    – The DETAIL EDIT window appears.

    – Move the cursor to each setting item and press [SELECT].
      Enter desired value/data into each setting item and press [ENTER].

6.   Press [ENTER].

    – the entered value/data are registered in the job.

6   Job Sample

The following table shows a simple job example. The applied job types are further developed based upon the job sample below.

Registered Instruction	Status
NOP	
MOVJ	Moves to the standby position.
MOVL	Moves to the starting position for search detection.
NSRCHON RIN#(1)=ON	Search activating instruction. Detects the start of DIN1. Instruction to start search detection.
MOVL	Search detecting section.
NSRCHOF	Search exit instruction. Instruction to exit from search detection.
GETS B002 $B002	Specifies detected/not detected of the search detection. Transfers the contents of the system variables $B002 - B002. B002=1: Detected. B002=0: Not detected.
JUMP *NG IF B002=0	Jumps to the label [*NG] in case of B002=0, which comes out to be NOT DETECTED.
GETS B003 $B016	Transfers the contents of the system variables $B016, which are corresponding to RIN#(1), to B003.
GETS P001 $PX150	Transfers the contents of the system variables $P150 (which indicate the detecting position pulse) to P001 (the pulse data position type variables). *If B003 shows 2 or more detections, transfers the contents above $P150 to the Cartesian data position type variable.
CNVRT P002 P001 BF	Converts P001 (the pulse data position type variables) to P002 (the Cartesian data position type variables).
MOVL P002	Moves to the position type variables (P002).
*NG	Jumps to this destination in case of no detection is found.
MOVJ END	Moves to the standby position; finishes the current instruction.

7 Instruction List

Numbers or character data are indicated within the "< >". When there are more than one item in the additional item, choose one of them.

NSRCHON	Function	Executes a search function.	
	Additional Item	RIN# (<Direct IN No.>) = <Status>	Direct IN No.: 1 - 4 Status: ON, OFF, B <variable No.>.

		ORRIN# (<Specified direct IN No.>) = <Status>	Specified direct IN No.: (applicable unit: bit):
			1 - 15 (D0: RIN#(1),
			    D1: RIN#(2),
			    D2: RIN#(3),
			    D3: RIN#(4))
			Status: ON, OFF,
			B <variable No.>.

	Example	NSRCHON RIN#(1)=ON MOVL V=50 MOVL V=50	
NSRCHOF	Function	Exit from the search function.	
	Example	NSRCHOF	
GETS	Function	Saves the system variable ($ variable) as a user variable.	
	Additional Item	B <Variable No.>, I <Variable No.>, D <Variable No.>, R <Variable No.>, PX <Variable No.>,	User Variable
		$B <Variable No.>, $I <Variable No.>, $D <Variable No.>, $R <Variable No.>, $PX <Variable No.>,	System Variable
	Example	GETS B000 $B000 GETS I001 $I[1] GETS PX003 $PX001	
CNVRT	Function	Converts the data 2 (position type variable) into a specified Cartesian data position type variable, and store in the data 1. Format: CNVRT <Data 1> <Data 2> <Coordinate system>	
	Additional Item	Data 1 PX <Variable No.>	
		Data 2 PX <Variable No.>	
		BF, RF, TF, UF# (<User coordinate system No.>), MTF	BF: Base coordinate system RF: Robot coordinate system TF: Tool coordinate system UF: User coordinate system MTF: Master tool coordinate system
	Example	CNVRT PX000 PX001 BF CNVRT LPX000 LPX001 TF	

YRC1000micro OPTIONS
INSTRUCTIONS

FOR SEARCH FUNCTION IN CONTINUOUS MOTION

Specifications are subject to change without notice
for ongoing product modifications and improvements.

YASKAWA

YASKAWA ELECTRIC CORPORATION