1802, TFDEN-092-005, 001

NACHI

FD CONTROLLER INSTRUCTION MANUAL COMMAND REFERENCE

5th edition

Volume 3
(FN598 FOPEN -)

- Before attempting to operate the robot, please read through this operating manual carefully, and comply with all the safety-related items and instructions in the text.
- The installation, operation and maintenance of this robot should be undertaken only by those individuals who have attended one of our robot course.
- When using this robot, observe the low related with industrial robot and with safety issues in each country.
- This operating manual must be given without fail to the individual who will be actually operating the robot.
- Please direct any queries about parts of this operating manual which may not be completely clear or any inquiries concerning the after-sale service of this robot to any of the service centers listed on the back cover.

NACHI-FUJIKOSHI CORP.

Chapter 1 Command Reference

This document is a reference manual for application commands (Functions) and move commands.

1.1 What is command?

1.1.1 Outline of the command

There are two categories for the commands in a playback program. One is motion command that can be taught using [REC] key and the other is application command that can be taught using [FN] key. However, these are simply treated as "Commands" in the robot language program.

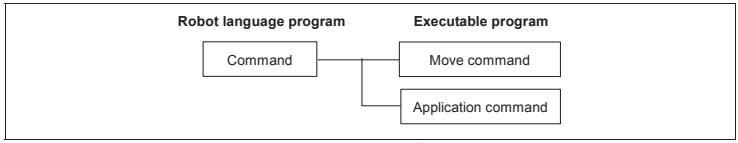


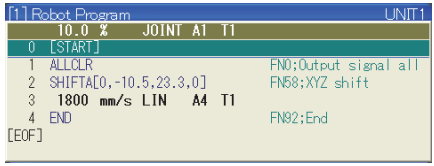
Fig 1.1.1 What is command?

Excepting three motion commands (MOVE, MOVEJ and MOVEX), the all command are called as "Application command (function)".

Application commands (functions) have code No. that starts from "FN". Motion commands do not have FN code No.

There are 100 or more various application commands for some kinds of applications or optional functions. For details. please refer to the respective option manuals.

1.1.2 Format of Move command and application command



Move command (step 3)
Application command (step 1,2 and 4)

- Parameters are surrounded by [ ] after command.
- FN code No. and title is displayed on the right side.

Fig 1.1.2 Format of move command and application command for executable program

```
ALLCLR - - - - - (1)
SHIFTA 0,-10.5,23.3,0 - - - - - (2)
MOVEX A=4,M1X,L,(*,*,*,*,*,*),S=1800,H=1,MS,CONF=0000 - - - (3)
END - - - - - (4)
```

Move command (3)
Application command (1) (2) (4)

- Parameters are displayed after command.
- Respective parameters are separated by comma.

Fig 1.1.3 Format of move command and application command for robot language program

1.2 Command list (order of SLIM command)

The command sorted in an order of SLIM command is described hereinafter.

The respective outlines are described in short. For more details, please refer to 1.3 Detail of each command (order of FN code No.).

IMPORTANT

Because this manual covers all the commands without any distinguishments like standard or option, please be sure that there are some cases where some commands are not available depending on the specification of the controller.
If the command is not displayed on the teach pendant screen, it is a command that is protected by option protect or non-supported command in an old system software version.

SLIM command	FN code	Name	Description
*	***601***	Label	Label. This is used as a label that can be referred by GOTO command etc.
ABOVE	***163***	Elbow config.(above)	The above-the-elbow (less than 180-degree angle formed by J2 axis and J3 axis) posture is forcibly selected for calculating the robot postures.
ABS	***657***	Let ABS function	Calculates the absolute value of real number.
ACOS	***649***	LET ACOS function	Get ACOS variables
ADAPTOFF	***365***	Adaptive Motion OFF	Ends Adaptive Motion. (Option)
ADAPTON	***364***	Adaptive Motion ON	Starts Adaptive Motion with the specified condition. (Option)
ADDP	***635***	Add pose variable	Adds the value of pose variable.
ADDR	***69***	Add shift value	The specified values in the specified shift register are added up. (Option)
ADDVF	***638***	Add real variable	Adds the value of real variable.
ADDVI	***637***	Add integer variable	Adds the value of integer variable.
AE	***415***	Arc end	Terminates arc welding with the specified conditions. This is available only when connected with a weld power interface.
AEM	***419***	Multi Pass Welding End	This ends the multi-pass welding under the designated conditions.
AEMV	***662***	Multi Pass Welding End(Variable)	Multi-pass welding end.
AES	***741***	Stitch pulse welding end command Cycle pulse welding end command	The arc welding will be terminated at the specified conditions.
AEV	***666***	ASV Arc end(Variable)	Terminates arc welding with the specified conditions.
AIMBASEPL	***725***	Aimed angle standard plane selection	This switches between the standard planes of aimed angle.
AIMREFPT	***726***	Aimed angle standard plane selection	This switches between the standard planes of aimed angle.
ALLCLR	***0***	Output signal all reset	This command is used to set all the output signals to OFF.
ANG2ENC	***820***	Set encoder Variable (angle)	Set an angle variable(As angle) to encoder variable(As encoder)
ANG2POS	***813***	Set position Variable (angle)	Set an angle variable(As angle) to position variable(As position)
ANG2POSE	***810***	Set Pose Variable (Angle)	Set an Angle variable(As Angle)to Pose variable Pn
AOUT	***46***	Analog output	The TCP (robot tool center point) linear speed and other data are output as analog voltages. Offset can be designated using distance or time. (OPTION)
APP_CALL	***880***	Call User application	Start the user application and wait for it to finish.
APP_CEVENT	***892***	Create event the User application	Create an event in the User application.
APP_FORK	***883***	Fork User application	Start the user application.
APP_HIDE	***891***	Hide User application	Hide the user application.
APP_SHOW	***890***	Show User application	Show me the user application.
APP_WAIT	***886***	Wait User application	Wait before the end user application.
APP_WEVENT	***893***	Wait event the User application	Wait for the event from the User application.
AS	***414***	Arc start	Starts arc welding with the specified conditions. This is available only when connected with a weld power interface.
ASIN	***648***	LET ASIN function	Get ASIN variables
ASM	***418***	Multi Pass Welding Start	This starts the multi-pass welding under the designated conditions.
ASMV	***661***	Multi Pass Welding Start(Variable)	Multi-pass welding start
ASS	***740***	Stitch pulse welding start command Cycle pulse welding start command	Starts arc welding with the specified conditions.
ASV	***665***	Arc start (Variable specification)	Starts arc welding with the specified conditions.
ATN	***655***	Let ATN function	Calculates the ATN value of real number.
ATN2	***656***	Let ATN2 function	Calculates the ATN2 value of real number.
AUTOZERO	***319***	Analog input auto zero set	Auto zero the analog input signal is executed. (Option)
BARC	***613***	Draw the arc	This command is used for the user screen to draw the arc.

SLIM command	FN code	Name	Description
BELOW	***164***	Elbow config.(below)	The below-the-elbow (180-degree angle or more formed by J2 axis and J3 axis) posture is forcibly selected for calculating the robot postures.
BGCOLOR	***617***	Designate back ground color	This can designate the background color used in color graphics command.(CLS, PRINT) Total 16 colors (0 to 15) are available.
BREAK	***688***	BREAK	End the execution of an innermost instruction that encloses this with the loop or the condition structure. The control shifts to the instruction immediately after the ended instruction.
CALIBROB	***702***	Calibration Execution	This is to execute deviation revision against the task program as a calibration target.
CALL	***21***	Step call	This command is used to call the step which has been specified in the same program.
CALLFAR	***454***	CallFar Program	This command is used to call the program of other unit. (Option)
CALLFARI	***455***	CallFarI Program	Using an input signal, this command is used to call the program of other unit. (Option)
CALLFARIV	***694***	CallFarI Program(Variable)	Call the task program in other unit, if there is a signal input.
CALLFARN	***456***	CallFarN Program	Using a pass count (number of passes), this command is used to call the program of other unit. (Option)
CALLFARNV	***695***	CallFarN Program(Variable)	Call the task program in other unit by the passing frequency.
CALLFARV	***693***	CallFar Program(variable)	Call the task program in other unit.
CALLI	***24***	Step call(I-condition)	Using an input signal, this command is used to call the step which has been specified in the same program.
CALLMCR	***671***	Call usertask Program	This command is used to call the specified user task program.
CALLN	***27***	Step call(freq. condition)	Using a pass count (number of passes), this command is used to call a step specified in the same program.
CALLP	***80***	Program call	This command is used to call the specified program.
CALLPBCD	***402***	Program call(external BCD prog.)	This command enables to call the program externally designated by the BCD code.
CALLPBIN	***403***	Program call(external BIN prog.)	The robot calls the program externally designated by the binary code.
CALLPI	***81***	Program call(I-condition)	Using an input signal, this command is used to call the specified program.
CALLPIV	***691***	Program call(I-cond…)(Variable)	Call the specified task program.
CALLPN	***82***	Program call(freq. condition)	Using a pass count (number of passes), this command is used to call the specified program.
CALLPNV	***692***	Program call(freq…)(Variable)	This command enables to call the specified task program by the passing number.
CALLPR	***102***	Relative program call	This command is used to call a subprogram and makes the first step position and orientation the same as the current step in the base program and all point positions in the subprogram become relative to that step position.
CALLPRI	***103***	Conditional relative program call	Using an input signal, this command is used to call the specified program.
CALLPRN	***104***	Relative program call (freq. condition)	Using a pass count (number of passes), this command is used to call the specified program.
CallProc	***806***	Call User Procedure	Call User procedure
CALLPV	***690***	Program call(Variable)	This command enables to call the specified task program.
CALMATRIX	***631***	Calculation matrix	Calculation matrix
CASE	***687***	CASE	Two or more conditions are judged.
CHGCOORD	***113***	Change coord. No.(shift)	This makes it possible to select the number of the user coordinate system used to implement shifts based on the coordinate system. The number of the user coordinate system must be selected without fail before implementing shift-related commands based on the coordinate system.
CHGENDLESS	***373***	Change endless control	The control of the endless rotation axis to change.
CHGGUN	***95***	Mount Mechanism2	Connect or disconnect mechanism2(Option) (dedicated to mechanism 2 only)
CHGMEC	***301***	Mount Mechanism	Connect or disconnect the designated mechanism(Option)
CHGXXGUN	***238***	Change Mechanism2	This is the function command used in mechanism change without electric disconnection, or mechanism change without removing and mounting.

SLIM command	FN code	Name	Description
CHGXXMEC	***302***	Change Mechanism	As for the change mechanism, refer to the function command CHGXXGUN: Change Mechanism (FN238). CHGXXGUN (FN238) is a command exclusive for the mechanism 2, meanwhile, CHXXMEC (FN302) allows you to designate an arbitrary mechanism. Except this point, it is the same command as CHGXXGUN (FN238).
CHKMCR	***834***	Check UserTask	Check the specified user task status from function commands in robot program or user task.
CLRREGWR	***699***	Clear register of written sts	Clear the written flag of shift register. (Option)
CLS	***609***	Clear user screen	This is to clear the user screen. (Paint screen with back ground color.)
CNVI	***550***	Conveyor interlock	Robot waits until conveyor register reaches up to the designated distance, stationarily. (Option)
CNVI2	***595***	Conveyor Interlock 2	Robot waits until conveyor register reaches up to the designated distance, stationarily
CNVSETM	***597***	Conveyer sync output signal ON/OFF	This command is used to set any general-purpose output signal to ON or OFF and assign conveyer resister value to global real number variable simultaneously with signal output.
CNVSYNC	***55***	Conveyor counter reset	Reset conveyor counter (Option)
CNVSYNCCHG	***274***	Conveyor synchronize select	Used to select a mechanism that is synchronized with the conveyor with the conveyor synchronization function.
CNVSYNCI	***562***	Conveyor interlock(sync.)	Robot waits until conveyor register reaches up to the designated distance, synchronizing to the conveyor. (Option)
COLDET	***31***	Collision detection	Executing step is interrupted by collision detection.
COLOR	***616***	Designate color	This can designate the color used in color graphics command. Total 16 colors (0 to 15) are available. 0; Black 1: Gray 2: Dark Blue 3: Blue 4: Dark Green 5: Green 6: Dark Sky Blue 7: Sky Blue 8: Dark Red 9: Red 10:Purple 11:Pink 12:Dark Yellow 13:Yellow 14:Light Gray 15:White
COLSEL	***230***	Set interference detection level	The threshold value to be considered as interference can be switched during playback.
COMPOFF	***207***	Compliance OFF	When this function command is executed, the soft compliance control function becomes disabled. (Option)
COMPON	***206***	Compliance ON	When this function command is executed, the soft compliance control function becomes enabled, and the robot can be moved according to external force. (Option)
COS	***653***	Let COS function	Calculates the COS value of real number.
CPRIMCR	***703***	Change usertask priority	The function changes the usertask priority.
CVTCOORDPOS	***821***	Coord. Trans (position)	Translate a position variable(As Position) to a designated coordinate.
DELAY	***50***	Timer delay	This command is used to place the robot in the standby status.
DIM	***801***	Any variable	You can define some variables as Integer, real and Array, as you like.
DIVVF	***644***	Divide real variable	Divides the value of real variable.
DIVVI	***643***	Divide integer variable	Divides the value of integer variable.
DOUT	***278***	Digital output	The TCP (robot tool center point) linear speed and other data are output using general-purpose output signals.
DPRESETM	***280***	Advanced output (distance)	This command is used to set one of the general-purpose output signals with advancing distance
DSPALLET	***65***	Direction select palletize	This limits the shift direction, and it is started by the palletizing work. (Option)
ELSE	***678***	Condition	Move the control to the following instruction.
ELSEIF	***677***	Condition	Move the control to the following instruction when the condition consists. Move the control to ELSE and ENDIF for the failure.
ENC2ANG	***817***	Set angle Variable (encoder)	Set an encoder variable(As encoder) to Angle variable(As Angle)
ENC2POS	***814***	Set position Variable (encoder)	Set an encoder variable(As encoder) to position variable(As position)
ENCS2POSE	***811***	Set Pose Variable (encoder)	Set an encoder variable(As Encoder)to Pose variable Pn

SLIM command	FN code	Name	Description
END	***92***	End	This command is used to end program playback. If the program is a called program, return to the original program.
ENDIF	***679***	Condition end	End IF-ENDIF.
EndProc	***804***	End Procedure	Finish and exit Procedure, and back to source procedure
ENDS	***689***	SWITCH end	It is a terminator of the SWITCH-ENDS structure.
ENDW	***664***	WHILE end	It is terminator of the WHILE-ENDW structure.
EP	***498***	Execution Pass Specification	This designates per pass whether the function commands are to be executed or not in the multi-pass section.
EQUALIZE	***287***	Equalize value	This command is used to the equalizing motion as defined by the servo gun.
EQUALIZECLR	***248***	Equalize clear	The equalize setting clear.
ET	***486***	End tracking	This ends the seam tracking. This is used when the arc sensor (AX-AR) is connected.
EXIT	***619***	User task end	This can terminate the user task.
ExitProc	***803***	Exit User Procedure	Stop procedure routine and back to source procedure
EXT_TRACK	***45***	External tracking	External tracking
FBUSCON	***565***	Field bus connect	This function is for a Filedbus master module. After waiting for the connection of the designated node (slave) with time-out condition, continue the program enabling the error detection immediately.
FBUSREL	***312***	Field bus release	In the field bus master, error detection Enabled/Disabled of the specified node is switched.
FCASEEND	***88***	Case jump end	This command is used to end the case jump(FCASEI, FCASEN).
FCASEI	***87***	Case jump(I-condition)	Using an input signal, this command is used to select one of a multiple number of steps and executes it.
FCASEN	***86***	Case jump(freq. condition)	Using a pass count (number of passes), this command is used to select one of a multiple number of steps and execute it.
FCLOSE	***599***	File Close	Specify the output file using FN669 PRINTF.
FETCH	***528***	Fetch Input cond.	Determine judgment the input condition of a following function.
FHCLAMP	***362***	FLEXhand Clamp	Execute clamp moiton by FLEXhand. (Option)
FHCLAMP2	***366***	New FH Clamp	Execute clamp moiton by FLEXhand
FHCLAMPDCT	***368***	FH Clamping Detection	Detect clamp status by FLEXhand
FHUNCLAMP	***363***	FLEXhand Unclamp	Execute unclamp moiton by FLEXhand (Option)
FHUNCLAMP2	***367***	New FH Unclamp	Execute unclamp moiton by FLEXhand
FLIP	***165***	Wrist config.(flip)	The wrist-flip posture is forcibly selected for calculating the robot postures.
FOPEN	***598***	File Open	Close the opened file.
FOR	***604***	Loop Start	This is loop command. Loop starts here. See also; NEXT(FN605)
FORCECTRL	***326***	Force control	Start the force control.
FORCEEND	***328***	Force Control/ Touch End	Ending of the force control and touch shift.
FORCETOUCH	***327***	Force Touch	Start the touch operation.
FORCEZERO	***379***	Force Sensor Zero Adjustment	Set the correction value of the force sensor.
FORK	***450***	Fork Program	This command is used to start the program of other unit. (Option)
FORKI	***451***	ForkI Program	Using an input signal, this command is used to start the program of other unit. (Option)
FORKMCR	***670***	Fork Usertask Program	This command is used to start the specified user task program.
FORKMCRDST	***673***	Fork User Task Program (distance)	This command is used to start the specified user task program with advancing distance.
FORKMCRTM	***672***	Fork User Task Program (time)	This command is used to start the specified user task program. Furthermore, the command enables advance execution to be specified.
FORKN	***452***	ForkN Program	Using a pass count (number of the passes), this command is used to start the program of other unit.(Option)
FORKWAIT	***453***	Wait Fork-Program	This command leads the robot to await the completion of the task program of the other unit which was started up by the FORK, FORKI or FORKN command. (Option)
FORM	***370***	Form cut	Cutting operation is performed using the specified form data.

SLIM command	FN code	Name	Description
FRANGE	***202***	Flange axis rot. config.	The rotational direction of the J6 axis is specified for calculating the robot postures
GACTIVE	***696***	Active user window	Switch the active of the user window.
GARC	***623***	Display ellipse	This command is used for the user screen to draw the ellipse.
GBOX	***612***	Draw the box	This command is used for the user screen to draw the box.
GE	***413***	Gas OFF	Stops the shield gas.
GETANG	***823***	Set angle variable (pos.data)	Substitute robot position to angle variables
GETANGLE	***157***	Set real variable (angle)	This command is used to store the current angle value of each axis in a real number variable.
GETBYTE	***587***	Get buffer (byte)	This command is used to read one byte data from the buffer, and stored the integer variable.
GETENC	***824***	Set encoder variable (pos.data)	Substitute robot position to encoder variables
GETFIGURE	***158***	Set real variable (figure)	The robot figure is used to store in real number variables.
GETFORCE	***360***	Get force/torque	The force/torque data are acquirable to a real variable. (Option)
GETFORCE2	***329***	Get Force/Torque Data	Acquire the data for force sensor.
GETINT	***585***	Get buffer (integer)	This command is used to read data from the buffer, and stored the integer variable.
GETOVR	***318***	Get Override	This command is used to get the speed override value.
GETP	***142***	Set real variable (coordinate)	This command is used to store the current coordinate values (RPY angle expression) in real number variables.
GETPELR	***94***	Set real variable(Euler pos)	This command is used to store the current coordinate values (Eulerian angle expressions) in the real number variables
GETPOS	***822***	Set position variable (pos.data)	Substitute robot position to positional variables
GETPOSE	***143***	Set real variable (pose)	This stores the pose variable Pn into the real variable V!.
GETREAL	***586***	Get buffer (real)	This command is used to read data from the buffer, and stored the real variable.
GETSFT	***145***	Set real variable (shift)	This command replaces the values of the specified shift register with the specified real number variables (7 consecutive variables are used).
GETSTR	***584***	Get buffer (string)	This command is used to read data from the buffer, and to store data in the string variable.
GETTIPCON	***306***	Get tip consumption	Used to get tip consumption amount.
GETTIPRATE	***371***	Get tip consumption rate	Used to get move-tip consumption rate.
GETTOOL	***830***	Get Tool Parameters	This command is used to get the tool parameter values.
GETUSRCOORD	***627***	Get user coordinate	Get the existent user coordinates
GFONT	***683***	Set the font	The font of the user screen is set.
GLINE	***611***	Display position specification	This command is used for the user screen to draw the straight line.
GMSGBOX	***685***	Create message box	Create a message box on the user screen.
GOSUB	***91***	Line call	Execute a sub-routine call by a designated line No. or label.
GOTO	***90***	Line jump	This is used to jump to a designated line or label.
GPAINT	***614***	Paint	This command is used to paint out the enclosed area on the user screen.
GS	***412***	Gas ON	Starts to output the shield gas.
GSEA	***167***	Servo gun search	This command is used to detect the electrode tip consumption of the servo gun.
GSEA_ORDER	***229***	Servo gun search order	Servo gun search2 is execute before servo gun search1
GSETP	***615***	Draw the pixel	This command is used for the user screen to draw a pixel.
GSOFTKEY	***684***	Create soft key	Create a soft key on the user screen.
GUNOPEN	***218***	Gun Open	This command is used to change stroke of air gun.
ICH	***410***	Inching	Performs inch the wire with specified time and wire speed
IF	***602***	Condition	If condition is satisfied then command(jump/call) after “THEN” is executed, else command(jump/call) after “ELSE” is executed.
IF	***676***	Condition	Move the control to the following instruction when the condition consists. Move the control to ELSEIF, ELSE, and ENDIF for the failure.
INCLUDE	***697***	Translate table included (file)	The conversion rule is read from “inc file”
INCLUDEIO	***698***	Translate table included (I/O)	The conversion rule is read from “I/O NAME”.
INH	***310***	Inhibit	This determines to inhibit the fetch control.

SLIM command	FN code	Name	Description
INPUT	***271***	Strings input	This receives the character string data from the specified communication (serial) port, and holds it in the specified character string variable. (Option)
INT2OSIG	***531***	Change int to O-signal	Change an integer to O-signal.
JMP	***20***	Step jump	The robot jumps to the step specified in the same program.
JMPI	***23***	Step jump(I-condition)	Using an input signal, this command causes the robot to jump to the step specified in the same program.
JMPN	***26***	Step jump(freq. condition)	Using a pass count (number of passes), the robot jumps to the step specified in the same program.
JMPP	***83***	Program jump	This command is used to jump to the start of the specified program.
JMPPBCD	***400***	Program jump(to ext. BCD prog.)	This command enables to externally jump to the program designated by the BCD code.
JMPPBIN	***401***	Program jump(to ext. BIN prog.)	The robot jumps to the program externally designated by the binary code.
JMPPI	***84***	Program jump(I-condition)	Using an input signal, this is used to jump to the start of the specified program.
JMPPIV	***681***	Program jump (I-cond…)(Variable)	This command enables to jump to the specified task program top.
JMPPNV	***682***	Program jump(freq…)(Variable)	This command enables to jump to the specified task program top by the passing number.
JMPPN	***85***	Program jump(freq. condition)	Using a pass count (number of passes), this command is used to jump to the start of the specified program.
JMPPV	***680***	Program jump(Variable)	This command enables to jump to the specified task program top.
KILLMCR	***833***	Kill UserTask	Stop the specified user task from function commands in robot program or user task.
LCALLMCR	***593***	Call User Task Program with Arguments	This command is used to call the specified user task program. At this time, ten real numbers can pass the arguments to the program.
LCALLP	***590***	Program call with Arguments	This command is used to call the specified program. At this time, ten real numbers can pass the arguments to the program.
LCALLPI	***591***	Conditional program call with Arguments	Using an input signal, this command is used to call the specified program. At this time, ten real numbers can pass the arguments to the program.
LCALLPN	***592***	Conditional program call after specified number of passes with Arguments.	Using a pass count (number of passes), this command is used to call the specified program. At this time, ten real numbers can pass the arguments to the program.
LEFTY	***161***	Arm config.(left/front)	The left-arm system posture is forcibly selected for calculating the robot postures
LET	***634***	Let variable	Sets the variable of the same type.
LETC	***647***	Integer variable setting	Used to make setting of values to integer variable registers specified.
LETCOORDP	***630***	Let pose variable	Stores the pose data recorded by the specified rectangular coordinates value in the pose variables.
LETLF	***629***	Set local real variable	Sets the value into the specified local real variable register.
LETLI	***628***	Set local integer variable	Sets the value into the specified local integer variable register.
LETPE	***632***	Let pose element	Stores the pose element recorded by the specified rectangular coordinates value in the pose variables.
LETPOSE	***144***	Set pose variable	This stores the real variable V!. into the pose variable.
LETR	***68***	Set shift value	The shift amount data is set in the specified shift register. (Option)
LETRE	***633***	Let shift element	Sets the shift element in the specified shift register.
LETVF	***76***	Set real variable	Substitute a value for a global float variable. Can not substitute for a local variable.
LETVI	***75***	Set integer variable	Substitute a value for a global integer variable. Can not substitute for a local variable.
LETVS	***77***	Set strings variable	Substitute a value(string) for a global string variable. Can not substitute for a local variable.
LETX	***71***	Pose X	Substitute a value for the X component of a pose. LETX, LETY, and LETZ are available only for an already recorded pose. These functions are used in a case where only 1 pose is made and parallel shift is applied for the pose.
LETY	***72***	Pose Y	Substitute a value for the Y component of a pose.

SLIM command	FN code	Name	Description
LETZ	***73***	Pose Z	Substitute a value for the Z component of a pose.
LOCATE	***610***	Locate the display pos	This command is used to specify the position of the character displayed on the user screen.
LOCCVT	***53***	Coord. trans(shift value)	It is possible to proceed with playback while offsetting each recorded point based on the difference (skew amount) measured beforehand between the recorded position of the three points serving as the reference and the actual position obtained from the visual device, etc. (OPTION)
LOCCVT1	***54***	Coord. trans(posi. value)	It is possible to proceed with playback while offsetting each recorded point based on the difference (skew amount) measured beforehand between the recorded position of the three points serving as the reference and the actual position obtained from the visual device, etc.
LOCCVT3	***275***	Base angle shift	The start or end of the shift operation is specified. When shift operation start has been specified, the shift operation is performed on the basis of the shift amount stored in the specified shift register.
MAX	***659***	Let MAX function	Calculates a larger real number out of two.
MESPOS	***700***	Taking of a Measuring/Reference point	This is to specify the measurement point.
MESQCP	***701***	Taking of a Quick check point	Obtain and store the quick check pints.
MIN	***658***	Let MIN function	Calculates a smaller real number out of two.
MODUSRCOORD	***626***	Modify User coordinate	Modifies the existent user coordinates using pose variables
MOVE	***-***	Movement (Cartesian coordinates or pose designation)	Move the robot based on a traditional Cartesian coordinate system of NACHI AW controller.(XYZRPY)
MOVEJ	***-***	Movement (Axis values)	Move the robot using joint values(angles) in NACHI AW controller format.
MOVEX	***645***	Movement (Unified format)	Move the robot based on this controller original format. Position data can be given in any of Cartesian coordinates, joint values and encoder data.
MPE	***497***	Multi Pass Section End	This represents the end position of the section where a series of movements for multi-pass welding is repeated.
MPS	***496***	Multi Pass Section Start	This represents the start position of the section where a series of movements for multi-pass welding is repeated.
MSRTM	***835***	Measure Time	Measure processing time from start-point A to end-point B.
MULTIM	***264***	Multi output signal	This command is used to set the pre-defined multiple output signals to ON or OFF using the binary format.
MULVF	***642***	Multiply real variable	Multiplies the real variables.
MULVI	***641***	Multiply integer variable	Multiplies the integer variables.
NEXT	***605***	Loop End	Please refer to "FOR"(FN604).
NONFLIP	***166***	Wrist config.(non-flip)	The wrist-non-flip posture is forcibly selected for calculating the robot postures.
NOP	***600***	NOP	No operation
NRLCRD	***171***	Select robot language coordinate system	Used to switch functions to a specified user coordinate system.
OFFSET	***499***	Multi Offset Specification	This sets offset in the movement steps in the multi-pass welding section.
OFFSETV	***660***	Multi Offset condition specification (Variable)	It gives offset to the movement steps between multi-pass welding section.
OnErrGoto	***36***	Error interrupt	Call the step/label, when an error or alarm occurs.
ONGOTO	***603***	ON GOTO Jump	Next command(jump/call) is determined by the value of condition. It's order is 1,2,3… from left.
OPEANG	***827***	Extraction angle Variable	Substitute or Extract an angle variable to a global real variable (V!) or local real variable (L!).
OPEENC	***828***	Extraction encoder Variable	Substitute or Extract an encoder variable to a global integer variable (V%) or local integer variable (L%), any integer variable.
OPENMCR	***621***	Open user task	Start user task program
OPEPOS	***826***	Extraction position Variable	Substitute or Extract a position variable to a global real variable (V!) or local real variable (L!).
OPEPOSE	***825***	Extraction pose Variable	Substitute or Extract a pose variable to a global real variable (V!) or local real variable (L!).
OUT	***44***	Binary output signal	This command is used to set the general-purpose output signals in any group to ON or OFF using the binary format.

SLIM command	FN code	Name	Description
OUTDIS	***43***	Discrete output signal	This command is used to set the general-purpose output signals in any group to ON or OFF using the discrete format.
PALLET2	***47***	Palletize start	Start palletizing based on the pre-designed palletizing pattern. (OPTION)
PALLET2_END	***48***	Palletize end	Finish palletizing based on the pre-designed palletizing pattern. Confirmation signal can be output. (OPTION)
PALLET2_RESET	***49***	Palletize reset	When a condition signal has been input, the palletize counter is forcibly reset. (palletizing operation is forcibly terminated) (OPTION)
PALLET3	***249***	Palletize start	Start palletizing based on the pre-designed palletizing pattern.
PALLET3_APR	***374***	Palletize approach selection	Starts approaching motion.
PALLET3_END	***250***	Palletize end	Finish palletizing based on the pre-designed palletizing pattern.
PALLET3_GETREG	***377***	Get palletize register	Store some palletize register to some variables.
PALLET3_GETSFT	***393***	Get palletize shift value	Store palletize shift value to some variables.
PALLET3_OPT	***375***	Palletize optimize path	Optimize Step position based on the locus of previous step and following step
PALLET3_RESET	***251***	Palletize reset	The palletize counter is forcibly reset. (palletizing operation is forcibly terminated)
PALLET3_SELGR	***376***	Palletize select grasp position	Select Work grasp position from registered by Palletize pattern.
PALLET3_SELZ	***388***	Palletize select height(Z)	The function compares the Z-axis value of target step and the Z-axis value of reference step after palletizing shift by using target palletizing number set by the first parameter of the function, and then Z-axis value of target step will be adjust higher value of both.
PALLET3_SELZJMP	***394***	Palletize select height (z) step jump	The function compares the Z-axis value of target step and the Z-axis value of reference step after palletizing shift by using target palletizing number set by the first parameter of the function, and then Z-axis value of target step will be adjust higher value of both.
PALLET3_SELZSFT	***395***	Palletize select height (z) step jump	The function compares the Z-axis value of target step and the Z-axis value of reference step after palletizing shift by using target palletizing number set by the first parameter of the function, and then Z-axis value of target step will be adjust higher value of both. In addition, the shift amount ratio amount specified in the palletizing shift, it will shift operation.
PALLET3_SETREG	***378***	Set palletize register	Set some variables to some palletize registers.
PAUSE	***620***	Pause user task	This can make a brief stop of user task.
PAUSEINPUT	***252***	Pause Input	The robot is pause when the designated [Pause input] signal is turned off.
POS2ANG	***816***	Set angle Variable (position)	Set a position variable(As position) to Angle variable(As Angle)
POS2ENC	***819***	Set encoder Variable (position)	Set a position variable(As position) to encoder variable(As encoder)
POS2POSE	***809***	Set Pose Variable (position)	Set a position variable(As Position)to Pose variable Pn
POSAUTO	***160***	Disable posture control	Used to disable the posture control for robot posture calculation.
POSE2ANG	***815***	Set angle Variable (pose)	Set Pose variable Pn to Angle variable(As Angle)
POSE2ENC	***818***	Set encoder Variable (pose)	Set Pose variable Pn to encoder variable(As encoder)
POSE2POS	***812***	Set position Variable (pose)	Set a Pose variable Pn to position variable(As position)
POSESAVE	***74***	Pose file save	Pose variables are stored to the pose file.
PRINT	***101***	Output strings	The character string data is output to the screen or specified RS232C serial port.
PRINT	***606***	Print String	Please refer to "PRINT"(FN101).

SLIM command	FN code	Name	Description
PRINTF	***669***	Print string with format	Draw the string data on the screen with form. Or Output string data with form via RS232C.
PRSD	***308***	Read press data	This reads a press brake synchronization setting file, in the press brake synchronization function.
PRSI	***564***	Press interlock	This sets interlock, in the press brake synchronization function.
PRSS	***307***	Press brake shelter	This executes retreat actions after work process, in the press brake synchronization function.
REGC	***224***	Shift register copy	Data is copied between shift registers. (Option)
RELMOV	***407***	Move of External axis	The designated external axis moves the specified distance from the current position.
REM	***99***	Comment	This command is used to provide comments inside programs.
RESET	***34***	Output signal reset	This command is used to set one of the general-purpose output signals to OFF.
RETI	***25***	Step return(I-condition)	Using an input signal, this command is used to return the robot to the step following the one which executed the step call command in the same program.
RETN	***28***	Step return(freq. condition)	Using a pass count (number of passes), this command is used to return the robot to the step following the one which executed the step call command in the same program.
RetProc	***805***	Return User Procedure	Set a return value of user procedure
RETURN	***22***	Step return	This command is used to return the robot to the step following the one which executed the step call command in the same program. The commands that call a sub-routine are CALL, CALLI, CALLN, and GOSUB. Normally, only GOSUB is used in robot language.
RETURNERR	***37***	Error interrupt return	Return from error interrupt processing.
RIGHTY	***162***	Arm config.(right/back)	The right-arm system posture is forcibly selected for calculating the robot postures
RINT	***29***	Robot interrupt(I-condition)	Executing step is interrupted by input signal
ROLHEMCHG	***193***	Change roller hem condition	Change the roller hem conditions during pressurization.
ROLHEMCTRL	***192***	Change control of roller hem	Change the control of roller hem during execution of roller hemming.
ROLHEMEND	***191***	Finish roller hem	Finish the roller hem pressing.
ROLHEMST	***190***	Start roller hem	Execute roller hem in accordance with pre-defined condition.
RSCLR	***111***	RS232C buffer clear	The send/receive buffer inside the specified RS232C port is cleared. (Option)
RTC	***411***	Retract	Performs to retract the wire with specified time and wire speed.
SCANF	***589***	Scan string with format	Read one line of strings from specified file, and output string to string register.
SEA	***59***	Search	Detect the work position shift amount, and store those data to the shift register (Option)
SEAMANG	***254***	Seam angle correction	Seam angle correction is start / end.
SEAMEND	***246***	Seam weld end	Stop the seam welding.
SEAMOV	***313***	Seam override	Set the electrode rotation speed override.
SEAMSPD	***247***	Seam electrode speed	Set the electrode rotation speed while welding.
SEAMST	***245***	Seam weld start	Start the seam welding.
SEAMTHICK	***311***	Seam panel thick	Set the thickness of the work.
SERVOON	***38***	Servo ON	Turn on the servo.
SET	***32***	Output signal set	This command is used to set one of the general-purpose output signals to ON.
SETBYTE	***583***	Set buffer (byte)	This command is used to stored byte data at an arbitrary position in the buffer.
SETC	***646***	Set output signal	Consecutive output signal is output.
SETINT	***581***	Set buffer (integer)	This command is used to stored integer value at an arbitrary position in the buffer.
SETM	***105***	Output signal	This command is used to set any general-purpose output signal to ON or OFF
SETMD	***35***	Output sig(ON/OFF/delay/pulse)	This command is used to set one of the general-purpose output signals to come with a pulse or delay and to ON or OFF.

SLIM command	FN code	Name	Description
SETMSECTION	***396***	Sectional signal output	This command is used to set any general-purpose output signal to ON or OFF. In selecting the step between ON to OFF, the signal always turns ON.
SETO	***100***	Consecutive output signal ON/OFF	This command is used to set any number of consecutive general-purpose output signals to ON or OFF altogether.
SETOVR	***317***	Set Override	This command is used to set the speed override value.
SETREAL	***582***	Set buffer (real)	This command is used to stored real value at an arbitrary position in the buffer.
SETSTR	***580***	Set buffer (string)	This command is used to stored string at an arbitrary position in the buffer.
SETTHKERR	***392***	Set panel thickness abnormal level	This command is setup (+) and (-) of panel thickness abnormal level detection is specified directly.
SETTIPCON	***323***	Set tip consumption	Used to set tip consumption amount.
SETTIPRATE	***372***	Set tip consumption rate	Used to set move-tip consumption rate.
SETTOOL	***831***	Set Tool Parameters	This command is used to set the tool parameter values from real variable register.
SETVELO	***309***	Set velocity	This command is used to set the speed in an endless axis.
SF0	***470***	Wire Extension	This detects and corrects the wire extension. This is used when the touch sensor (AX-WD) is connected.(OPTION)
SF1	***471***	One Direction Search(Touch)	This detects the deviation of a workpiece by a touch sensor. *This is used when the touch sensor (AX-WD) is connected. (Option)
SF2	***472***	Pattern Search(Touch)	Detect setting deviation of the work object by the touch sensor attached to the welding wire and store the deviation volume/gap volume file in the specified file / gap file.
SF3	***473***	Deviation call	This receives the stored deviation and execute a compensation. (Option) *This is used when the touch sensor (AX-WD) and the laser search (AX-RD) are connected.
SF4	***474***	Dev. vector composition	This calculates a new deviation on the basis of stored deviation. This is used when the touch sensor (AX-WD) and the laser search (AX-RD) are connected.
SF5	***475***	Store of tracking deviation	Store the cumulative volume of the weld line tracking augmenter up to the present will be stored in the deviation file.
SF8	***478***	Generation of a DEV. file	Exchange the deviation volume between the general purpose register and the deviation file.
SF9	***479***	Generation of a GAP.file	This stores variable values to a gap file. This is used when the touch sensor (AX-WD) and the laser search (AX-RD) are connected.
SGSPRT	***279***	Servo gun separation	Servo gun separated status is changed.
SGTIPRST	***270***	Reset consumption	Reset the tip consumption of designated servo gun
SHIFTA	***58***	XYZ shift	The playback position is shifted in parallel (Option)
SHIFTR	***52***	Shift	The start or end of the shift operation is specified. When shift operation start has been specified, the shift operation is performed on the basis of the shift amount stored in the specified shift register.
SIGREQ	***723***	Shift value get (signal)	Using external signals, the command requests shift amount input, and the shift amount data which is input is stored in the designated shift register.
SIN	***652***	Let SIN function	Calculates the SIN value of real number.
SLEND	***351***	Seal end	Stop the dispensing process
SLPRS	***355***	Seal press ctrl	Start/Stop pressure control in the dispensing process.
SLPRSG	***356***	Seal press ctrl 2	Start/Stop pressure control in the dispensing process. Control level can be designated.
SLREADY	***353***	Flow ready	Pressure in the pump is controlled to a specified value.
SLRELOAD	***352***	Reload	Refill the booster pump.
SLSTART	***350***	Seal start	Start the dispensing.
SOCKBIND	***572***	Bind the socket	This command is used to assign a socket an port No.
SOCKCLOSE	***571***	Close the socket	This command is used to close the socket.
SOCKCONNECT	***574***	Connect to server	This command is used to connect to server.
SOCKCREATE	***570***	Create Socket	This command is used to create the socket.
SOCKRECV	***577***	Receive data	This command is used to receive the data.
SOCKSEND	***575***	Send data	This command is used to transmit the data stored in the pecified buffer.

SLIM command	FN code	Name	Description
SOCKSENDSTR	***576***	Send string	This command is used to transmit the specified string.
SOCKWAIT	***573***	Wait for connect	This command is waited for until the connection from the client is done to the allocated port.
SPDDOWNA	***169***	Analog input speed override	The playback speed of the robot is changed in accordance with the input voltage. (Option)
SPDDOWND	***277***	Digital input speed override	The playback speed of the robot is changed in accordance with digital input signals
SPF	***439***	Servo OFF	This turns OFF the servo power source in unit of mechanism.
SPN	***438***	Servo ON	This turns ON the servo power source in unit of mechanism.
SPOT	***119***	Spot welding	Execute spot welding in accordance with pre-defined sequence.
SPOT2	***268***	Spot welding	By recording the spot welding function to the welding step, spot welding can be carried out by a designated sequence
SPOTC	***314***	Spot welding execution	Execute spot welding in accordance with pre-defined sequence.
SPOTIWB1	***199***	Spot welding	Execute spot welding in accordance with pre-defined sequence.（dedicated to welding I/F＝MEDbus only）(Option)
SPRAYOFF	***409***	Spray End	Turn OFF the start signal of thermal spraying
SPRAYON	***408***	Spray Start	Turn ON the start signal of thermal spraying
SQR	***651***	Let SQR function	Calculates the square root of the real number.
SREQ	***51***	Shift data request	The command requests the shift amount data from the external device using the serial port. Once it has been input from the external device, the shift amount data is stored in the specified shift register.
SREQ2	***315***	Shift amount request (binary)	The command requests the shift amount data (binary data) from the external device using the serial port. Once it has been input from the external device, the shift amount data is stored in the specified shift register.
ST	***485***	Start tracking	This starts seam tracking. This is used when the arc sensor (AX-AR) is connected.
STIMER	***150***	Short timer	Used to wait for a specified period of time.
STOOL	***67***	Select the stated tool No.	This command is used to select the coordinate system of the stationary tool number from among the user coordinate systems
STOP	***41***	Robot stop	This command is used to stop the robot.
STOPI	***42***	Robot stop(I-condition)	Using an input signal, this command is used to stop the robot.
SUBVF	***640***	Subtract real variable	Subtracts the real variable.
SUBVI	***639***	Subtract integer variable	Subtracts the value of integer variable.
SWITCH	***686***	SWITCH	Two or more conditions are judged.
SYNCSPOT	***303***	Sync spot welding	Enabling to perform synchronous welding with two servo guns.
SYNCSPOTIWB	***316***	Sync spot welding	Enabling to perform synchronous welding with two servo guns.（dedicated to welding I/F＝MEDbus only）(option)
TAN	***654***	Let TAN function	Calculates the TAN value of real number.
TIMER	***650***	Let TIMER function	Sets the time value passed since the power-on into the specified real variable register.
TIPDRESS	***265***	Tip dress	Execute the tip dress of spot welding gun.
TITLE	***608***	User screen title	This is to draw the title of user screen.
USE	***98***	Select pose file	This function is used to select a pose file. Pose data is controlled as a file, and poses P1 - P9999 can be recorded into a file. For example, it is useful when to change only the position data of the robot according to the type of work piece, and when to play back a same program.
USRERR	***467***	User Error Output	Output the user customized error, alarm and information.
UsrProc	***802***	User Procedure	Define User Procedure
VCHKGRP	***336***	Vision group check	Check the measurement group of the vision sensor.(Option)
VDATA	***334***	Vision data	Get the data from the vision sensor.(Option)
VGROUP	***335***	Vision group change	Change the measurement group of the vision sensor.(Option)

SLIM command	FN code	Name	Description
VLOCCVT	***342***	Vision location convert	The start or end of the shift operation with the vision sensor are specified. When shift operation start has been specified, the shift operation is performed on the basis of the shift amount stored in the specified shift register. (Option)
VRESET	***330***	Vision reset	Data of the vision sensor is cleared. (Option)
VSHIFT	***333***	Vision shift	Get the shift value from the vision sensor. (Option)
VSTART	***331***	Vision start	Start the measurement of vision sensor. (Option)
VWAIT	***343***	Vision measure wait	The measurement completion of the vision sensor is waited for.(Option)
VWORK	***332***	Vision work	Distinguish work with the vision sensor. (Option)
WAIT	***552***	Wait I-cond with timer	This command is used to wait for any one general-purpose input signal for up to the specified time.
WAITA	***553***	Wait I-group(AND) with timer	This command is used to wait for any of group general-purpose input signal (AND logic) with designated time.
WAITAD	***558***	Wait I-group BCD(AND) with timer	This command is used to wait for any of group general-purpose input signal (AND logic) with designated time. The condition is written in BCD format.
WAITE	***555***	Wait I-group with timer	This command is used to wait for any of group general-purpose input signal with designated time.
WAITED	***560***	Wait I-group BCD with timer	This command is used to wait for any of group general-purpose input signal with designated time. The condition is written in BCD format.
WAITI	***525***	Wait Input cond	This command is used to wait for any one general-purpose input signal.
WAITJ	***526***	Wait not Input cond	This command is used to wait for any one general-purpose input signal using negative logic.
WAITJL	***561***	Wait not I-cond with timer2	This command is used to wait for any one general-purpose input signal using negative logic for up to the specified time.
WAITMCR	***622***	Wait user task	Wait for the end of user task program
WAITO	***554***	Wait I-group(OR) with timer	This command is used to wait for any of group general-purpose input signal (OR logic) with designated time.
WAITOD	***559***	Wait I-group BCD(OR) with timer	This command is used to wait for any of group general-purpose input signal (OR logic) with designated time. The condition is written in BCD format.
WAITR	***127***	Wait shift value receive	This initiates a jump to the shelter step when the robot has been waiting for the shift amount data to be input from the external source into the specified shift register and the data has not been input within the specified time. (Option)
WAX	***441***	Axis Weaving	Starts weaving with the simple harmonic motion of the axes.
WAXV	***668***	Axis Weaving (variable)	Starts weaving with the simple harmonic motion of the axes.
WE	***443***	Weaving End	Terminates weaving
WELDCND	***33***	Spot condition output	This function outputs signals assigned to the "weld condition output."
WELDGRP	***282***	Weld condition with group	When this function command is executed, the welding machine number to be used by the welding function (FN119) and the welding condition group number are designated.
WFP	***440***	Fix Pattern Weaving	Starts weaving with the specified waveform, attitude, and frequency.
WFXP	***667***	Fixed pattern weaving (Variable)	Starts weaving with the specified waveform, attitude, and frequency.
WHILE	***663***	WHILE loop	Execute the instruction in WHILE-ENDW repeatedly until the condition doesn't consist.
WINDOW	***607***	User screen open/close	Open user screen, or close user screen.
WRISTSINGULARITY	***289***	Wrist singularity control	This makes to robot able to pass through the dead zone with condition that flange surface is the horizontal.
WSF	***442***	Taught Weaving	This carries out weaving in the taught pattern.
ZF1	***480***	One Direction Search(Laser)	This detects the setting deviation of a workpiece. This is used when the laser search (AX-RD) is connected.
ZG1	***483***	High-speed groove search	This searches the groove information at high speed. This s used when the laser search (AX-RD) is connected.

1.3 Detail of each command (order of FN code No.)

Detail of each command is described hereinafter, sorted in an order of FN code number.

IMPORTANT

Because this manual covers all the commands without any distinguishments like standard or option, please be sure that there are some cases where some commands are not available depending on the specification of the controller.
If the command is not displayed on the teach pendant screen, it is a command that is protected by option protect or non-supported command in an old system software version.

Function commands (FN codes)

Command name	FOPEN
FN code	598
Title name	File Open
General description	Close the opened file.

■ General description

Specify the output file using 'FN669 PRINTF'.
At the same time, you can open up to 32 kinds of files.
After use, it is necessary to close the file with 'FN599 FCLOSE' command.
You cannot use opened device number with another file name.
If 'FCLOSE' is not executed, it is automatically closed at the END step.
If robot stops and restarts while keeping the file open, the file is keeping it open.
When program number is selected, or step number is reset to 0, the file is automatically closed.

■ Example of operation

```
1  FOPEN #5,V1$,"test.log"
2  V1$ = TIME$
3  PRINTF #5,"time:%s", V1$
4  FCLOSE #5
5  END
```

■ Parameter

1st parameter	Device No.	Device NO. specifying with PRINTF. 5 – 36 : At the same time you can open up to 32 kinds of files.
2nd parameter	File name	Specify the file name as a character string.
3rd parameter	Device	0: Internal Mem. (WORK¥LOG) 1: RC Ext. Mem. (root)
4th parameter	Attribute	Select processing when the specified file exists. 0: Existing file is cleared. 1: Appended to the existing file.

■ Example of screen display

FOPEN	FN598; File Open

See
PRINTF ; Print string with format(FN669)
FCLOSE ; Files Close(FN599)

Function commands (FN codes)

Command name	FCLOSE
FN code	599
Title name	File Close
General description	Specify the output file using FN669 PRINTF.

■ General description

The file specified with 'FN598 FOPEN' is closed.
You cannot use opened device number with another file name.
If 'FCLOSE' is not executed, it is automatically closed at the END step.
If robot stops and restarts while keeping the file open, the file is keeping it open.
When program number is selected, or step number is reset to 0, the file is automatically closed.

■ Example of operation

```
1  FOPEN #5,V1$,"test.log"
2  V1$ = TIME$
3  PRINTF #5,"time:%s", V1$
4  FCLOSE #5
5  END
```

■ Parameter

1st parameter	Device No.	Device NO. specifying with PRINTF. 5 – 36 : At the same time you can open up to 32 kinds of files.

■ Example of screen display

FCLOSE	FN599; File Close

See
PRINTF ; Print string with format(FN669)
FOPEN ; Files Open(FN598)

Function commands (FN codes)

Command name	NOP
FN code	600
Title name	Doing nothing
Outline	Doing nothing

■ General description

Doing nothing. This is used as a punctuation mark in program.

■ Example of operation

no parameters necessary

<SLIM sample> NOP

■ Example of screen display

Function commands (FN codes)

Command name	*
FN code	601
Title name	Label
Outline	Doing nothing

■ General description

Doing nothing.
This is used as a label that can be referred by GOTO command.

■ Example of operation

Beginning from *, and open software keyboard by [Enable]+[Edit] to input characters of label.
<SLIM sample> *LOADING

■ Example of screen display

See
ONGOTO ;ONGOTO jump(FN603)

Application command (FN code)

Command name	IF
FN code	602
Title name	Condition (IF-THEN-ELSE)
General description	If condition is satisfied then command after “THEN” is executed, else command after “ELSE” is executed

■ General description

This is conditional statement.
This is flow control statement (IF-THEN-ELSE). If condition is satisfied then command after “THEN” is execute, else command after “ELSE” is executed. If “ELSE” is not described and condition is not satisfied, then next step is executed.

■ Parameter

1st parameter	IF	This is condition. At present, condition equations where integer variables or real number variables are calculated in comparison can be described.
2nd parameter	THEN	Step number or label (FN601) is described as the command to be executed in case if the condition is satisfied.
3rd parameter	ELSE	Step number or label (FN601) is described as the command to be executed in case if the condition is not satisfied. This is not to be described all the time.

● First Parameter Designation Method

The first parameter can be described freely by use of the soft keyboard.
At present, condition equations where integer variables or real number variables are calculated in comparison can be described.

[Description example]

```
IF V1% = 1 THEN 10 ELSE 20
    ;  To step 10 when the integer variable "1" is "1", and
       to step 20 in other cases

IF V2! <> 0 THEN 30
    ;  To step 30 when the integer variable "2" is "other than 0", and
       to the next step in other cases

IF V3% > 1 THEN *FINISH ELSE *LOADING
    ;  To the label (*FINISH) when the integer variable "3" is "1 or higher", and
       to the label (*LOADING) in other cases
```

● Integer Variables

Numeric values not containing decimal point are handled.

Format	Vn%, V%[n] n=1 to 200 (Global integer variables) Ln%, L%[n] n=1 to 200 (Local integer variables) * Vn% is same in meaning as V%[n].
Range	-2147483648 to +2147483647
Sample	IF V1%=1 ; When the variable 1 is 1 IF V2%<>0 ; When the variable 2 is not 0
Storage	All the global integer variables are stored even if the main power source is turned off. All the local integer variables are not stored.

● Actual Value Variables

Numeric values containing decimal point are handled.

Format	Vn!, V![n] n=1 to 100 (Global integer variables) Ln!, L![n] n=1 to 100 (Local integer variables) * Vn! is same in meaning as V![n].
Range	-1.0E38 to +1.0E38

Sample	IF V1!=103.45 ; When the variable 1 is 103.45 IF V2!<>1.567E-2 ; When the variable 2 is not 1.567E-2
Storage	All the global integer variables are stored even if the main power source is turned off. All the local integer variables are not stored.

● Relation Calculation Equation

The relation calculation is used when to compare 2 numeric values. The result is obtained as true (1) or false (0), and is used for changing the program executional sequences in condition judgment texts and so forth.

Operator	Calculation contents	Example
=	Equal	V1%=V2%
<>	Not equal	V1%<>V2%
<	Smaller	V1%<V2%
>	Larger	V1%>V2%
<=	Smaller or equal	V1%<=V2%
>=	Larger or equal	V1%>=V2%

■ Example of screen display

```
IF V1%>1 THEN 100 ELSE 400    FN602;Condition
```

Function commands (FN codes)

Command name	ONGOTO
FN code	603
Title name	ON GOTO jump
Outline	Next command is determined by the value of condition

■ General description

This is flow control statement.
Next command is determined by the value of condition.
It's order is from 1 to 2,3,…

■ Example of operation

Parameter No. 1	ON	This is condition. One integer variable is designated. (1-200 : global variables, 201-400:local variables)
Parameter No. 2	GOTO	Command after this (described with the line number or label) is executed depending on the value of condition. The order is; command executed when condition=1, command executed when condition=2, command executed when condition=3, , . . Press [Enable]+[Edit] to open software keyboard. Characters must includes comma that separates each command.

<SLIM sample> ON V3% GOTO *CASE1,*CASE2,*CASE3

■ Example of screen display

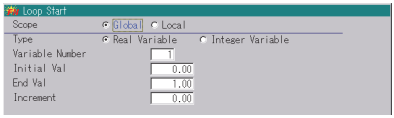
Function commands (FN codes)

Command name	FOR
FN code	604
Title name	Loop Start
Outline	This is loop command. Loop starts here.

■ General description

Plural commands enclosed with FOR and NEXT are repeated.
This command is used with the set of NEXT command (no exception).
Steps between FOR command and NEXT command are repeated,
while [Variables] written in FOR command is started from [Initial value],
and reaches to [End value], with increasing [Increment].

■ Parameter



Parameter No. 1	Scope	This is to designate the variable to be used to determine the loop counter (number of repeat). Usury scope needs not to be cared. In case of multi-unit application, local variables are used for each unit individually, and global variables are used for all unit commonly.
Parameter No. 2	Type	
Parameter No. 3	Variable number	
Parameter No. 4	Initial Val	This is loop (repeat) starting counter.
Parameter No. 5	End Val	This is loop (repeat) ending counter.
Parameter No. 6	Increments	This is the increments in every loop.

■ Example of operation

step13 FOR V3%=1 TO 10 STEP 1
step14 Move
step15 Move
step16 Move
step17 Move
step18 NEXT
Step19 Move

At first, "1" is set in V3% and step14 to step17 are executed.
After executing step18 NEXT, robot goes back to step13 FOR (robot position is at step17). “Increment=1” is added on V3%, and
step14 to step17 is executed again. (This is 2nd execution)
After executing NEXT, robot goes back to FOR again.
This flow continues until V3% reaches to “10”.
When V3% becomes greater than “10”, continuous flow stops and robot goes to step19.
At last, step14 to step17 is repeated 10 times.

■ Example of screen display

```
FOR V3%=1 TO 10 STEP 1   FN604:Loop Start
```

See
NEXT ;Loop End(FN605)

Function commands (FN codes)

Command name	NEXT
FN code	605
Title name	loop End
Outline	This is loop command. Loop ends here.

■ General description

Plural commands enclosed with FOR and NEXT are repeated.
This command is used with the set of FOR command (no exception).

■ Example of operation

No parameter.
<SLIM sample>　NEXT

■ Example of screen display

See
FOR　;Loop Start (FN604)

Function commands (FN codes)

Command name	PRINT
FN code	606
Title name	Print string
Outline	The character string data is output to the screen or specified RS232C serial port

■ General description

When this function command is used, character string data can be displayed on the TP screen or output to the specified serial port. (RS232C is option)
Device number can designate to where output data. #0 is screen, #1 is RS232C. If device number is omitted, #0 is selected. If character is omitted, line feed code is only sent. Plural characters can be combined by ";" or ",". If last character was ";", line feed code is not sent.
FN101 is same as this function.

■ Example of operation

When the robot reaches the step in which the PRINT command is recorded, the character string is sent.
The robot continues moving while the data is being sent.

■ Parameter

Parameter No. 1	Port number	This is used to specify the number of the port from which the character string is to be output. 0; screen 1; RS232C
Parameter No. 2	Output character string	This is used to specify the character string to be output. Press [Enable]+[Edit] to open software keyboard to input characters. (Up to 199 single-byte alphanumeric)

<SLIM sample> PRINT #0,ABC

■ Example of screen display

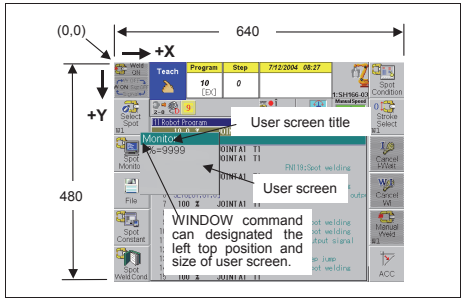
Function commands (FN codes)

Command name	WINDOW
FN code	607
Title name	User screen open/close
Outline	Open user screen, or close user screen.

■ General description

User task can draw the custom dialog on the screen, this is called “User screen”. User screen can be drawn on any place at the mode screen (where 12 F keys are displayed on left side and right side).
Size of TP screen is 640 * 480 dots, left top corner is (0,0). WINDOW command can designate the position of user screen. The position can be designated in every 16 dots. When one of width or height is defined 0, user screen can be closed.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **“User task” operating manual** for the detail of user task and user screen.



■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of left top corner of user screen. (0 to 624)
Parameter No. 2	Y position of left top corner	This is to define the Y position of left top corner of user screen. (0 to 464)
Parameter No. 3	Width	This is to define the width of user screen. (0 to 640)
Parameter No. 4	Height	This is to define the height of user screen. (0 to 480)

<SLIM sample> WINDOW 64,160,80,64

See
TITLE ;User title (FN608)

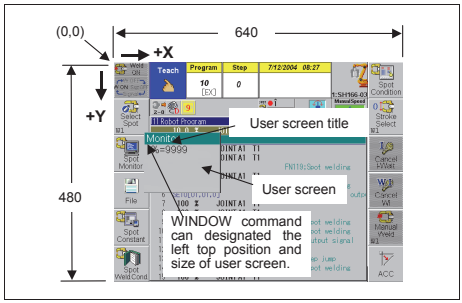
Function commands (FN codes)

Command name	TITLE
FN code	608
Title name	User screen title
Outline	This is to draw the title of user screen

■ General description

This is to draw the title of user screen.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.



■ Parameters

Parameter No. 1	Title	This is the character pattern data which show a title.

<SLIM sample> TITLE "MONITOR"

See
WINDOW ;User screen open/close(FN607)

Function commands (FN codes)

Command name	CLS
FN code	609
Title name	Erase user screen
Outline	This is to erase user screen

■ General description

This is to erase user screen. (User screen is fully painted by background color.) Its color can be designated by BGCOLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

No parameters.

<SLIM sample> CLS

See

WINDOW ;User screen open/close (FN607)

TITLE ;User title (FN608)

BGCOLOR ;Background color (FN617)

Function commands (FN codes)

Command name	LOCATE
FN code	610
Title name	Locate the display pos
Outline	This command is used to specify the position of the character displayed on the user screen.

■ General description

The position of the character displayed by the PRINT command in the user screen is specified by the row and the column.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	Row number	The row to which the character string is displayed is specified. (0 to 22)
Parameter No. 2	Column number	The column at the character string head is specified. (0 to 80)

<SLIM sample> LOCATE 12,5

See
PRINT ; Print strings (FN606)

Function commands (FN codes)

Command name	GLINE
FN code	611
Title name	Display position specification
Outline	This command is used for the user screen to draw the straight line.

■ General description

This command describes a straight-line in the user screen. A straight-line color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of start of line	X position of the point that the straight line begins is specified. (0 to 639)
Parameter No. 2	Y position of start of line	Y position of the point that the straight line begins is specified. (0 to 479)
Parameter No. 3	X position of end of line	X position of the point that the straight line ends is specified. (0 to 639)
Parameter No. 4	Y position of end of line	X position of the point that the straight line ends is specified. (0 to 479)

<SLIM sample> GLINE 10,10,100,100

See
GBOX ; Draw the box (FN612)
GSETP ; Draw the pixel (FN615)
COLOR ; Color (FN616)

Function commands (FN codes)

Command name	GBOX
FN code	612
Title name	Draw the box
Outline	This command is used for the user screen to draw the box.

■ General description

This command describes a box in the user screen. A box color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of left top corner of the box. (0 to 639)
Parameter No. 2	Y position of left top corner	This is to define the Y position of left top corner of the box. (0 to 479)
Parameter No. 3	Width	This is to define the width of the box. (0 to 640)
Parameter No. 4	Height	This is to define the height of the box. (0 to 480)
Parameter No. 5	Select of paint out	1: paint out 0: not paint out

<SLIM sample> GBOX 64,160,80,64,1

See
GLINE ; Draw the line FN611)
GSETP ; Draw the pixel (FN615)
COLOR ; Color (FN616)
BGCOLOR ; Background color (FN617)

Function commands (FN codes)

Command name	BARC
FN code	613
Title name	Draw the arc
Outline	This command is used for the user screen to draw the arc.

■ General description

This command describes an arc in the user screen. An arc color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of arc center. (0 to 639)
Parameter No. 2	Y position of left top corner	This is to define the Y position of arc center. (0 to 479)
Parameter No. 3	Arc radius	This is to define the arc radius. (0 to 800)
Parameter No. 4	Starting point of arc	This is to define the angle of starting point of the arc. (0 to 360)
Parameter No. 5	Center angle	This is to define the center angle. (0 to 360)

<SLIM sample> BARC 64,160,80,45,90

See
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
GSETP ; Draw the pixel (FN615)
COLOR ; Color (FN616)
BGCOLOR ; Background color (FN617)

Function commands (FN codes)

Command name	GPAINT
FN code	614
Title name	Paint
Outline	This command is used to paint out the enclosed area on the user screen.

■ General description

This command is used to paint out the enclosed area on the user screen. An paint out color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of paint out starting. (0 to 639)
Parameter No. 2	Y position of left top corner	This is to define the Y position of paint out starting. (0 to 479)
Parameter No. 3	Border color	This is to define the border color to paint out. (0 to 15)

<SLIM sample> GPAINT 64,160,8

See
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
GSETP ; Draw the pixel (FN615)
COLOR ; Color (FN616)
BGCOLOR ; Background color (FN617)

Function commands (FN codes)

Command name	GSETP
FN code	615
Title name	Draw the pixel
Outline	This command is used for the user screen to draw a pixel.

■ General description

This command describes a pixel in the user screen. A pixel color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of pixel. (0 to 639)
Parameter No. 2	Y position of left top corner	This is to define the Y position of pixel. (0 to 479)

<SLIM sample> GSETP 64,160

See
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
COLOR ; Color (FN616)

Function commands (FN codes)

Command name	COLOR
FN code	616
Title name	Color
Outline	This can designate the color used in color graphics command

■ General description

This can designate the color used in color graphics command. Total 16 colors (0 to 15) are available.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	Color	0; Black	
		1: Gray	
		2: Dark Blue	
		3: Blue	
		4: Dark Green	
		5: Green	
		6: Dark Sky Blue	
		7: Sky Blue	
		8: Dark Red	
		9: Red	
		10:Purple	
		11:Pink	
		12:Dark Yellow	
		13:Yellow	
		14:Light Gray	
		15:White	

<SLIM sample> COLOR 15

See
GLINE ;Draw line (FN611)
GBOX ;Draw rectangle (FN612)
BGCOLOR ;Background color (FN616)

Function commands (FN codes)

Command name	BGCOLOR
FN code	617
Title name	Background color
Outline	This can designate the background color used in color graphics command

■ General description

This can designate the background color used in color graphics command.(CLS, PRINT) Total 16 colors (0 to 15) are available.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	Color	(refer to COLOR command)

<SLIM sample> BGCOLOR 15

See
COLOR ;Color(FN616)

Function commands (FN codes)

Command name	EXIT
FN code	619
Title name	User task end
Outline	This can terminate the user task

■ General description

This can terminate the user task.
User task never ends (back to the top command after finishing the last command) unless otherwise stopped by manual operation or this EXIT command is executed.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

No parameters.
<SLIM sample> EXIT

See
OPENMCR ;Start user task(FN621)
WAITMCR ;Wait user task(FN622)

Function commands (FN codes)

Command name	PAUSE
FN code	620
Title name	Pause user task
Outline	This can make a brief stop of user task

■ General description

This can pause (make a brief stop of) user task for designated time period.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

This command (longer than 300msec pause) must be recorded in user task in order to avoid the CPU overload.
If not recorded, cycle time of robot program operated simultaneously with user task may varies.

■ Parameters

Parameter No. 1	Pause time	This is to define the pause time of user task. (0 to 999) [msec]

<SLIM sample> PAUSE 300

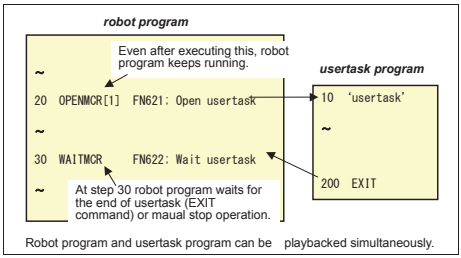
See
EXIT ;End user task (FN619)
OPENMCR ;Start user task (FN621)

Function commands (FN codes)

Command name	OPENMCR
FN code	621
Title name	Open usertask
Outline	Start usertask program

■ General description

This can start usertask program from robot program.
Even after executing this, robot program keeps running. (never wait for the end of usertask.) To synchronize usertask program with robot program, please use WAITMCR and EXIT command



■ Example of operation

Parameter No. 1	Usertask number	This is the usertask number to be started. (0 to 999)

<SLIM sample> OPENMCR 123

■ Example of screen display

```
OPENMCR[123]          FN621: Open usertask
```

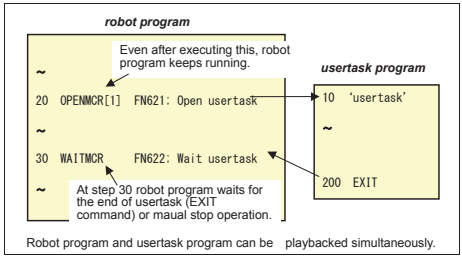
See
EXIT ;End usertask(FN619)
WAITMCR ;Wait usertask(FN622)

Function commands (FN codes)

Command name	WAITMCR
FN code	622
Title name	Wait usertask
Outline	Wait for the end of usertask program

■ General description

Robot program waits for the end of usertask program.
This is used for the synchronization of usertask program and robot program.



■ Example of operation

No parameter.
<SLIM sample> WAITMCR

■ Example of screen display

```
WAITMCR              FN622: Wait usertask
```

See
EXIT ;End usertask (FN619)
OPENMCR ;Start usertask (FN621)

Function commands (FN codes)

Command name	GARC
FN code	623
Title name	Display ellipse
Outline	This command is used for the user screen to draw the ellipse.

■ General description

This command describes a ellipse in the user screen. A ellipse color is a value set by the COLOR command.

This command is available only in user task, and is permitted being written in robot language only. Please refer to the **"User Task" operating manual** for the detail of user task and user screen.

■ Parameters

Parameter No. 1	X position of left top corner	This is to define the X position of left top corner of the box to which oval is inscribed. (0 to 639)
Parameter No. 2	Y position of left top corner	This is to define the Y position of left top corner of the box to which oval is inscribed. (0 to 479)
Parameter No. 3	Width	This is to define the width of the box to which oval is inscribed. (0 to 640)
Parameter No. 4	Height	This is to define the height of the box to which oval is inscribed. (0 to 480)
Parameter No. 5	Select of paint out	1: paint out 0: not paint out

<SLIM sample> GARC 64,160,80,45,1

See
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
GSETP ; Draw the pixel (FN615)
COLOR ; Color (FN616)
BGCOLOR ; Background color (FN617)

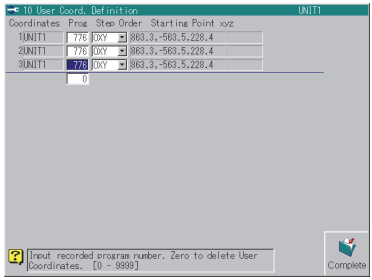
Function Commands (FN Codes)

Command name	MODUSRCOORD
FN code	626
Title name	Modify User coordinate
General description	Modifies the existent user coordinates using pose variables

■ General description

Executing this function command, the origin position and posture on the existent user coordinates can be modified using three pose variables.

The MODUSRCOORD command is so useful that the pose variables, that have been operated/ modified while executing the teaching programs, can be designated as a reference point on the user coordinates; however, the user coordinates that have been once modified can be never restored.
Therefore, if necessary to store the original user coordinates, be sure to duplicate the user coordinates file before executing MODUSRCOORD.



<Requirements for MODUSRCOORD>
・Existent user coordinates
…Required to register in [Service] → [10 User Coord. Definition] beforehand.
MODUSRCOORD can not create the new user coordinates.
・Pose variable
…Be sure to register three points in advance to define the user coordinates as the pose variables. For details of the definition of user coordinates, see [Service Menu] → [10 User coordinate] in this document.

■ Parameter

1st parameter	User coordinate No.	Designates the existent user coordinate No. (1~100)
2nd parameter	1st pose variable No.	Designates the 1st pose variable No. to define the user coordinates. (1~9999)
3rd parameter	2nd pose variable No.	Designates the 2nd pose variable No. to define the user coordinates. (1~9999)
4th parameter	3rd pose variable No.	Designates the 3rd pose variable No. to define the user coordinates. (1~9999)

＊ The pose variables used in the 2nd ~ 4th parameters depend on the USE command.

■ Example of screen display

```
MODUSRCOORD[1, 1, 2, 3]          FN626: Modify User coordinate
```

The parameters shown on the screen are “User coordinate No.”, “1st pose variable No.”, “2nd pose variable No.”, and “3rd pose variable No.” from the left.

See
LETCOORDP; Let pose variable (Coordinates designation) (FN630)
LETPE; Let pose element (FN632)

Function Commands (FN Codes)

Command name	GETUSRCOORD
FN code	627
Title name	Get user coordinate
General description	Get the existent user coordinates

■ General description

This function is to get the origin of user coordinate.

The origin is set to real variables as the following.

Real variables	value
Real Variable No (This is set as 2nd parameter)	X position @ world coordinate
"2nd parameter" + 1	Y position @ world coordinate
"2nd parameter" + 2	Z position @ world coordinate
"2nd parameter" + 3	R(roll angle) @ world coordinate
"2nd parameter" + 4	P(Pitch angle) @ world coordinate
"2nd parameter" + 5	Y(Yaw angle) @ world coordinate

In case that Installation Angle is all "0", world coordinate is the same as Machine (Robot) coordinate.

■ Parameter

1st parameter	User coordinate No.	Set the existent user coordinate No. (1-100)
2nd parameter	Variable No.	Set the first variable number for the origin value.

■ Example of screen display

Function Commands (FN Codes)

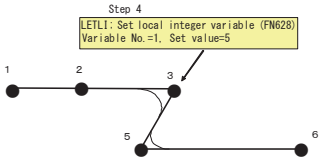
Command name	LETLI
FN code	628
Title name	Set local integer variable
General description	Sets the value into the specified local integer variable register

■ General description

This function command allows to set the value into the specified local integer variable. The local integer variables can be referred to by each unit.

■ Example of operation

The step 4 is recorded by “LETLI: Set local integer variable (FN628)”, “Variable No.=1”, and “Set value=5”. The 1st integer variable is set to 5 by playback. The set variables can be checked by the register screen of local integer variable on the monitor.



The robot will not slow down by this command. Without any positioning designation, this command is executed where the robot reaches the accuracy range of the move command right before.

■ Parameter

1st parameter	Local integer variable No.	Designates the integer variable No. to set the value. (1-200)
2nd parameter	Set value	Designates the value to set in the integer variables. (-2147483647~+2147483647)

■ Example of screen display

```
LETLI[L1%,5]        FN628:Set local integer variable
```

See
LETLF; Set local real variable (FN629)

Function Commands (FN Codes)

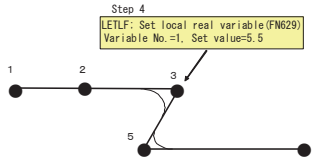
Command name	LETLF
FN code	629
Title name	Set local real variable
General description	Sets the value into the specified local real variable register

■ General description

This function command allows to set the value into the specified local real variable. The local real variables can be referred to by each unit.

■ Example of operation

The step 4 is recorded by “LETLF: Set local real variable (FN629)”, “Variable No.=1”, and “Set value=5.5”. The 1st real variable is set to 5.5 by playback. The set variables can be checked by the register screen of local real number variable on the monitor.



The robot will not slow down by this command. Without any positioning designation, this command is executed where the robot reaches the accuracy range of the move command right before.

■ Parameter

1st parameter	Local real variable No.	Designates the real variable No. to set the value. (1-200)
2nd parameter	Set value	Designates the value to set in the real variable. (-1.0E38~+1.0E38)

■ Example of screen display

```
LETLF[L1!,5.5]      FN629:Set local real variable
```

See
LETLI; Set local real variable (FN628)

Function Commands (FN Codes)

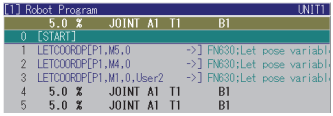
Command name	LETCOORDP
FN code	630
Title name	Let pose variable
General description	Stores the pose data recorded by the specified rectangular coordinates value in the pose variables

■ General description

This function command allows to record the pose variable set command of the coordinates designation.

- The LETCOORDP command is the pose set command by each mechanism. If there exist multiple mechanisms in the unit, execute the LETCOORDP command for the number of registered mechanisms.

  ∗ Also, in order not to forget initializing the pose variables (= Execution of LETCOORDP command for all the mechanisms), it is recommended to teach the LETCOORDP command for the number of registered mechanisms when starting to run the program.

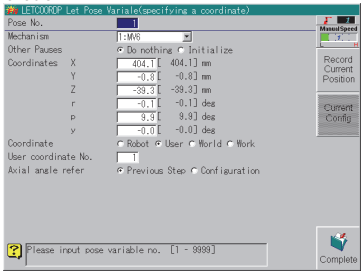


- Before executing LETCOORDP under the structure of synchronized unit, be sure to execute this command first in the operation standard mechanism.

- The robot does not move by executing LETCOORDP only. To move the robot, it is required to teach the MOVEX command.

■ LETCOORDP Teach Method

(1) Select FN630 “Let pose variable”.



(2) Enter the pose No. of the set destination.

(3) Select the mechanism No. of the pose set destination.

Be sure to teach the operation standard mechanism first. In the synchronized system of the robot and positioner, the positioner is the operation standard mechanism.

(4) Set the required parameters (described in the following).

(5) Move the robot by manual operation to the position for carrying out the pose record, and then press F8 “Record Current Position” key. Or, specify the value directly for the position to carry out the pose record.

(6) Press f12 <Complete> to record LETCOORDP.

■ Parameter

Parameter name	Description	Range
Pose No.	Enters the pose variable No. of the set destination.	1~9999
Mechanism	Selects the mechanism No. of the pose set destination. → Be sure to teach the operation standard mechanism first.	1~9

Other Poses	Selects the method of how to deal with the pose data other than the record mechanism. If selecting “Initialize”, a function variable in the MOVE command step right before is set as the pose datum.	Do nothing/ Initialize in the previous step
Rectangular coordinates	Enters the rectangular coordinates value of the specified coordinates base. The current position can be also obtained by F8 “Record Current Position” key.	XYZ element: -99999.9~99 999.9[mm] RPY (Rotation) element: -360.0~360.0 [deg]
Coordinate	Designates the coordinates of the rectangular coordinates value. The external axis is fixed to the axis coordinates in being recorded.	Manipulator: Base/ User/ Absolute/ Workpiece External axis: Each axis
User coordinate No.	Enters the user coordinate No. when “User” has been selected in [Coordinate].	1~100
Axis angle refer	Designates the selection method of redundant solution in the reverse conversion, With "Configuration" selected, the radio button for redundant solution selection become ON in the J1, J3, J5, and J6 axis.	Previous step/ Configuration
J1 axis angle selection	Selects the redundant solution of the J1 axis. ・ Left arm: +45 ~ 135º ・ Right arm: -45 ~ -135º ・ Less than ±90º: -45 ~ +45º ・ ±90º or more: -135º or below or +135º or more	Left arm/ Right arm/ Less than ±90º/±90 or more
J3 axis angle selection	Selects the redundant solution of the J3 axis. ・ Upper elbow: 79.1º or below ・ Lower elbow: 79.1º or more	Upper elbow/ Lower elbow
J5 axis angle selection	Selects the redundant solution of the J5 axis. ・ Flip: 0º or below ・ Non-flip: 0º or more	Flip/ Non-flip
J6 axis angle selection	Selects the redundant solution of the J6 axis. ・ Less than ±180º: -180 ~ +180º ・ 0 ~ 360º : 0 ~ 360º ・ 0 ~ -360: 0 ~ -360º	Less than ±180º 0~360º/ 0~ -360º

■ **Example of screen display**

The parameters appeared on the screen are “Pose variable No.”, “Mechanism No.”, “Other Poses(0/1)”, and “Coordinates (+ User coordinate No.)” from the left.

See
LETPE; Let pose element (FN632)
LETPE; Let shift element (FN633)
LET; Let variable (FN634)
ADDP; Add pose variable (FN635)

Function Commands (FN Codes)

Command name	CALMATRIX
FN code	631
Title name	Calculation matrix
General description	Calculation matrix

■ General description

This function is for matrix operation (multiplication / inverse / transpose) of position.

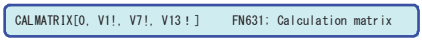
Real variable as set parameter is the following.

Real variables	value
Real Variable No. (This is set as parameter)	X position
“Variable No. as set parameter” + 1	Y position
“Variable No. as set parameter” + 2	Z position
“Variable No. as set parameter” + 3	R(Roll angle)
“Variable No. as set parameter” + 4	P(Pitch angle)
“Variable No. as set parameter” + 5	Y(Yaw angle)

■ Parameter

1st parameter	Operation (0 / 1 / 2)	Set the Operation. 0:Multiplication 1:Inverse 2:transpose
2nd parameter	Variable No. (Operand 1)	Set the first variable number for Operand 1.
3d parameter	Variable No. (Operand 2)	Set the first variable number for Operand 2. -Robot program on monitor. This setting is skipped. -Robot language program. In case of “Inverse” or “Transpose”, Set the same value as 2nd parameter.
4th parameter	Variable No. (Result)	Set the first variable number for Result.

■ Example of screen display



Function Commands (FN Codes)

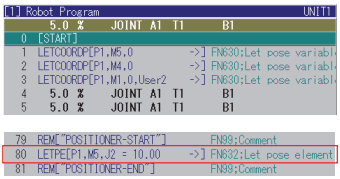
Command name	LETPE
FN code	632
Title name	Let pose element
General description	Stores the pose element recorded by the specified rectangular coordinates value in the pose variables

■ General description

This function command allows to record the let pose element command of the coordinates designation by each single element.

- The LETPE command allows to specify a pose storage position by the parameter and set the pose only in that element.

  ∗For smooth teaching operation, it is recommended to use FN630 (the LETCOORDP command) on the pose storage of all the elements, and the LETPE command on a single element or when modifying the pose data of only 1 axis. (The following is the example when setting 10º only into the 2nd axis of the mechanism 5 using LETPE.)

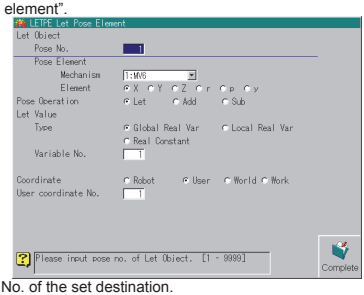


- If there is no original pose variable, it is not available to use LETPE. In that case, execute FN630 (LETCOORDP) and create the pose data.

- The robot does not move by executing LETPE only. To move the robot, it is required to teach MOVEX command.

■ LETPE Teach Method

(1) Select FN632 “Let pose element”.



(2) Enter the pose variable No. of the set destination.
(3) Select the mechanism No. of the pose set destination.
(4) Select the element of the pose set destination.
(5) Set the required parameters (described in the following).
(6) Press f12 <Complete> to record LETPE.

■ Parameter

Parameter name	Description	Range
Pose No.	Enters the pose variable No. of the set destination.	1~9999
Mechanism	Selects the mechanism No. of the pose set destination.	1~9
Element	Selects the element of the pose set destination.	Manipulator: X/Y/Z/r/p/y

	Selects the elements of rectangular coordinates when the mechanism is a manipulator, and the axis angle element when the mechanism is an external axis.	External axis: J1/J2/J3/J4/ J5/J6
Pose operation	Selects the type of pose operation. Addition and subtraction are carried out to the original pose data.	Set/ Add/ Subtract
Type	Selects a type of the pose set value. It becomes available to input [Variable No.] with a variable selected, and [Constant value] with a constant selected.	Global real variable/ Local real variable/ Real constant
Coordinate	Designates the coordinates of the rectangular coordinates value.	Manipulator: Robot/ User/ World/ Work
	The external axis is fixed to the axis coordinates in being recorded.	External axis: Each axis
User coordinate No.	Enters the user coordinate No. when “User” has been selected in [Coordinate].	1~100

■ **Example of screen display**

```
LETPE[P1,M1,X = V1!,User1]    FN632:Let pose element
```

The parameters appeared on the screen are “Pose variable No.”, “Mechanism No.”, “Pose element=Pose set value”, and “Coordinates (+ User coordinate No.)” from the left.

See
LETCOORDP; Let pose variable (Coordinates designation) (FN630)
LETPE; Let shift element (FN633)
LET; Let variable (FN634)
ADDP; Add pose variable (FN635)

Function Commands (FN Codes)

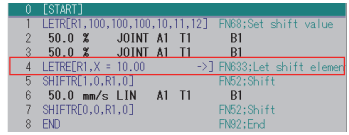
Command name	LETRE
FN code	633
Title name	Let shift element
General description	Sets the shift element in the specified shift register

■ General description

This function command allows to set the shift amount data in the specified shift register by a single element.
Even if the specified shift register has been occupied by “SHIFTR; Shift2 (FN52)” or others, the value specified by LETRE can be newly set in the shift register without any influence exerted on the robot motion. The modified shift value becomes effective by the next playback of the SHIFTR; Shift2 (FN52).

- The LETRE command allows to specify the shift element storage position by the parameter and set the shift amount data only in that element.

  ∗For smooth teaching operation, it is recommended to use FN68 (LETR command) on the shift amount set of all the elements, and LETRE command on modifying the shift amount data.
  (The following is an example when setting 10mm only into the X element using LETRE.)



■ Example of operation

Shift register value when executing LETRE [R1, X = 10.00].
<1> Executing with the specified shift register value

	Before executing LETRE	After executing LETRE
Request flag	0	0
Set flag	1	1
X	110	10
Y	120	100
Z	130	100
θX	5	10
θY	6	11
θZ	7	12

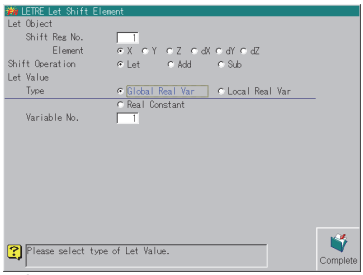
<2> Executing with the initial shift register

	Before executing LETR	After executing LETR
Request flag	0	0
Set flag	0	0
X	0	10
Y	0	0
Z	0	0
θX	0	0
θY	0	0
θZ	0	0

By executing this command, the request flag of shift register always becomes “0” and the set flag “1”. The values specified by the parameter are stored in X ~ θz.

■ LETRE Teach Method

(1) Select FN633 “Let shift element”.



(2) Enter the shift register No. of the set destination.
(3) Select the shift element of the set destination.
(4) Set the required parameters (described in the following).
(5) Press f12 <Complete> to record LETRE.

■ **Parameter**

Parameter name	Description	Range
Shift register No.	Enters the shift register No. of the set destination.	1~9
Element	Selects the shift element of the set destination.	X/Y/Z/θX/θY /θZ
Shift operation	Selects the type of shift operation. Addition and subtraction are carried out to the original shift amount data.	Set/ Add/ Subtract
Type	Selects a type of the shift amount substitution value. It becomes available to input [Variable No.] with a variable selected, and [Constant value] with a constant selected.	Global real variable/ Local real variable/ Real constant

■ **Example of screen display**

```
LETRE[R1,X = V1!]                FN633:Let shift element
```

The parameters appeared on the screen are “Shift register No.” and “Shift element=Shift amount set value”.

See
LETR; Let shift amount (FN68)
LETCOORDP; Let pose variable (Coordinates designation) (FN630)
LETPE; Let pose element (FN632)
LET; Let variable (FN634)
ADDP; Add pose variable (FN635)

Function Commands (FN Codes)

Command name	LET
FN code	634
Title name	Let variable
General description	Sets the variable of the same type

■ General description

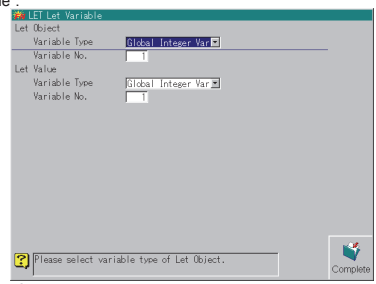
This function command allows to set the variable of the same type.
This is executed when using this command as a storage of the operation result while executing the program or copying the contents of variables.

- There are six types of variables available in the LET command; the global/local integer variable, global/local real variable, pose variable, and shift variable (shift register).

∗Values can be set each other only within the same type for the pose variable and shift variable, while it is available across the scope and type for the integer variable and real variable.

■ LET Teach Method

(1) Select FN634 “Let variable”.



(2) Select the type of variable of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of variable to set.
(5) Enter the variable No. of the set value.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Selects the variable type of the set destination.	Global integer variable/ Global real variable/ Local integer variable/ Local real variable/ Pose variable/ Shift variable
Variable No. of set destination	Enters the variable No. of the set destination.	Pose variable: 1~9999 Shift variable: 1~9 Others: 1~200
Variable type/ Variable No. of set value	Same as the set destination. However, if different kinds of variable type are selected for setting the pose variable/shift variable, the variable type of the set destination is applied.	-

■ Example of screen display

The parameters appeared on the screen are “Set destination variable” and “Set value variable” from the left.

See
LETCOORDP; Let pose variable (Coordinates designation) (FN630)
LETPE; Let pose element (FN632)
LETPE; Let shift element (FN633)
ADDP; Add pose variable (FN635)

Function Commands (FN Codes)

Command name	ADDP
FN code	635
Title name	Add pose variable
General description	Adds the value of pose variable

■ General description

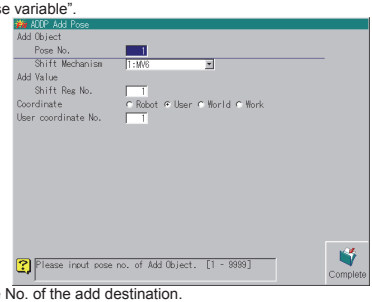
This function command allows to add the shift amount of shift register to the pose variable based on the specified coordinates.

- If there is no original pose variable, it is not available to use ADDP. In this case, execute FN630 (LETCOORDP command) and create the pose data.

The robot does not move by executing ADDP only. To move the robot, it is required to teach MOVEX command.

■ ADDP Teach Method

(1) Select FN635 “Add pose variable”.



(2) Enter the pose variable No. of the add destination.
(3) Select the shift mechanism No.
(4) Set the required parameters (described in the following).
(5) Press f12 <Complete> to record ADDP.

■ Parameter

Parameter name	Description	Range
Pose No.	Enters the pose variable No. of the add destination.	1~9999
Shift mechanism	Selects the manipulator of the shift target.	1~9
Shift register No.	Enters the shift register No. (added value).	1~9
Coordinate	Designates the coordinates of the rectangular coordinates value.	Robot/ User/ World/ Work
User coordinate No.	Enters the user coordinate No. when “User” has been selected in [Coordinate].	1~100

■ Example of screen display

```
ADDP[P1,M1,R1,User1]        FN635:Add pose variable
```

The parameters appeared on the screen are “Pose variable No.”, “Mechanism No.”, “Shift register No.”, and “Coordinates (+ User coordinate No.)” from the left.

See
LETCOORDP; Let pose variable (Coordinates designation) (FN630)
LETPE; Let pose element (FN632)
LETPE; Let shift element (FN633)
LET; Let variable (FN634)

Function Commands (FN Codes)

Command name	ADDVI
FN code	637
Title name	Add integer variable
General description	Adds the value of integer variable

■ General description

This function command allows to add the integer variables.

■ Example of operation

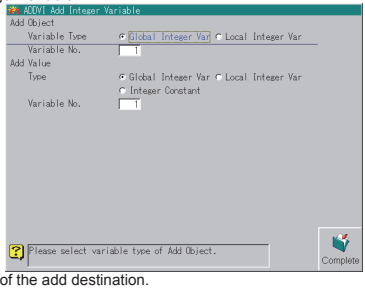
Any steps can be recorded by “ADDVI: Add integer variable (FN637)”, “Global variable No. of the add destination=1”, and “Global variable No. of the add value=2”. The 2nd variable is added to the 1st variable by playback of this command. The set variables can be checked by the register screen of global integer variable on the monitor. (Local integer variables are also available.)

Execution sample of ADDVI [V1%, V2%]

Global variable	Before executing ADDVI	After executing ADDVI
V1%	1	3
V2%	2	2

■ ADDVI Teach Method

(1) Select FN637 “Add integer variable”.



(2) Select the variable type of the add destination.
(3) Enter the variable No. of the add destination.
(4) Select the type of add value.
(5) Enter the variable No. of add value or add constant.
(6) Press F12 <Complete> to record ADDVI.

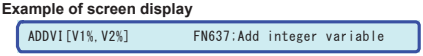
■ Parameter

Parameter name	Description	Range
Variable type of add destination	Enters the variable type of add destination.	Global integer variable/ Local integer variable
Variable No. of the add destination	Enters the variable No. of the add destination.	1~250,301~200 *
Type of add value	Enters the type of add value. ※ Selecting “Integer constant”, the value to add can be directly designated.	Global integer variable/ Local integer variable/ Integer constant
Variable No. of add value or Add constant	Enters the variable No. with “Variable” selected, and the constant value with “Integer constant” selected in the variable type of add value.	Variable No.: 1~250,301~200 * Constant value: -2147483647~ 2147483647

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**



The parameters appeared on the screen are “Variable of the add destination”, “Add variable (or add constant)” from the left.

See
SUBVI; Subtract integer variable (FN639)
MULVI; Multiply integer variable (FN641)
DIVVI; Divide integer variable (FN643)

Function Commands (FN Codes)

Command name	ADDVF
FN code	638
Title name	Add real variable
General description	Adds the value of real variable

■ General description

This function command allows to add the real variables.

■ Example of operation

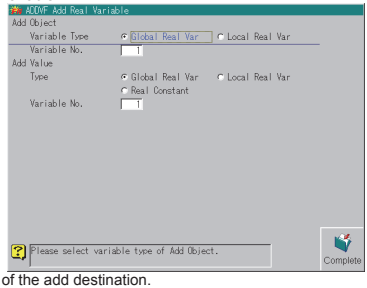
Any steps can be recorded by “ADDVF: Add real variable (FN638)”, “Global variable No. of the add destination=1”, and “Global variable No. of the add value=2”. The 2nd variable is added to the 1st variable by playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of ADDVF [V1!, V2!]

Global variable	Before executing ADDVF	After executing ADDVF
V1!	1.1000	3.3000
V2!	2.2000	2.2000

■ ADDVF Teach Method

(1) Select FN638 “Add real variable”.



(2) Select the variable type of the add destination.
(3) Enter the variable No. of the add destination.
(4) Select the type of add value.
(5) Enter the variable No. of the add value or add constant.
(6) Press F12 <Complete> to record ADDVF.

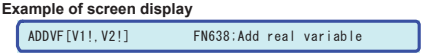
■ Parameter

Parameter name	Description	Range
Variable type of add destination	Enters the variable type of the add destination.	Global real variable/ Local real variable
Variable No. of add destination	Enters the variable No. of the add destination.	1~250,301~200 *
Type of add value	Enters the type of add value. ※ Selecting “real constant”, the value to add can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of add value or Add constant	Enters the variable No. with “Variable” selected, and the constant value with “real constant” selected in the variable type of add value.	Variable No.: 1~250,301~200 * Constant value: -1e+038~ 1e+038

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**



The parameters appeared on the screen are “Variable of add destination”, “Add variable (or add constant)” from the left.

See
SUBVF; Subtract real variable (FN640)
MULVF; Multiply real variable (FN642)
DIVVF; Divide real variable (FN644)

Function Commands (FN Codes)

Command name	SUBVI
FN code	639
Title name	Subtract integer variable
General description	Subtracts the value of integer variable

■ General description

This function command allows to subtract the integer variables.

■ Example of operation

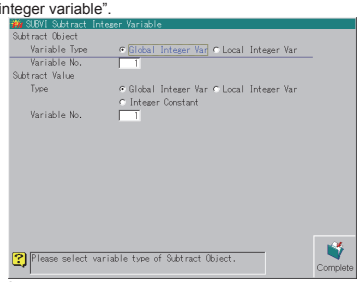
Any steps can be recorded by “SUBVI: Subtract integer variable (FN639)”, “Global variable No. of the subtract destination=1”, and “Global variable No. of the subtract value=2”. The 2nd variable is subtracted from the 1st variable by playback of this command. The set variables can be checked by the register screen of global integer variable on the monitor. (Local integer variables are also available.)

Execution sample of SUBVI [V1%, V2%]

Global variable	Before executing SUBVI	After executing SUBVI
V1%	2	1
V2%	1	1

■ SUBVI Teach Method

(1) Select FN639 “Subtract integer variable”.



(2) Select the variable type of the subtract destination.
(3) Enter the variable No. of the subtract destination.
(4) Select the type of subtract value.
(5) Enter the variable No. of the subtract value or subtract constant.
(6) Press F12 <Complete> to record SUBVI.

■ Parameter

Parameter name	Description	Range
Variable type of subtract destination	Enters the variable type of the subtract destination.	Global integer variable/ Local integer variable
Variable No. of subtract destination	Enters the variable No. of the subtract destination.	1~250,301~500 *
Type of subtract value	Enters the type of subtract value. ※ Selecting “Integer constant”, the value to subtract can be directly designated.	Global integer variable/ Local integer variable/ Integer constant
Variable No. of subtract value or Subtract constant	Enters the variable No. with “Variable” selected, and the constant value with “Integer constant” selected in the variable type of subtract value.	Variable No.: 1~250,301~500 * Constant value: -2147483647 ~2147483647

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**

The parameters appeared on the screen are “Variable of the subtract destination”, “Subtract variable (or subtract constant)” from the left.

See
ADDVI; Add integer variable (FN637)
MULVI; Multiply integer variable (FN641)
DIVVI; Divide integer variable (FN643)

Function Commands (FN Codes)

Command name	SUBVF
FN code	640
Title name	Subtract real variable
General description	Subtracts the real variable

■ General description

This function command allows to subtract the real variable.

■ Example of operation

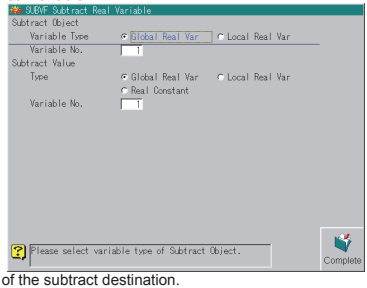
Any steps can be saved by “SUBVF: Subtract real variable (FN640)”, “Global variable No. of the subtract destination=1”, and “Global variable No. of the subtract value=2”. By playback of this command, the 2nd variable is subtracted from the 1st variable. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of SUBVF [V1!, V2!]

Global variable	Before executing SUBVF	After executing SUBVF
V1!	2.2000	1.1000
V2!	1.1000	1.1000

■ SUBVF Teach Method

(1) Select FN640 “Subtract real variable”.



(2) Select the variable type of the subtract destination.
(3) Enters the variable No. of the subtract destination.
(4) Select the type of subtract value.
(5) Enter the variable No. of the subtract value or subtract constant.
(6) Press F12 <Complete> to record SUBVF.

■ Parameter

Parameter name	Description	Range
Variable type of subtract destination	Enters the variable type of the subtract destination.	Global real variable/ Local real variable
Variable No. of subtract destination	Enters the variable No. of the subtract destination.	1~250,301~500 *
Type of subtract value	Enters the type of subtract value. ※ Selecting “Real constant”, the value to subtract can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of subtract value or Subtract constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of subtract value.	Variable No.: 1~250,301~500 * Constant value: -1e+038~ 1e+038

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**

```
SUBVF[V1!,V2!]          FN640:Subtract real variable
```

The parameters appeared on the screen are “Variable of subtract destination”, “Subtract variable (or subtract constant)” from the left.

See
ADDVF; Add real variable (FN638)
MULVF; Multiply real variable (FN642)
DIVVF; Divide real variable (FN644)

Function Commands (FN Codes)

Command name	MULVI
FN code	641
Title name	Multiply integer variable
General description	Multiplies the integer variables

■ General description

This function command allows to multiply the integer variables.

■ Example of operation

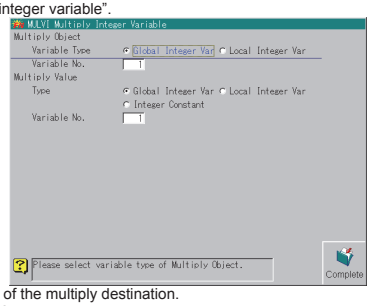
Any steps can be recorded by “MULVI: Multiply integer variable (FN641)”, “Global variable No. of the multiply destination=1”, and “Global variable No. of the multiply value=2”. The 1st and the 2nd variable are multiplied by playback of this command. The set variables can be checked by the register screen of global integer variable on the monitor. (Local integer variables are also available.)

Execution sample of MULVI [V1%, V2%]

Global variable	Before executing MULVI	After executing MULVI
V1%	2	6
V2%	3	3

■ MULVI Teach Method

(1) Select FN641 “Multiply integer variable”.



(2) Select the variable type of the multiply destination.
(3) Enter the variable No. of the multiply destination.
(4) Select the type of multiply value.
(5) Enter the variable No. of the multiply value or multiply constant.
(6) Press F12 <Complete> to record MULVI.

■ Parameter

Parameter name	Description	Range
Variable type of multiply destination	Enters the variable type of the multiply destination.	Global integer variable/ Local integer variable
Variable No. of multiply destination	Enters the variable No. of the multiply destination.	1~250,301~500 *
Type of multiply value	Enters the type of multiply value. ※ Selecting “Integer constant”, the value to multiply can be directly designated.	Global integer variable/ Local integer variable/ Integer constant
Variable No. of multiply value or Multiply constant	Enters the variable No. with “Variable” selected, and the constant value with “Integer constant” selected in the variable type of multiply value.	Variable No.: 1~250,301~500 * Constant value: -2147483647~ 2147483647

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**

The parameters appeared on the screen are “Variable of multiply destination”, “Multiply variable (or multiply constant)” from the left.

See
ADDVI; Add integer variable (FN637)
SUBVI; Subtract integer variable (FN639)
DIVVI; Divide integer variable (FN643)

Function Commands (FN Codes)

Command name	MULVF
FN code	642
Title name	Multiply real variable
General description	Multiplies the real variables

■ General description

This function command allows to multiply the real variables.

■ Example of operation

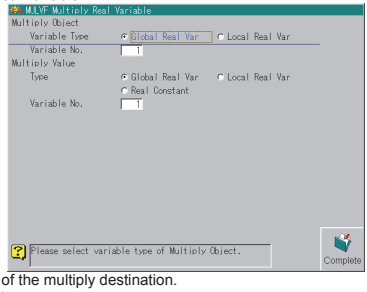
Any steps can be recorded by “MULVF: Multiply real variable (FN642)”, “Global variable No. of the multiply destination=1”, and “Global variable No. of the multiply value=2”. The 1st and the 2nd variables are multiplied by playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of MULVF [V1!, V2!]

Global variable	Before executing MULVF	After executing MULVF
V1!	2.2000	6.6000
V2!	3.0000	3.0000

■ MULVF Teach Method

(1) Select FN642 “Multiply real variable”.



(2) Select the variable type of the multiply destination.
(3) Enter the variable No. of the multiply destination.
(4) Select the type of multiply value.
(5) Enter the variable No. of the multiply value or multiply constant.
(6) Press F12 <Complete> to record MULVF.

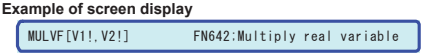
■ Parameter

Parameter name	Description	Range
Variable type of multiply destination	Enters the variable type of the multiply destination.	Global real variable/ Local real variable
Variable No. of multiply destination	Enters the variable No. of the multiply destination.	1~250,301~500 *
Type of multiply value	Enters the type of multiply value. ※ Selecting “Real constant”, the value to multiply can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of multiply value or Multiply constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of multiply value.	Variable No.: 1~250,301~500 * Constant value: -1e+038~ 1e+038

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**



The parameters appeared on the screen are “Variable of multiply destination”, “Multiply variable (or multiply constant)” from the left.

See
ADDVF; Add real variable (FN638)
SUBVF; Subtract real variable (FN640)
DIVVF; Divide real variable (FN644)

Function Commands (FN Codes)

Command name	DIVVI
FN code	643
Title name	Divide integer variable
General description	Divides the value of integer variable

■ General description

This function command allows to divide the integer variables.

■ Example of operation

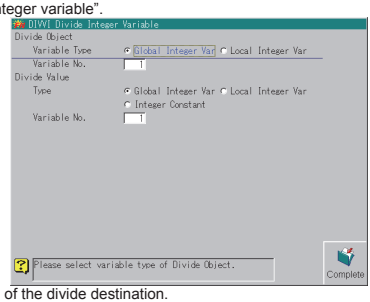
Any steps can be recorded by “DIVVI: Divide integer variable (FN643)”, “Global variable No. of the divide destination=1”, and “Global variable No. of the divide value=2”. The 1st variable is divided by the 2nd variable by playback of this command. The set variables can be checked by the register screen of global integer variable on the monitor. (Local integer variables are also available.)

Execution sample of DIVVI [V1%, V2%]

Global variable	Before executing DIVVI	After executing DIVVI
V1%	4	2
V2%	2	2

■ DIVVI Teach Method

(1) Select FN643 “Divide integer variable”.



(2) Select the variable type of the divide destination.
(3) Enters the variable No. of the divide destination.
(4) Select the type of divide value.
(5) Enter the variable No. of the divide value or divide constant.
(6) Press F12 <Complete> to record DIVVI.

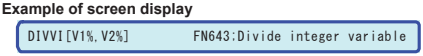
■ Parameter

Parameter name	Description	Range
Variable type of divide destination	Enters the variable type of the divide destination.	Global integer variable/ Local integer variable
Variable No. of divide destination	Enters the variable No. of the divide destination.	1~250,301~500 *
Type of divide value	Enters the type of divide value. ※ Selecting “Integer constant”, the value to divide by can be directly designated.	Global integer variable/ Local integer variable/ Integer constant
Variable No. of divide value or Divide constant	Enters the variable No. with “Variable” selected, and the constant value with “Integer constant” selected in the variable type of divide value.	Variable No.: 1~250,301~500 * Constant value: -2147483647~2147483647

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**



The parameters appeared on the screen are “Variable of divide destination”, “Variable of divide value (or divide constant)” from the left.

See
ADDVI; Add integer variable (FN637)
SUBVI; Subtract integer variable (FN639)
MULVI; Multiply integer variable (FN641)

Function Commands (FN Codes)

Command name	DIVVF
FN code	644
Title name	Divide real variable
General description	Divides the value of real variable

■ General description

This function command allows to divide the real variables.

■ Example of operation

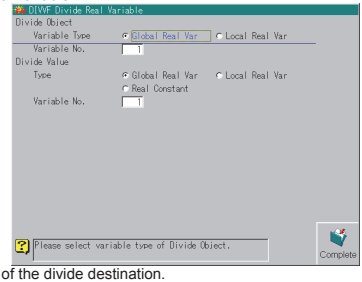
Any steps can be recorded by “DIVVF: Divide real variable (FN644)”, “Global variable No. of the divide destination=1”, and “Global variable No. of the divide value=2”. The 1st variable is divided by the 2nd variable by playback of this command. The set variables can be checked by the register screen of global real variable on the monitor. (Local variables are also available.)

Execution sample of DIVVF [V1!, V2!]

Global variable	Before executing DIVVF	After executing DIVVF
V1!	4.4000	2.0000
V2!	2.2000	2.2000

■ DIVVF Teach Method

(1) Select FN644 “Divide real variable”.



(2) Select the variable type of the divide destination.
(3) Enters the variable No. of the divide destination.
(4) Select the type of divide value.
(5) Enter the variable No. of the divide value or divide constant.
(6) Press F12 <Complete> to record DIVVF.

■ Parameter

Parameter name	Description	Range
Variable type of divide destination	Enters the variable type of the divide destination.	Global real variable/ Local real variable
Variable No. of divide destination	Enters the variable No. of the divide destination.	1~250,301~500 *
Type of divide value	Enters the type of divide value. ※ Selecting “Real constant”, the value to divide by can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of divide value or Divide constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of divide value.	Variable No.: 1~250,301~500 * Constant value: -1e+038~ 1e+038

*201-250 be set only if the global variable

201-250 variable number is a variable number of the PLC only.
Must be running the PLC when setting 201 to 250.
When executed in the state of PLC “stop” or “disconnect” ,display to "A2368 Connection with Built-in PLC cannot be performed." to stop playback.

■ **Example of screen display**

```
DIVVF[V1!,V2!]          FN644:Divide real variable
```

The parameters appeared on the screen are “Variable of divide destination”, “Variable of divide value (or divide constant)” from the left.

See
ADDVF; Add real variable (FN638)
SUBVF; Subtract real variable (FN640)
MULVF; Multiply real variable (FN642)

Function Commands (FN Codes)

Command name	SETC
FN code	646
Title name	Set output signal
General description	Consecutive output signal is output.

■ General description

The output signal processing is brought together by the automatic operation when robot language → execution form is converted when one or more output signal processing is consecutive and that is converted into this one application instruction.
However, there is a necessity with which meets the following requirements in conversion into the example of the favorite.

(1) "Comment cut" is ENABLE, at detailed setting of "8 Language"
(2) The set value will be a value soon.
(3) The set value is equivalent.
(4) The output signal setting is directly.
(5) The output signal is O1 – O2048.

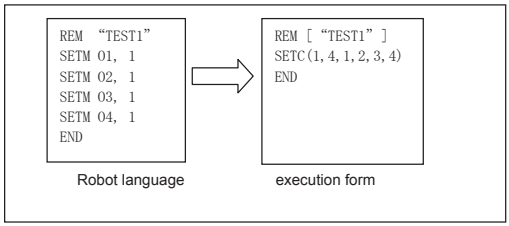
The number of parameters of this application instruction is changeable.
The thing to bring 2048 signal processing or less in length to the output signal together in one application instruction can be done.
When execution system form → robot language is converted, this application instruction is converted into the output signal processing to former output signal instructions.
When robot language → execution form is converted, becomes an error when this application instruction is described in robot language.
This application instruction is not good at thing recorded from TP.
Moreover, the thing edited with the screen editor cannot be done.

■ Example of operation

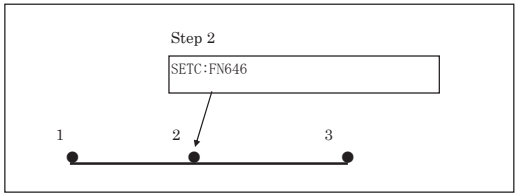
There are two type operations, one is that without move instruction back or forth this instruction, the other is that with them.

Without MOVE instruction

When robot language → execution form is converted, is converted as shown in the figure below.

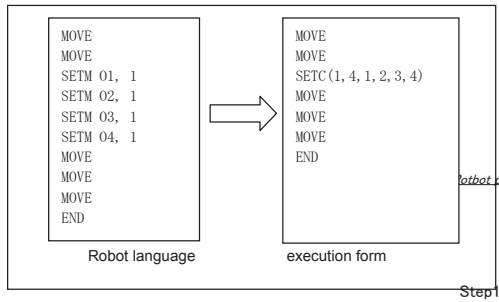


O1 – O4 are output at stage where the execution step counter reached step 2 ahead when reproducing.
(It is asynchronously executed with the movement of the robot)

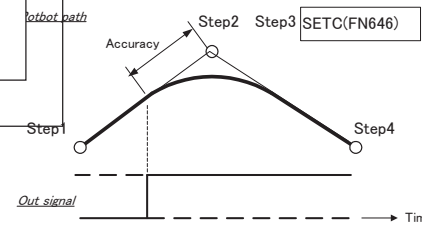


Without MOVE instruction

When robot language → execution form is converted, is converted as shown in the figure below.



O1 – O4 are output at stage where the robot reached in accuracy range of fore MOVE instruction.



■ **Parameter**

1st parameter	ON/OFF	Set the output state. (0: OFF, 1: ON)
2nd parameter	The number of signal	The number of parameters specified since the third parameter is specified. (1 to 50)
3rd parameter	Output signal 1	The output signal number 1 is specified. (1 to 2048)
・ ・ ・	・ ・ ・	・ ・ ・
52th parameter	Output signal 50	The output signal number 50 is specified. (1 to 2048)

■ **Example of screen display**

```
SETC[1,3,1,2,3]          FN646:Set output signal
```

See
SETM : Output signal ON/OFF (FN105)

Application Command (FN Code)

Command name	LETC
FN code	647
Title name	Integer variable setting
Outline	Used to make setting of values to integer variable registers specified.

■ **Outline**

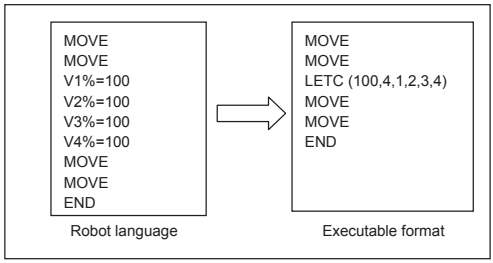
If one or more assignment operations to integer variables continue, making a conversion from Robot language into Executable format will make it possible to automatically assign to integer variables and convert them just into this application command; provided, however, that the following conditions must be met.

(1) On the “Service” → “9 Program Conversion” → “8 Language conversion” screens, the “Variable / Output Formatting 1 Command” parameter out of Detail setting is set to “Enabled”.
(2) Values to be set are literal.
(3) Values to be set are equivalent.
(4) Integer variables of setting destinations are directly specified.
(5) Integer variables of setting destinations range from V1% to V200%..

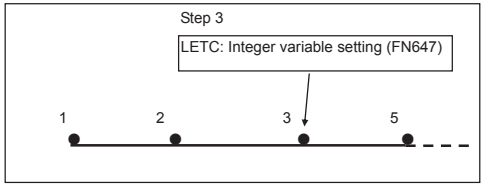
The number of parameters of this application command is variable. Assignment to a maximum of 200 integer variables can be integrated into a single application command.
By making a conversion from the Executable format into the Robot language, this application command is converted into assignment to the integer variables of the setting sources.
If this application command is described to the Robot language, an error will occur when making a conversion from the Robot language into the Executable format.
This application command is not available for recording from the teach pendant nor edit with the screen editing function.
Executing this application command makes it possible to assign values to “integer variables” specified.

■ **Example of motion**

As shown in the figure below, describe assignment to integer variables in the Steps 3 to 6.
Making a conversion from the Robot language into the Executable format will convert the program as shown in the figure below.



When playing back the program, “100” will be set to the first to the fourth integer variables in a stage in which the advance execution step counter reaches the Step 3. (This is executed asynchronously with robot motions.)
These set variables can be checked on the Integer variable register window on the Monitor screen.



■ **Parameters**

Parameter 1	Assign value	Used to make setting of value to be assigned to integer variable. (Setting range: –2147483647 to +2147483647)
Parameter 2	Number of integer variables	Used to make setting of the number of integer variables to be specified by the parameter 3 or later. (Setting range: 1 to 200)
Parameter 3	Integer variable No. 1	Used to specify the Integer variable number. (Range of integer variable No.: 1 to 200)
• • •	• • •	• • •
Parameter 202	Integer variable No. 200	Used to specify the Integer variable number. (Range of integer variable No.: 1 to 200)

■ **Example of screen display**

LETC[100,3,1,2,3] FN674: Integer variable setting

Related commands
LETVI: Integer variable assign (FN75)

Function commands (FN codes)

Command name	ASIN
FN code	648
Title name	LET ASIN function
General description	Get ASIN variables

■ General description

It calculates the real value of ASIN and set the result to real variable.

■ Example of operation

Record ASIN, designated global variable1(V1!) and original global variable2(V2!). After acting the function, ASIN value of V2! is stored V1!

You can see the values by some monitors. You can use Local variables too.

Functionality of ASIN[V1!,V2!]

Global variables	Before ASIN	After ASIN
V1!	0.0000	1.5708
V2!	1.0000	0.0000

■ **Parameters**

Parameters	Contents	Range
Type of designated variables	Set the type of designated variable	Real Global Var. / Real Local Var.
Variable number	Set the number of variables	1～200
Type of original value	Set the type of original value ※You can set the value directly if you use "Real constant value"	Real Global Var. / Real Local Var. Real constant value
Variable number or Constant value	Set variable number if you use variable type Set real constant if you use Real constant value.	Variables : 1～200 Constant : -1e+038～1e+038

■ Example of screen display

Displayed parameters on the screen from left are "Designated variables", "Original value set by some variables, or real value"

See

ACOS; Let ACOS function (FN649)
SIN; Let SIN function (FN652)
COS; Let COS function (FN653)
TAN; Let TAN function (FN654)
ATN; Let ATN function (FN655)
ATN2; Let ATN2 function (FN656)

Function commands (FN codes)

Command name	ACOS
FN code	649
Title name	LET ACOS function
General description	Get ACOS variables

■General description
It calculates the real value of ACOS and set the result to real variable.

■ Example of operation
Record ACOS, designated global variable1(V1!) and original global variable2(V2!). After acting the function, ACOS value of V2! is stored V1!
You can see the values by some monitors. You can use Local variables too.

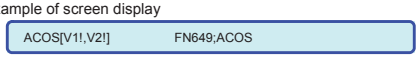
Functionality of ACOS[V1!,V2!]

Global variables	Before ACOS	After ACOS
V1!	0.0000	1.5708
V2!	1.0000	0.0000

■ **Parameters**

Parameters	Contents	Range
Type of designated variables	Set the type of designated variable	Real Global Var. / Real Local Var.
Variable number	Set the number of variables	1～200
Type of original value	Set the type of original value ※You can set the value directly if you use "Real constant value"	Real Global Var. / Real Local Var. Real constant value
Variable number or Constant value	Set variable number if you use variable type Set real constant if you use Real constant value.	Variables : 1～200 Constant : -1e+038～1e+038

■Example of screen display



Displayed parameters on the screen from left are "Designated variables", "Original value set by some variables, or real value"

See
ASIN; Let ASIN function (FN648)
SIN; Let SIN function (FN652)
COS; Let COS function (FN653)
TAN; Let TAN function (FN654)
ATN; Let ATN function (FN655)
ATN2; Let ATN2 function (FN656)

Function Commands (FN Codes)

Command name	TIMER
FN code	650
Title name	Let TIMER function
General description	Sets the time value passed since the power-on into the specified real variable register

■ General description

This function command allows to set the time value into the specified real variable register by 1ms.

■ Parameter

1st parameter	Real variable No.	Designates the real variable No. to set. (1-200)

■ Example of screen display

```
TIMER[V1!]          FN650:Let TIMER function
```

Function Commands (FN Codes)

Command name	SQR
FN code	651
Title name	Let SQR function
General description	Calculates the square root of the real number

■ General description

This function command allows to calculate the square root of the real number and set its return value into the specified real variable register.

■ Example of operation

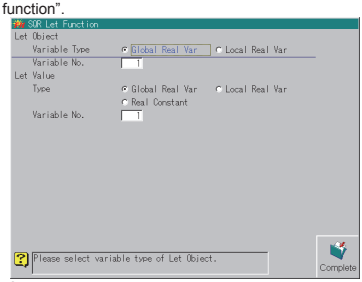
Any steps can be recorded by “SQR: Let SQR function (FN651)”, “Global variable No. of the set destination=1”, and “Global variable No. of the set value=2”. The square root of the 2nd variable is set into the 1st variable by playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of SQR [V1!, V2!]

Global variable	Before executing SQR	After executing SQR
V1!	0.0000	2.0000
V2!	4.0000	4.0000

■ SQR Teach Method

(1) Select FN651 “Let SQR function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant.
(6) Press F12 <Complete> to record SQR.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ Example of screen display

```
SQR[V1!,V2!]          FN651:Let SQR function
```

The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or set constant)” from the left.

Function Commands (FN Codes)

Command name	SIN
FN code	652
Title name	Let SIN function
General description	Calculates the SIN value of real number

■ General description

This function command allows to calculate the SIN value of the real number and set its return value into the specified real variable register.

■ Example of operation

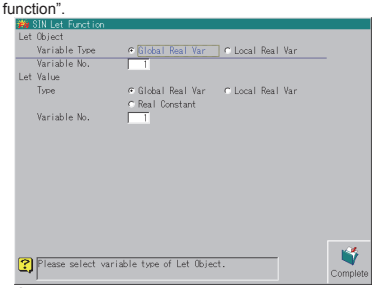
Any steps can be recorded by “SIN: Let SIN function (FN652)”, “Global variable No. of the set destination=1”, and “Global variable No. of the set value=2”. The SIN value of the 2nd variable is set into the 1st variable by playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of SIN [V1!, V2!]

Global variable	Before executing SIN	After executing SIN
V1!	0.0000	0.8415
V2!	1.0000	1.0000

■ SIN Teach Method

(1) Select FN652 “Let SIN function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant.
(6) Press F12 <Complete> to record SIN.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enter the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ **Example of screen display**

```
SIN[V1!,V2!]          FN652:Let SIN function
```

The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or set constant)” from the left.

See
COS; Let COS function (FN653)
TAN; Let TAN function (FN654)
ATN; Let ATN function (FN655)
ATN2; Let ATN2 function (FN656)

Function Commands (FN Codes)

Command name	COS
FN code	653
Title name	Let COS function
General description	Calculates the COS value of real number

■ General description

This function command allows to calculate the COS value of the real number and set its return value into the specified real variable register.

■ Example of operation

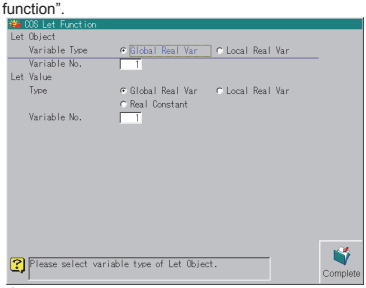
Any steps can be recorded by “COS: Let COS function (FN653)”, “Global variable No. of the set destination=1”, and “Global variable No. of the set value=2”. The COS value of the 2nd variable is set to the 1st variable by playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of COS [V1!, V2!]

Global variable	Before executing COS	After executing COS
V1!	0.0000	0.5403
V2!	1.0000	1.0000

■ COS Teach Method

(1) Select FN653 “Let COS function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant.
(6) Press F12 <Complete> to record COS.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enter the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ **Example of screen display**

```
COS[V1!,V2!]          FN653:Let COS function
```

The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or set constant)” from the left.

See
SIN; Let SIN function (FN652)
TAN; Let TAN function (FN654)
ATN; Let ATN function (FN655)
ATN2; Let ATN2 function (FN656)

Function Commands (FN Codes)

Command name	TAN
FN code	654
Title name	Let TAN function
General description	Calculates the TAN value of real number

■ General description

This function command allows to calculate the TAN value of real number and set its return value into the specified real variable register.

■ Example of operation

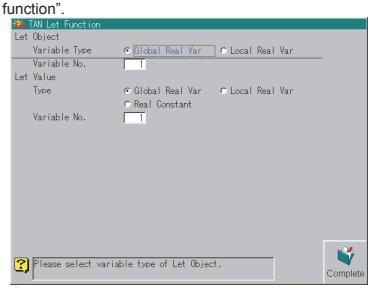
Any steps can be recorded by “TAN: Let TAN function (FN654)”, “Global variable No. of the set destination=1”, and “Global variable No. of the set value=2”. The TAN value of the 2nd variable is set into the 1st variable by performing playback of this command. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of TAN [V1!, V2!]

Global variable	Before executing TAN	After executing TAN
V1!	0.0000	1.5574
V2!	1.0000	1.0000

■ TAN Teach Method

(1) Select FN654 “Let TAN function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant.
(6) Press F12 <Complete> to record TAN.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ **Example of screen display**

```
TAN[V1!,V2!]          FN654:Let TAN function
```

The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or set constant)” from the left.

See
SIN; Let SIN function (FN652)
COS; Let COS function (FN653)
ATN; Let ATN function (FN655)
ATN2; Let ATN2 function (FN656)

Function Commands (FN Codes)

Command name	ATN
FN code	655
Title name	Let ATN function
General description	Calculates the ATN value of real number

■ General description

This function command allows to calculate the ATN value of the real number and set its return value into the specified real variable register.

■ Example of operation

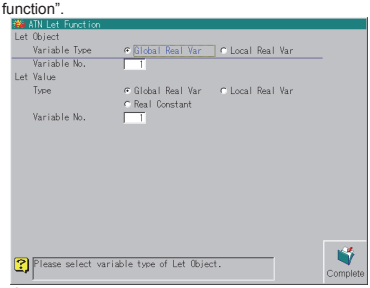
Any steps can be recorded by “ATN: Let ATN function (FN655)”, “Global variable No. of the set destination=1”, and “Global variable No. of the set value=2”. By playback of this command, the ATN value of the 2nd variable is set into the 1st variable. The set variables can be checked by the register screen of global real number variable on the monitor. (Local variables are also available.)

Execution sample of ATN [V1!, V2!]

Global variable	Before executing ATN	After executing ATN
V1!	0.0000	0.7854
V2!	1.0000	1.0000

■ ATN Teach Method

(1) Select FN655 “Let ATN function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant value.
(6) Press F12 <Complete> to record ATN.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enter the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ **Example of screen display**

```
ATN[V1!,V2!]          FN655:Let ATN function
```

The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or set constant)” from the left.

See
SIN; Let SIN function (FN652)
COS; Let COS function (FN653)
TAN; Let TAN function (FN654)
ATN2; Let ATN2 function (FN656)

Function Commands (FN Codes)

Command name	ATN2
FN code	656
Title name	Let ATN2 function
General description	Calculates the ATN2 value of real number

■ General description

This function command allows to calculate the ATN2 value of the real number and set its return value into the specified real variable register.

■ Example of operation

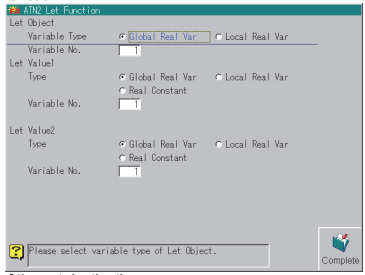
Any steps can be recorded by “ATN2: Let ATN2 function (FN656)”, “Global variable No. of the set destination=1”, “Global variable No.1 of the set value=2” and “Global variable No.2 of the set value=3”. By playback of this command, the ATN2 value of the 2nd and 3rd variable are set into the 1st variable. The set variables can be checked by the register screen of global real variable on the monitor. (Local variables are also available.)

Execution sample of ATN2 [V1!, V2!, V3!]

Global variable	Before executing ATN2	After executing ATN2
V1!	0.0000	0.4636
V2!	1.0000	1.0000
V3!	2.0000	2.0000

■ ATN2 Teach Method

(1) Select FN656 “Let ATN2 function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value 1.
(5) Enter the variable No. of the set value 1 or the set constant.
(6) Select the type of set value 2.
(7) Enter the variable No. of the set value 2 or the set constant.
(8) Press F12 <Complete> to record ATN2.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value 1	Enters the type of set value 1. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant

Variable No. of set value 1 or Set constant 1	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 1.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038
Type of set value 2	Enters the type of set value 2. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value 2 or Set constant 2	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 2.	Variable No.: 1~200 Constant value: -1e+038~ 1e+038

■ **Example of screen display**

```
ATN2[V1!,V2!,V3!]          FN656:Let ATN2 function
```

The parameters appeared on the screen are “Variable of set destination”, “Variable of set value 1 (or set constant 1)”, and “Variable of set value 2 (or set constant 2)” from the left.

See
SIN; Let SIN function (FN652)
COS; Let COS function (FN653)
TAN; Let TAN function (FN654)
ATN; Let ATN function (FN655)

Function Commands (FN Codes)

Command name	ABS
FN code	657
Title name	Let ABS function
General description	Calculates the absolute value of real number

■ General description

This function command allows to calculate the absolute value of real number and set its return value into the specified real variable register.

■ Example of operation

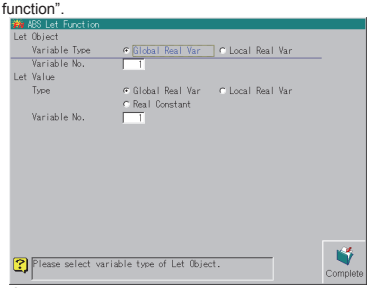
Any steps can be recorded by “ABS: Let ABS function (FN657)”, “Global variable No. of the set destination=1” and “Global variable No. of the set value=2”. By playback of this command, the absolute value of the 2nd variable is set into the 1st variable. The set variables can be checked by the register screen of global real variable on the monitor. (Local variables are also available.)

Execution sample of ABS [V1!, V2!]

Global variable	Before executing ABS	After executing ABS
V1!	0.0000	1.1000
V2!	-1.1000	-1.1000

■ ABS Teach Method

(1) Select FN657 “Let ABS function”.

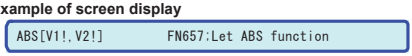


(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value.
(5) Enter the variable No. of the set value or set constant.
(6) Press F12 <Complete> to record ABS.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value	Enters the type of set value. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value or Set constant	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value.	Variable No.: 1~200 Constant value: -1e+038~1e +038

■ **Example of screen display**



The parameters appeared on the screen are “Variable of set destination” and “Variable of set value (or substitution constant)” from the left.

Function Commands (FN Codes)

Command name	MIN
FN code	658
Title name	Let MIN function
General description	Calculates a smaller real number out of two

■ General description

This function command allows to set a smaller real number out of two into the real variable register.

■ Example of operation

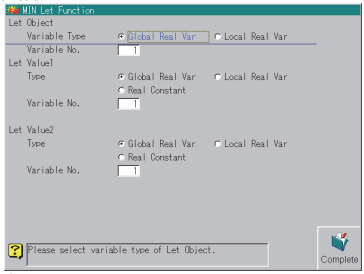
Any steps can be recorded by “MIN: Let MIN function (FN658)”, “Global variable No. of the set destination=1”, “Global variable No. of the set value 1 = 2”, and “Global variable No. of the set value 2 =3”. By playback of this command, a smaller variable of the 2nd or 3rd is set into the 1st variable. The set variables can be checked by the register screen of global real variable on the monitor. (Local variables are also available.)

Execution sample of MIN [V1!,V2!, V3!]

Global variable	Before executing MIN	After executing MIN
V1!	0.0000	1.0000
V2!	1.0000	1.0000
V3!	2.0000	2.0000

■ MIN Teach Method

(1) Select FN658 “Let MIN function”.



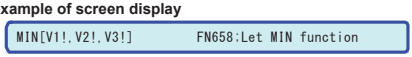
(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value 1.
(5) Enter the variable No. of the set value 1 or the set constant.
(6) Select the type of set value 2.
(7) Enter the variable No. of the set value 2 or the set constant.
(8) Press F12 <Complete> to record MIN.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value 1	Enters the type of set value 1. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value 1 or Set constant 1	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 1.	Variable No.: 1~200 Constant value: -1e+038~1e +038

Type of set value 2	Enters the type of set value 2. ※ Selecting “Real constant”, the substitution value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value 2 or Set constant 2	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 2.	Variable No.: 1~200 Constant value: -1e+038~1e +038

■ **Example of screen display**



The parameters appeared on the screen are “Variable of set destination”, “Variable of set value 1 (or set constant 1)” and “Variable of set value 2 (or set constant 2)” from the left.

See
MAX; Let MAX function (FN659)

Function Commands (FN Codes)

Command name	MAX
FN code	659
Title name	Let MAX function
General description	Calculates a larger real number out of two

■ General description

This function command allows to set a larger real number of the two into the real variable register.

■ Example of operation

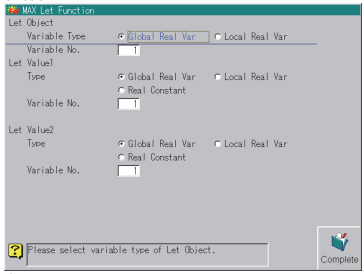
Any steps can be recorded by “MAX: Let MAX function (FN659)”, “Global variable No. of the set destination=1”, “Global variable No. of the set value 1 =2” and “Global variable No. of the set value 2 =3”. By playback of this command, a larger variable of the 2nd or 3rd is set into the 1st variable. The set variables can be checked by the register screen of global real variable on the monitor. (Local variables are also available.)

Execution sample of MAX [V1!, V2!, V3!]

Global variable	Before executing MAX	After executing MAX
V1!	0.0000	2.0000
V2!	1.0000	1.0000
V3!	2.0000	2.0000

■ MAX Teach Method

(1) Select FN659 “Let MAX function”.



(2) Select the variable type of the set destination.
(3) Enter the variable No. of the set destination.
(4) Select the type of set value 1.
(5) Enter the variable No. of the set value 1 or set constant.
(6) Select the type of set value 2.
(7) Enter the variable No. of the set value 2 or set constant.
(8) Press F12 <Complete> to record MAX.

■ Parameter

Parameter name	Description	Range
Variable type of set destination	Enters the variable type of the set destination.	Global real variable/ Local real variable
Variable No. of set destination	Enters the variable No. of the set destination.	1~200
Type of set value 1	Enters the type of set value 1. ※ Selecting “Real constant”, the set value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value 1 or Set constant 1	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 1.	Variable No.: 1~200 Constant value: -1e+038～ 1e+038

Type of set value 2	Enters the type of set value 2. ※ Selecting “Real constant”, the substitution value can be directly designated.	Global real variable/ Local real variable/ Real constant
Variable No. of set value 2 or Set constant 2	Enters the variable No. with “Variable” selected, and the constant value with “Real constant” selected in the variable type of set value 2.	Variable No.: 1~200 Constant value: -1e+038～ 1e+038

■ **Example of screen display**

```
MAX[V1!,V2!,V3!]          FN659:Let MAX function
```

The parameters appeared on the screen are “Variable of set destination”, “Variable of set value 1 (or set constant 1)” and “Variable of set value 2 (or set constant 2)” from the left.

See
MIN; Let MIN function (FN658)

Application command (FN code)

Command name	OFFSETV
FN code	660
Title name	Multi Offset condition specification (Variable)
General description	It gives offset to the movement steps between multi-pass welding section.

■ General description

This command gives offset to the movement steps between multi-pass welding section. Multi Offset condition number can be specified by variables. Except multi offset condition number, other parameters are same as FN499 OFFSET.

Method to specify the condition file that can be used in OFFSETV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number : 1 to 200, 301 to 500
Local variables	Variable number : 1 to 200, 301 to 500

What are Global variables / Local variables ?

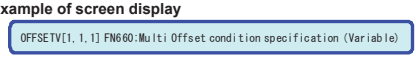
Variable type	Explanation
Global variables	These variables can be referenced from all the units. These variables start with V.
Local variables	These variables exist in each unit respectively and cannot be referenced from other units. These variables start with L.

Global integer variables / Local integer variables can be used in OFFSETV.

■ Parameter

1st parameter	Multi Offset condition number	Specify the multi offset condition file number by direct value /Global variable /Local variable method. This file is already created by the <Arc condition setting> - [9 Multi offset condition].
2nd parameter	Mechanism ID	This specifies the mechanism number that gives the offset. (1 to 9) Normally, "1" is specified because the Manipulator with welding torch has Mechanism 1.
3rd parameter	Section type	Offset becomes enabled for entire multi-pass welding section, so this specifies whether to "Start" or "End" the offset. (1: Start / 0: End) Specify "Start" in case of start position of multi-pass welding section and "End" in case of end position.

■ Example of screen display



See
OFFSET ; Multi Offset condition specification (FN499)

Application command (FN code)

Command name	ASMV
FN code	661
Title name	Multi-pass welding start (Variable)
General description	Starts Multi-pass welding with the specified conditions.

■ General description

Multi-pass condition can be specified by direct value or variable. Except this, all other is similar to FN418 ASM.

Method to specify the condition file that can be used in ASMV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number: 1 to 200, 301 to 500
Local variables	Variable number: 1 to 200, 301 to 500

What are Global variables / Local variables ?

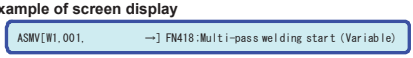
Variable type	Explanation
Global variables	These variables can be referenced from all the units. These variables start with V.
Local variables	These variables exist in each unit respectively and cannot be referenced from other units. These variables start with L.

Global integer variables / Local integer variables can be used in ASMV.

■ Parameter

1st parameter	Condition file ID	Specify multi-pass welding start condition file number by direct value /Global variable /Local variable method. This file is already created by the <Arc condition setting> - [6 Multi-pass welding start condition].

■ Example of screen display



See
ASM ; Multi-pass welding start(FN418)

Function commands (FN codes)

Command name	WHILE
FN code	663
Title name	WHILE loop
Outline	Execute the instruction in WHILE-ENDW repeatedly until the condition doesn't consist.

■ General description

This application instructions repeatedly executes the instruction in WHILE-ENDW until the result of evaluating the condition becomes 0. The condition is evaluated before the loop is executed every time.
Therefore, the WHILE loop is executed 0 times or more.
Use it together with ENDW.

In the following example, while V1% is less than 10,the instructions between WHILE and ENDW are executed repeatedly.

Example:
```
V1%=0
WHILE V1%<10
Instruction 1
Instruction 2
V1%=V1%+1
ENDW
```

■ Parameter

Parameter No. 1	Conditional expression	It is a conditional expression. The conditional expression that compare the integer variable or the real number variable can be described now.

■ Method of specifying the first parameter

The first parameter can be freely described with a soft keyboard.

The conditional expression that compare the integer variable or the real number variable can be described now.

description example:

```
WHILE V1% = 1
    ;  While integer variable 1 is equal to 1
WHILE V2! < 0
    ;  While real number variable 2 is Negative
WHILE V3% > 1
    ;  While integer variable 3 is larger than 1
```

- Integer variable

Treat the numerical value that doesn't contain the decimal point.

Format	Vn% and V% n ; n=1-200 (global integer variable) Ln% and L% n ; n=1-200 (local integer variable) - Vn% and V% n are the same meanings.
Range	-2147483648～+2147483647
Sample	WHILE V1%=1 ;while variable 1 is one WHILE V2%<>0 ;while variable 2 is not 0
Preservation	Even if the main power supply is cut, all a global integer variables are preserved. All a local integer variables are not preserved.

- Real number variable

Treat the numerical value including the decimal point.

Format	Vn!, V!n ; n=1-100 (global real variable) Ln!, L!n ; n=1-100 (local real variable) - Vn! With V. n is the same meaning.
Range	-1.0E38～+1.0E38
Sample	WHILE V1!>0 While variable 1 is larger than 0
Preservation	Even if the main power supply is cut, all a global real number variables are preserved. All a local real number variables are not preserved.

- Relational operation type

Use the relational operation when you compare two numerical values. The result obtains by truth (1) and false (0), and is used for the change in the order of executing the program like the condition judgment sentence etc. etc.

Operator	Content of operation	Example
=	It is equal.	V1%=V2%
<>	It is not equal.	V1%<>V2%
<	It is small.	V1%<V2%
>	It is large.	V1%>V2%
<=	It is small or equal.	V1%<=V2%
>=	It is large or is equal.	V1%>=V2%

■ **Example of screen display**

```
WHILE V1%<10                    FN663;WHILE loop
```

See
ENDW: WHILE end (FN664)

Function commands (FN codes)

Command name	ENDW
FN code	664
Title name	WHILE end
Outline	It is terminater of the WHILE-ENDW structure.

■ General description

Execute the instructions described in the WHILE-ENDW loop repeatedly.
Use it together with WHILE.

■ Parameter

None.

■ Example of screen display

```
ENDW                    FN664;WHILE loop end
```

See
WHILE; WHILE loop (FN663)

Application command (FN code)

Command name	ASV
FN code	665
Title name	Arc start (Variable specification)
General description	Starts arc welding with the specified conditions.

■ **General description**

Condition file No. such as Arc start condition file, retry condition file can be specified indirectly through variables. This allows you to change the Arc start conditions by the input of internal counter value or signal from external source.
In case of the conditions that are not required to be changed, the file No. can be specified by direct value.
The welding start position is a move command just before the ASV (FN665). To select the command, designate the FN code “665”.

Method to specify the condition file that can be used in ASV/AEV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number: 1 to 200, 301 to 500
Local variables	Variable number: 1 to 200, 301 to 500

What are Global variables / Local variables ?

Variable type	Explanation
Global variables	These variables can be referenced from all the units. These variables start with V.
Local variables	These variables exist in each unit respectively and cannot be referenced from other units. These variables start with L.

Global integer variables / Local integer variables can be used in ASV/AEV.

Modification of variable value during welding

When the condition file number is set by variable, if the variable value is changed during the welding, it will not be reflected in the welding condition. However, in case of restart after temporary stop or emergency stop, the condition file of changed variable value will be used

Change in condition by signal from external source

As for the teaching data, the data is pre-fetched from some steps before the step to be executed. Therefore, if the Welding condition file no. is replaced from the external source during playback motion, it may not be reflected. In case of replacing the welding condition file no. from external source, check the welding condition file no. before starting the program.

■ **Parameter**

For details of each setting items, also refer to arc start command (FN414).

Setting items of ASV <FN665>

Item set	Setting range	Remarks
Welder No.	Welder 1 to Welder 4	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Direct value specification: 1 to 999 Variables specification: Global/ Local variable	Specify the welding conditions file to be used in Arc start command. Set the condition file no. in case of direct value and variable number in case of variable.
Retry no.	Direct value specification: 0 to 99	Specify respective condition files of retry no., restart no., Move
Restart no.		

Move cond. no.		
RS control	NO / Yes	Set the method of movement of RS control. This condition can be set if the "RS control" optional software is set and welding constant "RS control" is set to "Enabled". NO : RS control is not performed. Yes : RS control is performed.
RS No.*1	Direct value specification: 0 to 999 Variables specification: Global/ Local variable	It can be set when RS control is "Yes". Set the condition file no. in case of direct value specification and variable number in case of variable specification. Movement is different in case of condition file no. 0 and condition file no 1 to 99.
Robot RS control	NO / Robot RS No.	Set the control by robot RS no. NO: Robot RS control is not performed. Robot RS No.: Performs robot RS by the Robot RS condition file of specified No.
Robot RS No.	Direct value specification: 1 to 999 Variables specification: Global/ Local variable	It can be set when Robot RS control is "Robot RS No." Set the condition file no. in case of direct value specification and variable number in case of variable specification.

*1: RS No. can be set only for DL-350(S-2), DP-400R and WB-M350L.

■ **Example of screen display**

```
ASV[W1, V1%, 00, 00, 00, 00, 00, 00→]
```

[ ] shows Welder No., Arc start conditions (Variable), Arc retry No. (Variable), RS control condition No. (Variable), Move cond. no. (Variable), Restart No. (Variable) from the left.

See
AS; Arc start (FN414)
AE; Arc end (FN415)
AEV; Arc end (Variable specification)(FN666)

Application command (FN code)

Command name	AEV
FN code	666
Title name	Arc end (Variable specification)
General description	Terminates arc welding with the specified conditions.

■ **General description**

Arc end conditions file can be specified indirectly through variables. This allows you to change the Arc end conditions by input of internal counter value or signal from external source.
In case of the conditions that are not required to be changed, the file No. can be specified by direct value.
The welding start position is a move command just before the AEV (FN 666). To select the command, designate the FN code “666”.

Method to specify the condition file that can be used in AEV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number: 1 to 200, 301 to 500
Local variables	Variable number: 1 to 200, 301 to 500

What are Global variables / Local variables ?

Variable type	Explanation
Global variables	These variables can be referenced from all the units. These variables start with V.
Local variables	These variables exist in each unit respectively and cannot be referenced from other units. These variables start with L.

Global integer variables / Local integer variables can be used in AEV.

Modification of variable value during welding

When the condition file number is set by variable, if the variable value is changed during the welding, it will not be reflected in the welding condition. However, in case of restart after temporary stop or emergency stop, the condition file of changed variable value will be used

Change in condition by signal from external source

As for the teaching data, the data is pre-fetched from some steps before the step to be executed. Therefore, if the Welding condition file no. is replaced from the external source during playback motion, it may not be reflected. In case of replacing the welding condition file no. from external source, check the welding condition file no. before starting the program.

■ **Parameter**

For details of each setting items, also refer to arc start command (FN415).

Setting items of AEV <FN666>

Item set	Setting range	Remarks
Welder No.	Welder 1 to Welder 4	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Direct value specification: 1 to 999 Variables specification: Global/ Local variable	Specify the welding conditions file no. to be used in Arc end command. Set the condition file no. in case of direct value and variable number in case of variable.

■ **Example of screen display**

```
ASV[W1,V1%,                    →]
```

[ ] shows Welder No., Arc end condition (Variable) from left.

See
AS; Arc start (FN414)
AE; Arc end (FN415)
AEV; Arc end (Variable specification)(FN666)

Application command (FN code)

Command name	WFPV
FN code	667
Title name	Fixed pattern weaving start (Variable specification)
General description	Starts arc welding with the specified conditions.

■ General description

Weaving conditions file no. can be specified indirectly through variables. This allows you to change the weaving conditions by input of internal counter value or signal from external source.
In case of the conditions that are not required to be changed, the file no. can be specified by direct value.
The robot starts weaving from a position of the movement command taught immediately before this command (WFP).

Method to specify the condition file that can be used in WFPV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number: 1 to 200, 301 to 500
Local variables	Variable number: 1 to 200, 301 to 500

Modification of variable value during weaving

When the condition file is set by variable, if the variable value is changed during the weaving, it will not be reflected in the weaving condition. However, in case of restart after temporary stop or emergency stop, the condition file of changed variable value will be used.

■ Parameter

For details of each setting items, also refer to Fixed pattern weaving command (FN440).

Weaving (variable) conditions

Item set	Setting range	Remarks
Condition file ID	Direct value specification: 1 to 999 Variables specification: Global/ Local variable	Specify the weaving condition file. Set the condition file no. in case of direct value and variable number in case of variable.

■ Example of screen display

```
WFPV[V1%,                    →]
```

[ ] shows Axis weaving conditions from left.

See
WFP; Fixed Pattern weaving start (FN440)
WE; Weaving End command (FN443)

Application command (FN code)

Command name	WFXV
FN code	668
Title name	Axis weaving start (Variable specification)
General description	Starts arc welding with the specified conditions.

■ General description

Weaving conditions file no. can be specified indirectly through variables. This allows you to change the weaving conditions by input of internal counter value or signal from external source.
In case of the conditions that are not required to be changed, the file no. can be specified by direct value.
The robot starts weaving from a position of the movement command taught immediately before this command (WFXV).

Method to specify the condition file that can be used in WFXV command

Specification method	Setting range
Direct value	Range of each condition file number
Global variables	Variable number: 1 to 200, 301 to 500
Local variables	Variable number: 1 to 200, 301 to 500

Modification of variable value during weaving

When the condition file is set by variable, if the variable value is changed during the weaving, it will not be reflected in the weaving condition. However, in case of restart after temporary stop or emergency stop, the condition file of changed variable value will be used

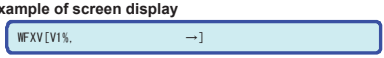
■ Parameter

For details of each setting items, also refer to Axis weaving command (FN441).

Weaving (variable) conditions

Item set	Setting range	Remarks
Condition file ID	Direct value specification: 1 to 999 Variables specification: Global/ Local variable	Specify the weaving condition file. Set the condition file no. in case of direct value and variable number in case of variable.

■ Example of screen display



[ ] shows Axis weaving conditions from left.

See
WAX; Axis weaving start (FN441)
WE; Weaving End command (FN443)

Function commands (FN codes)

Command name	PRINTF
FN code	669
Title name	Print string with format
General description	Draw the string data on the screen with form. Or Output string data with form via RS232C.

■ General description

The function draws some string data and output some string data via RS232C, files.
You should select “Device”. Device number must start character"#". The form is based on the “Printf” function of C language library. Corresponding sub parameters will translate to some string data and output to the device. Sub parameters will be designate max.5, and you can skip too.

■Example of operation

When the robot reaches the step where FN669 is recorded, the function will act with no motion pause.

■ **Parameters**

1st parameter	Device number	Set port number of string code #0： User display(It is only available by User task） #1： RS232C port #2： Not supported now #3： Not supported now #4： Playback logging monitor #5～ Device No. #36 （Set at FN698 FOPEN） ：
2nd parameter	String data with form	Set the string data. You can set the data from Soft keyboard by ［Enable］＋［Edit］. （Max. 100 characters） Corresponding sub parameters will translate to some string data and output to the device if you use below string forms You must start 「%」character. If you use 「%」itself, you should put「%%」 % [flag] [] []
3rd parameter	1st sub parameter	Set the variable number. You can use Integer variables, Real variables, String variables, and Optional variables (You can also skip).
4th parameter	2nd sub parameter	
5th parameter	3rd sub parameter	
6th parameter	4th sub parameter	
7th parameter	5th sub parameter	
8th parameter	6th sub parameter	

■ Example of screen display

```
PRINT[#4, "V1%% = %d", V1%]        FN669;Print string with format
FOPEN    ; Files Open(FN598)
FCLOSE   ; Files Close(FN599)
```

Function commands (FN codes)

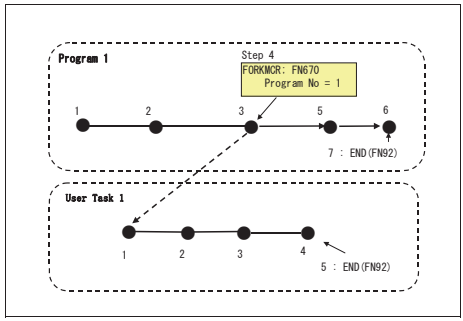
Command name	FORKMCR
FN code	670
Title name	Fork User Task Program
General description	This command is used to start the specified user task program.

■ General description

When this function command is executed, the specified user task program is started. Started user task program finish after the program is executed once from start to end.

■ Example of operation

In step 4, record FORKMCR: User Task Program Start (FN670) and "1" as the program number. When this is played back, the program1 start the user task program 1 upon arriving at step 4. (program1 and user task 1 operate concurrently.)
When the start of User Task 1 fails, the program1 jumps shelter step.



■ Parameter

Parameter No. 1	Program No.	This specifies the number of the program serving as the call destination. (1-999)
Parameter No. 2	Shelter step	This is used to specify the number of the shelter step when the specified user task program was not starting. (1 to 10000) When 10000 is specified as the shelter step number, an alarm results immediately with no escape operation performed, and the robot can be stopped.

■ Example of screen display

```
FORKMCR [1,6]        FN670; Fork User Task Program
```

See
CALLMCR: Call user task program (FN671)
FORKMCRTM: Fork user task program (Time) (FN672)
FORKMCRDST: Fork user task program (Distance) (FN673)

Function commands (FN codes)

Command name	CALLMCR
FN code	671
Title name	Call User Task Program
General description	This command is used to call the specified user task program.

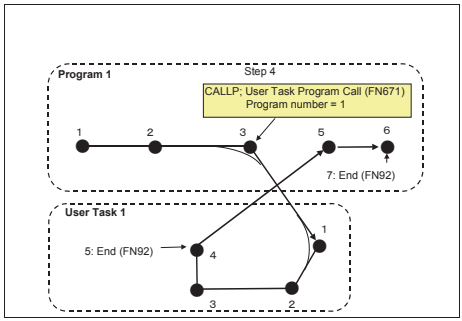
■ General description

When this function command is executed, the specified user task program is called. When program call user task program, program stop one's playback and start specified user task program.
When the playback of the user task program at the call destination is completed (in the status established by executing the END command), the program returns to the step following the step with the call command of the call source program.

■ Example of operation

In step 4, record CALLMCR: User Task Program Call (FN671) and "1" as the program number.

When this is played back, the program1 call the user task program 1 upon arriving at step 4. When the start of User Task 1 fails, the program1 jumps shelter step.
When the playback of user task program 1 is completed (in the status established by executing the END command), the robot returns to step 5 following the step with the call command of call source program 1.



■ Parameter

Parameter No. 1	Program No.	This specifies the number of the program serving as the call destination. (1-999)
Parameter No. 2	Shelter step	This is used to specify the number of the shelter step when the specified user task program was not starting. (1 to 10000) When 10000 is specified as the shelter step number, an alarm results immediately with no escape operation performed, and the robot can be stopped.

■ Example of screen display

```
CALLMCR [1,6]        FN671; Call User Task Program
```

See
FORKMCR: fork user task program (FN670)
FORKMCRTM: Fork user task program (Time) (FN672)
FORKMCRDST: Fork user task program (Distance) (FN673)

Function commands (FN codes)

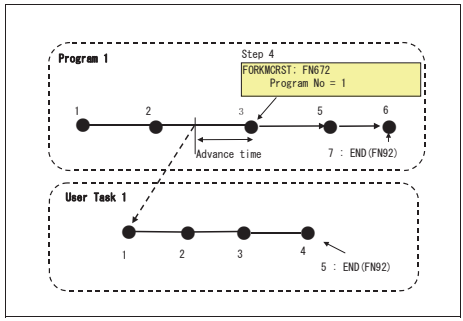
Command name	FORKMCRTM
FN code	672
Title name	Fork User Task Program (time)
General description	This command is used to start the specified user task program. Furthermore, the command enables advance execution to be specified.

■ General description

When this function command is executed, the specified user task program is started. Furthermore, the command enables advance execution earlier than at the position reached by the robot in the accuracy range of the move command.

■ Example of operation

In step 4, record FORKMCRTM : User Task Program Start with early execution (FN672) and "1" as the program number.
When this is played back, the program1 start the user task program 1 before specified seconds from arriving at step 4. (program1 and user task 1 operate concurrently.)
When the start of User Task 1 fails, the program1 jumps shelter step.



■ Parameter

Parameter No. 1	Program No.	This specifies the number of the program serving as the call destination. (1-999)
Parameter No. 2	Advance execution time	If "0.0" is specified as the time, the command is executed at the timing which coincides with the recorded point. the command is starting user task program ahead of the original execution timing by the amount equivalent to the delay time setting.(Increment: seconds) (-10.0 – 0.0)
Parameter No. 3	Shelter step	This is used to specify the number of the shelter step when the specified user task program was not starting. (1 to 10000) When 10000 is specified as the shelter step number, an alarm results immediately with no escape operation performed, and the robot can be stopped.

■ Example of screen display

```
FORKMCRTM [1,-2,6]      FN672; Fork User Task   Program(Time)
```

See
FORKMCR: Fork user task program (FN670)

CALLMCR: Call user task program (FN671)
FORKMCRDST: Fork user task program (Distance) (FN673)

Function commands (FN codes)

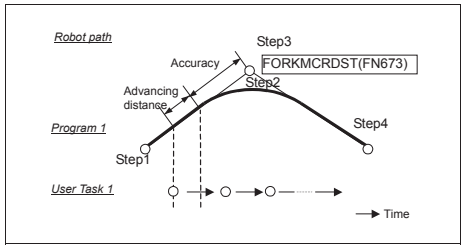
Command name	FORKMCRDST
FN code	673
Title name	Fork User Task Program (distance)
General description	This command is used to start the specified user task program with advancing distance.

■ General description

When this function command is executed, the specified user task program is started. Furthermore, the command enables advanced execute designated by distance from the recorded point. Advancing distance is calculated linear length from recorded point, so if MOVE step is recorded by JOINT output point differs from the real moving length of robot TCP.

■ Example of operation

In step 3, record FORKMCRDST : Fork User Task Program (distance) (FN672) and "1" as the program number.
When this is played back, the program1 start the user task program 1 before specified distance from arriving at step 3. (Program1 and user task 1 operate concurrently.)
When the start of User Task 1 fails, the program1 jumps shelter step.



■ Parameter

Parameter No. 1	Program No.	This specifies the number of the program serving as the call destination. (1-999)
Parameter No. 2	Advance execution timing	This specifies the output advancing timing that is designated by the linear length from the recorded point. (-1500.0 – 0.0)
Parameter No. 3	Shelter step	This is used to specify the number of the shelter step when the specified user task program was not starting. (1 to 10000) When 10000 is specified as the shelter step number, an alarm results immediately with no escape operation performed, and the robot can be stopped.

■ Example of screen display

FORKMCRDST [1,-100,6] FN670; Fork User Task Program (Distance)

See
FORKMCR: Fork user task program (FN670)
CALLMCR: Call user task program (FN671)
FORKMCRTM: Fork user task program (Time) (FN672)

Function commands (FN codes)

Command name	IF
FN code	676
Title name	Condition
Outline	Move the control to the following instruction when the condition consists. Move the control to ELSEIF, ELSE, and ENDIF for the failure.

■ General description

It is conditional.
Use it together with ELSEIF, ELSE, and ENDIF.

IF conditional expression
Instruction 1
Instruction 2
・・
Instruction I
ELSEIF conditional expression
Instruction J
・・
Instruction K
ELSE
Instruction L
・・
Instruction M
ENDIF

If the condition of the IF instruction consists, it moves the control to instruction 1 and moves the control to ENDIF after executing instruction I.

If the condition of the IF instruction is a failure, it moves the control to ELSEIF. If the condition of the ELSEIF instruction consists, it moves the control to instruction J and moves the control to ENDIF after executing instruction K.
If the condition of the ELSEIF instruction is a failure, it moves the control to ELSE and moves to control to instruction L and moves the control to ENDIF after executing instruction M.

■ Parameter

Parameter No. 1	Conditional expression	It is a conditional expression. The conditional expression that comparing operates the integer variable or the real number variable can be described now.

■ Method of specifying the first parameter

The first parameter can be freely described with a soft keyboard.

The conditional expression that comparing operates the integer variable or the real number variable can be described now.

description example:

```
IF V1% = 1
        ;   if integer variable 1 is 1
IF V2! > 0
        ;   if real number variable 2 is larger than 0
IF V3% >= 1
        ;   When integer variable 3 is 1 or more.
```

■ Example of screen display

```
IF V1%<10                    FN676;IF condition
```

See
ELSEIF; ELSEIF Condition (FN677)
ELSE; ELSE (FN678)
ENDIF; Condition end (FN679)

Function commands (FN codes)	
Command name	ELSEIF
FN code	677
Title name	Condition
Outline	Move the control to the following instruction when the condition consists. Move the control to ELSE and ENDIF for the failure.

■ General description

It is conditional.
Use it together with IF, ELSEIF, ELSE, and ENDIF.

IF conditional expression
Instruction 1
Instruction 2
・・
Instruction I
ELSEIF conditional expression
Instruction J
・・
Instruction K
ELSE
Instruction L
・・
Instruction M
ENDIF

If the condition of the IF instruction consists, it moves the control to instruction 1 and moves the control to ENDIF after executing instruction I.

If the condition of the IF instruction is a failure, it moves the control to ELSEIF. If the condition of the ELSEIF instruction consists, it moves the control to instruction J and moves the control to ENDIF after executing instruction K.
If the condition of the ELSEIF instruction is a failure, it moves the control to ELSE and moves to control to instruction L and moves the control to ENDIF after executing instruction M.

■ Parameter

Parameter No. 1	Conditional expression	It is a conditional expression. The conditional expression that comparing operates the integer variable or the real number variable can be described now.

■ Method of specifying the first parameter

The first parameter can be freely described with a soft keyboard.

The conditional expression that comparing operates the integer variable or the real number variable can be described now.

description example:

```
IF V1% = 1
        ;   if integer variable 1 is 1
IF V2! > 0
        ;   if real number variable 2 is larger than 0
IF V3% >= 1
        ;   When integer variable 3 is 1 or more.
```

■ Example of screen display

```
ELSEIF V1%=10          FN677;ELSEIF condition
```

See
IF; IF Condition (FN676)
ELSEIF; ELSEIF Condition (FN677)
ELSE; ELSE (FN678)
ENDIF; Condition end (FN679)

Function commands (FN codes)	
Command name	ELSE
FN code	678
Title name	Condition
Outline	Move the control to the following instruction.

■ General description

It is conditional.
Use it together with IF, ELSEIF, ELSE, and ENDIF.

IF conditional expression
Instruction 1
Instruction 2
・・
Instruction I
ELSEIF conditional expression
Instruction J
・・
Instruction K
ELSE
Instruction L
・・
Instruction M
ENDIF

If the condition of the IF instruction consists, it moves the control to instruction 1 and moves the control to ENDIF after executing instruction I.

If the condition of the IF instruction is a failure, it moves the control to ELSEIF. If the condition of the ELSEIF instruction consists, it moves the control to instruction J and moves the control to ENDIF after executing instruction K.
If the condition of the ELSEIF instruction is a failure, it moves the control to ELSE and moves to control to instruction L and moves the control to ENDIF after executing instruction M.

■ Parameter

None.

■ Example of screen display

ELSE	FN678;ELSE

See
IF; IF Condition (FN676)
ELSEIF; ELSEIF Condition (FN677)
ELSE; ELSE (FN678)
ENDIF; Condition end (FN679)

Function commands (FN codes)

Command name	ENDIF
FN code	679
Title name	Condition end
Outline	End IF-ENDIF.

■ General description

It is a terminator of IF – ENDIF structure.
Use it together with IF, ELSEIF, ELSE, and ENDIF.

IF conditional expression
Instruction 1
Instruction 2
・・
Instruction I
ELSEIF conditional expression
Instruction J
・・
Instruction K
ELSE
Instruction L
・・
Instruction M
ENDIF

If the condition of the IF instruction consists, it moves the control to instruction 1 and moves the control to ENDIF after executing instruction I.

If the condition of the IF instruction is a failure, it moves the control to ELSEIF. If the condition of the ELSEIF instruction consists, it moves the control to instruction J and moves the control to ENDIF after executing instruction K.
If the condition of the ELSEIF instruction is a failure, it moves the control to ELSE and moves to control to instruction L and moves the control to ENDIF after executing instruction M.

■ Parameter

None.

■ Example of screen display

```
ENDIF                FN679;condition end
```

See
IF; Condition (FN676)
ELSEIF; Condition (FN677)
ELSE; Condition (FN678)

Function commands (FN codes)

Command name	GFONT
FN code	683
Title name	Set the font
Outline	The font of the user screen is set.

■ General description

The font of the character string where it draws to the user screen is set.
If this function is executed, PRINTF; Print string (FN606) will draw the string of the font set by this function.
It returns to the default font when WINDOW; User screen open / close (FN607) is executed.

This command is available only in user task, and is permitted being written by robot language only. Please refer to the **"User task" operating manual** for the detail of user task and user screen.

■ Parameter

Parameter No. 1	Height	The height of the character is specified. When 0 is set, It become same height of the current font.
Parameter No. 2	Width	The width of the character is specified. When 0 is set, It become same width of the current font.
Parameter No. 3	Bold	0:disabled 1:enabled (Bold)
Parameter No. 4	Italic	0:disabled 1:enabled (Italic)
Parameter No. 5	Under line	0:disabled 1:enabled (Under line)

<SLIM sample> GFONT 16,8,0,0,0

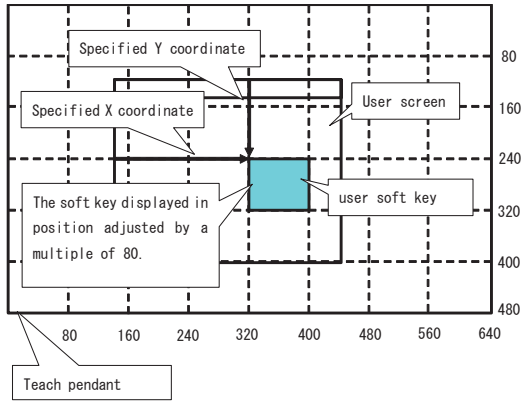
See
PRINT ; Print String (FN606)
WINDOW ; Open/Close user display (FN607)
TITLE ; Set the title on user display (FN608)
CLS ; Set the title on user display (FN609)
LOCATE ; Locate the diplay pos (FN610)
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
BARC ; Draw the arc (FN613)
GPAINT ; Paint (FN614)
GSETP ; Draw the arc (FN615)
COLOR ; Ste the color (FN616)
BGCOLOR ; Set the bkgr color (FN617)
GARC ; Display ellipse (FN623)
GSOFTKEY ; Create soft key (FN684)
GMSGBOX ; Create message box (FN685)

Function commands (FN codes)

Command name	GSOFTKEY
FN code	684
Title name	Create soft key
Outline	Create a soft key on the user screen.

■ General description

This function creates a soft key on the user screen.
The “AC00USK.INC file (User soft key definition file)” where the definition of a soft key is described is necessary to create a soft key by this function.
You can make or edit the user soft key definition file in [Service][User task][User task softkey] menu.
The user soft key definition file can be made or be edited by text editor because it is descried by the text form.
Please refer to "User task operation manual" for the description of the file.
The coordinates of the soft key are specified by relative coordinates on the upper-left of the user screen.
But, an actual display position of the user soft key become a position adjusted by a multiple of 80 on teach pendant.



This command is available only in user task, and is permitted being written by robot language only. Please refer to the **“User task” operating manual** for the detail of user task and user screen.

■ Parameter

Parameter No. 1	X coordinate	X coordinates of the user soft key are specified. (0 – 560)
Parameter No. 2	Y coordinate	Y coordinates of the user soft key are specified. (0 – 400)
Parameter No. 3	Soft key number	The soft key number described in the user soft key definition file (AC00USK.INC) is specified. When 0 is specified, a soft key to specified coordinates is deleted. (0 - 96)

<SLIM sample> GSOFTKEY 80,160,1

See
PRINT ; Print String (FN606)
WINDOW ; Open/Close user display (FN607)
TITLE ; Set the title on user display (FN608)
CLS ; Set the title on user display (FN609)
LOCATE ; Locate the diplay pos (FN610)
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
BARC ; Draw the arc (FN613)

```
GPAINT      ; Paint (FN614)
GSETP       ; Draw the arc (FN615)
COLOR       ; Ste the color (FN616)
BGCOLOR     ; Set the bkgr color (FN617)
GARC        ; Display ellipse (FN623)
GFONT       ; Set the font (FN683)
GMSGBOX     ; Create message box (FN685)
```

Function commands (FN codes)

Command name	GMSGBOX
FN code	685
Title name	Create message box
Outline	Create a message box on the user screen.

■ General description

This function creates a message box on the user screen.
It is for selecting some items by the user screen. When this function is executed, the user task stops processing until the button of the message box is selected. It is necessary to activate the user screen to display the message box.

This command is available only in user task, and is permitted being written by robot language only. Please refer to the **"User task" operating manual** for the detail of user task and user screen.

■ Parameter

Parameter No. 1	Display form	0: Display the "OK" button. 1: Display the "OK" and "Cancel" button. 2: Display the "YES" and "NO" button. 3: Display the "YES", "NO" and "Cancel" button. 4: Display the user definition buttons specified parameter No.6 – No.9.
Parameter No. 2	Icon	0: Not display an Icon. 1: Display the icon of warning. 2: Display the con of question. 3: Display the icon of caution. 4: Display the icon of information.
Parameter No. 3	Title	The string of the title bar is specified. (normal-width 20 characters)
Parameter No. 4	Text	The string of the text is specified. (normal-width 100 characters)
Parameter No. 5	Default	The default select button is specified. (1 -4)
Parameter No. 6	Button 1	When the user definition is specified by parameter No.1, the string of the button is specified. These parameters are not used, and please specify the empty string when specifying it by the parameter No.1 excluding the user definition. (normal-width 8 characters)
Parameter No. 7	Button 2	
Parameter No. 8	Button 3	
Parameter No. 9	Button 4	

```
<SLIM sample 1> GMSGBOX 2, 2, "Confirm", "Is counter reset?", 2, "", "", "", ""
<SLIM sample 2> GMSGBOX 4, 4, "Select processing",
                              "Please select the processing",
                                2, "set","all set","return","cancel"
```

See

PRINT ; Print String (FN606)
WINDOW ; Open/Close user display (FN607)
TITLE ; Set the title on user display (FN608)
CLS ; Set the title on user display (FN609)
LOCATE ; Locate the diplay pos (FN610)
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
BARC ; Draw the arc (FN613)
GPAINT ; Paint (FN614)
GSETP ; Draw the arc (FN615)
COLOR ; Ste the color (FN616)
BGCOLOR ; Set the bkgr color (FN617)
GARC ; Display ellipse (FN623)
GFONT ; Set the font(FN683)
GSOFTKEY ; Create soft key (FN684)

Function commands (FN codes)

Command name	SWITCH
FN code	686
Title name	SWITCH
Outline	Two or more conditions are judged.

■ General description

Two or more conditions are judged.
Use it together with CASE, BREAK, and ENDS.

```
SWITCH V1%
CASE 1
Instruction 1
・・
Instruction I
BREAK
CASE 2
CASE 3
Instruction J
・・
Instruction K
BREAK
CASE
Instruction L
・・
Instruction M
BREAK
ENDS
```

When the value of integer variable V1% is one, it executes from instruction I to instruction K and moves the control to ENDS.
When the value of integer variable V1% is 2 or 3, it executes from Instruction J to instruction K and moves the control to ENDS.
When the value of integer variable V1% is not equal to 1, 2 and 3, it executes from Instruction L to instruction M and moves the control to ENDS.

■ Parameter

Parameter No. 1	Expression	It is an expression of the integer type.

■ Method of specifying the first parameter

The first parameter can be freely described with a soft keyboard.

■ Example of screen display

SWITCH V1%	FN686;SWITCH

See
CASE; CASE (FN687)
BREAK; BREAK(FN688)
ENDS; SWITCH end (FN689)

Function commands (FN code)

Command name	CASE
FN code	687
Title name	CASE
General description	This is used to perform judgment for multiple conditions

■ General description

This is used to perform judgment for multiple conditions.
It is used as a set with SWITCH, BREAK and ENDS.

```
SWITCH V1%
CASE 1
Command 1
 ・・
Command I
BREAK
CASE 2
CASE 3
Command J
 ・・
Command K
BREAK
CASE
Command L
 ・・
Command M
BREAK
ENDS
```

In this example, if the value for integer variable V1% is 1, command 1 to command I is executed, and then control transitions to ENDS.
If the value for integer variable V1% is 2 or 3, command J to command K is executed, and then control transitions to ENDS.
If the integer variable V1% is a value other than 1, 2 or 3, command L to command M is executed, and then control transitions to ENDS.

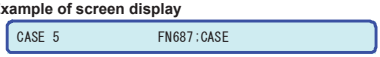
■ Parameter

1st parameter	Integer variable	This is an integer variable.

● First Parameter Designation Method

The first parameter can be described freely by use of the soft keyboard.
This describes the integer variable value.

■ Example of screen display



See
SWITCH; SWITCH (FN686)
BREAK; BREAK (FN688)
ENDS; CASE end (FN689)

Function commands (FN codes)

Command name	BREAK
FN code	688
Title name	BREAK
Outline	End the execution of an innermost instruction that encloses this with the loop or the condition structure. The control shifts to the instruction immediately after the ended instruction.

■ General description

It is possible to use it in the WHILE-ENDW structure, the FOR-NEXT structure, and the SWITCH-ENDS structure.

The control moves to the following instruction of the first ENDW instruction in the direction of the program end.

The control moves to the following instruction of the first NEXT instruction.

The control moves to the following instruction of the first ENDS instruction.

Example:

```
WHILE 1
Instruction 1
Instruction 2
V1%=V1%+1
IF V1% > 10
BREAK
ENDIF
ENDW
Instruction 3
```

It exits the WHILE-ENDW loop, and moves the control to instruction 3, when the value of V1% becomes larger than ten.

■ Parameter

None

■ Example of screen display

```
BREAK                    FN688;BREAK
```

See

```
SWITCH;   SWITCH(FN686)
CASE;      CASE(FN687)
ENDS;      SWITCH end(FN689)
WHILE;     WHILE loop (FN663)
ENDW;      WHILE loop end(FN664)
FOR;       FOR(FN604)
NEXT;      NEXT(FN605)
```

Function commands (FN codes)

Command name	ENDS
FN code	689
Title name	SWITCH end
Outline	It is a terminator of the SWITCH-ENDS structure.

■ General description

It is a terminator of the SWITCH-ENDS structure.
Use it together with SWITCH, CASE, and BREAK.

```
SWITCH V1%
CASE 1
Instruction 1
. .
Instruction I
BREAK
CASE 2
CASE 3
Instruction J
. .
Instruction K
BREAK
CASE
Instruction L
. .
Instruction M
BREAK
ENDS
```

When the value of integer variable V1% is one, it executes from instruction I to instruction K and moves the control to ENDS.
When the value of integer variable V1% is 2 or 3, it executes from Instruction J to instruction K and moves the control to ENDS.
When the value of integer variable V1% is not equal to 1, 2 and 3, it executes from Instruction L to instruction M and moves the control to ENDS.

■ Parameter

None

■ Example of screen display

```
ENDS                    FN689;SWITCH end
```

See
SWITCH; SWITCH(FN686)
CASE; CASE(FN687)
BREAK; BREAK(FN688)

Function commands (FN codes)

Command name	GACTIVE
FN code	696
Title name	Avtive user window
Outline	Switch the active of the user window.

This command is available only in user task, and is permitted being written by robot language only. Please refer to the **"User task" operating manual** for the detail of user task and user screen.

■ Parameter

Parameter No. 1	ON/OFF(1/0)	0: Hide me the user window. 1: Show me the user window.

See
PRINT ; Print String (FN606)
WINDOW ; Open/Close user display (FN607)
TITLE ; Set the title on user display (FN608)
CLS ; Set the title on user display (FN609)
LOCATE ; Locate the diplay pos (FN610)
GLINE ; Draw the line (FN611)
GBOX ; Draw the box (FN612)
BARC ; Draw the arc (FN613)
GPAINT ; Paint (FN614)
GSETP ; Draw the arc (FN615)
COLOR ; Ste the color (FN616)
BGCOLOR ; Set the bkgr color (FN617)
GARC ; Display ellipse (FN623)
GFONT ; Set the font (FN683)
GSOFTKEY ; Create soft key (FN684)
GMSGBOX ; Create message box (FN685)

Application command (FN code)

Command name	INCLUDE
FN code	697
Title name	Conversion table reading
General description	Reads conversion rules from inc file.

■ General description

Reads the specified inc file and adds the conversion rules to the table.

```
Start input,I10
END,O100
COUNT,V100%
CNT_MAX,255
```

Example of inc file

Steps after INCLUDE are converted according to the conversion rules table.
If INCLDUE is used multiple times, conversion rules described in 2 files, SAMPLE1.INC and SAMPLE2.INC, are used after 3rd step, as shown below.

```
INCLUDE “SAMPLE1.INC”
INCDLUE “SAMPLE2.INC”
V1% = 10
 ・
 ・
 ・
```

Nothing is processed at the time of Playback.

■ Parameter

1st parameter	Include file name	Specify name of inc file that is to be read. If the file does not have extension ".inc", ".inc" is added to the file name and then processing is performed.

■ Example of screen display

INCLUDE[“SAMPLE1”]	FN697 ; Conversion table reading

See
INCLDUEIO ; Conversion table reading (I/O name) (FN698)

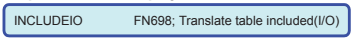
Function commands (FN codes)

Command name	INCLUDEIO
FN code	698
Title name	Translate table included (I/O)
General description	The conversion rule is read from “I/O NAME”.

■ General description

This command makes the conversion rule from “I/O NAME”, and adds it to the table. The conversion processing is done from the next step of “INCLUDEIO Command” according to the table of the conversion rule. Signal with “I/O NAME” where prohibited character is included is not added to the conversion rule. This Command can be used with “INCLUDE Command (FN697)”. The table of conversion rule can be added up to 9999.
When play backing, nothing is processed.

■ Example of screen display



See
INCLUDE : Translate table included (file) (FN697)

Function commands (FN codes)

Command name	CLRREGWR
FN code	699
Title name	Clear register of written sts
Outline	Clear the written flag of shift register

■ General description

This command resets the written flag of the specified shift register. “SHIFTR: Shift2" (FN52) or other command, this command will reset the written flag of shift register without adversely affecting the operation of the other command being executed.

■ Example of operation

The Shift register values when CLRREGWR[R1] has been executed.

	Before LETR is executed	After LETR is executed
Request flag	0	0
Setting flag	1	0
X	110	110
Y	120	120
Z	130	130
θX	5	5
θY	6	6
θZ	7	7

Written flag of shift register set 0 when this command is executed.

Other shift register values are not changed after this command is executed.

Please see “SREQ: Shift amount request” (FN51) about how to use.

■ Parameter

Parameter No. 1	Shift register number	This is used to specify the number of the shift register in which to clear the written flag of the shift register. Setting 0 means clear written flag of all shift registers. (0 to 9)

■ Example of screen display

See
SREQ: Shift amount request (FN51)
SHIFTR: Shift2 (FN52)
RSCLR: Buffer clear (FN111)
WAITR: Wait shift value receive (FN127)

Function commands (FN codes)

Command name	CPRIMCR
FN code	703
Title name	Change usertask priority
General description	The function changes the usertask priority.

■ General description

This command is available only in user task, and is permitted being written by robot language only. Please refer to the **"User task" operating manual** for the detail of user task and user screen.

■Example of operation

When the robot reaches the step where FN703 is recorded, the function will act with no motion pause.

■ **Parameters**

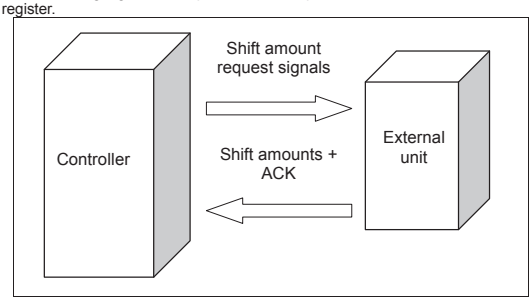
1st parameter	priority	Usertask priority (1 - 6)

Function commands (FN code)

Command name	SIGREQ
FN code	723
Title name	Shift value get (signal)
General description	Using external signals, the command requests shift amount input, and the shift amount data which is input is stored in the designated shift register.

■ **General description**

The robot controller requests the shift amounts using external output signals, and the external unit inputs the shift amounts using signals in response to the requests, after which the controller stores these amounts in the specified shift register.



The shift amount data (X, Y, Z, θX, θY, θZ) and shift amount input completed notice signal (ACK signal) are input from the external unit. This controller acquires the ACK signal input pending from the specified pending time, and the shift amount from the shift amount input signal after the ACK signals are received. If the ACK signal is not received during the specified period, operation jumps to the save destination step.

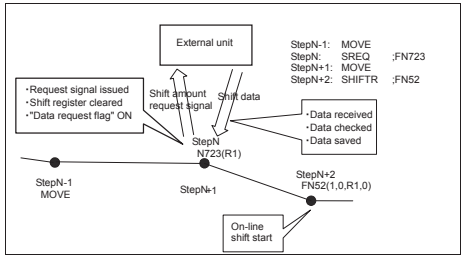
IMPORTANT

The signals must be allocated before this application command is used. For details, refer to [Constant Setting] [17 Handling Application] [3 Shift signal allocation].

If the robot has been stopped while waiting to receive the shift amounts and then restarted, the remaining time in the specific period serves as the wait time.

■ **Example of operation**

When, as shown in the figure, SIGREQ (FN723) is executed at step N, the "shift amount request" is output to the external unit, and the shift amount input is awaited until the shift amount reception is completed. Once shift data has been received from an external unit, whether or not the data is appropriate is checked, and it is only when the data has been found to be correct that its values are stored in the designated shift register and operation moves to the next step. Shift operations can be performed with the shift register values using the SHIFTR: shift 2 (FN52) command, for example, such as the one contained in step N+2.



■ **Parameter**

1st parameter	Shift Register No.	This specifies the number (1 to 9) of the shift register where the shift amount data input is awaited.
2nd parameter	Timer	This specifies the wait time (0.0 to 60.0 seconds). When 0.0 sec. is specified, the wait is extended until the shift amount data is input.
3rd parameter	Shelter No.	This specifies the save step (0 to 10000) when the data was not input during the specified period. When 10000 is specified as the save step, the save operation is not performed, an alarm (A2118: Shift register contains no data.) results immediately so that the robot is stopped.

■ **Example of screen display**

See
SHIFTR; Shift (FN52)

Application command (FN code)

Command name	AIMBASEPL
FN code	725
Title name	Aimed angle standard plane selection
General description	This switches between the standard planes of aimed angle.

■ General description

Standard plane of the aimed angle can be selected from the XY, YZ, ZX planes of the standard coordinate system.

■ Parameter

Conditions	Setting range
Mechanism No.	1 to 9
Standard coordinate system	0 : Count / 1 : Machine / 2 : User / 3 : Absolute / 4 : Work
Standard plane	0 : XY / 1 : YZ / 2 : ZX

■ Example of screen display

```
AIMBASEPL [M1,User,No.1, XY]
```

Regarding the contents of [ ], display the Mechanism number, Standard coordinate system, Standard plane respectively.

See
AIMREFPL; reference to define the aimed angle standard plane (FN726)

Application command (FN code)

Command name	AIMREFPL
FN code	726
Title name	Aimed angle standard plane selection
General description	This switches between the standard planes of aimed angle.

■ General description

The standard plane of the aimed angle can be defined if the reference position is taught to any place.

■ Parameter

Conditions	Setting range
Mechanism No.	1 to 9
Standard coordinate system	Work coordinate system is selected in case of Synchronized units and in any other cases, machine coordinate system is selected automatically.
Standard plane	Reference position data

■ Example of screen display

```
AIMREFPT [M1,Taught]
```

Regarding the contents of [ ], display the Mechanism number and reference position status from the left side.

See
AIMBASEPL; Aimed angle standard plane selection (FN725)

Function commands (FN codes)

Command name	ZJLETP
FN code	727
Title name	Groove Point Detecting (Let pose)
Outline	Detects the groove position of target workpiece by Laser sensor (LaserSearch-SF) to save the result in the pose variable. ※ Used when connecting the LaserSearch-SF.

■ General description

Using this function command, it is available to sense the welding point (groove position of AS point or AE point) and save the results (absolute position of the groove) in the pose variable. At the same time, it is possible to specify a desired torch posture (Aiming angle, Push/Drag angle) for the postural components of pose variable by parameter.

Specifying the saved pose variable into the pose parameter of MOVEX record<FN645>command, it reduces the teaching time for robot welding performance as it is possible to position to the welding point measured by sensor with keeping the desired torch posture.

Also, it is available to automatically register the coordinates (called **groove coordinates** hereinafter) of which direction as a welding travelling direction formed by two groove positions detected by sensing the weld seam line (sensing the 2nd groove position along) as the user coordinates.

Designating the registered coordinates and the shift amount (adjustment value of aiming position) with the shift function by numeric input of SF3<FN473> command, it is possible to adjust the aiming position by the weld seam line shift (parallel shift along the actual weld seam line).

In addition, it is available to sense the groove information (Gap amount, Area, Mismatch, Normal angle) to save the result in GAP file.

Using the data saved in the GAP file, a welding program can be switched by the groove information.

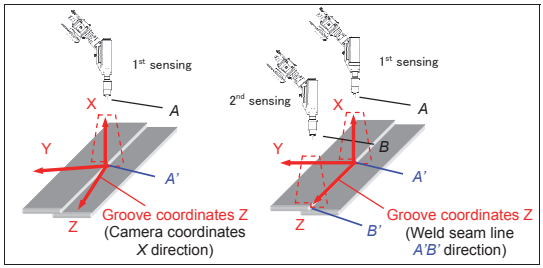
With this command, the following two types of search methods are available depending on the use conditions.

Search method	Features
1-point search	After moving to the search start point (record position of the last MOVE command) of this command, it senses the groove position and groove information to save the result in a pose variable and GAP file. As the cycle time can be reduced due to no 2nd sensing (sensing of the weld seam line) is performed, the groove coordinates registered in the user coordinates are simple detection; therefore it does not accord with the actual direction of weld seam line.
2-point search	Moving parallel to the 2nd sensing point after finishing 1-point search, the groove position detection is performed for the groove coordinates operation. The command executing time becomes longer comparing with 1-point search, however the groove coordinates registered in the user coordinates accord with the actual direction of weld seam line.

Teaching of the search start point could be rough, however, be sure that the groove of sensing target is within the field of view of sensor in positioning.

■ Example of operation

1-point search	2-point search

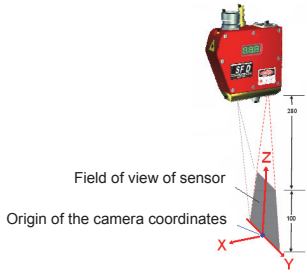


About searching motion

Search method	Outline of searching motion
1-point search	The 1st sensing is performed at the search start point *A* (record position of the last MOVE command) to save the detected groove position *A'* and groove information in a pose variable and GAP file. Also, it registers the simply detected groove coordinates (traveling direction is the *X* direction in the camera coordinates) as user coordinates.
2-point search	Where 2-point search is selected, moving to the point *B* specified by the parameter (moving distance in the X direction on the camera coordinates) after finishing 1-point search, and then the 2nd sensing is performed. The groove coordinates detected at this point (traveling direction is the *A'B'* direction of weld seam line) is registered as the user coordinates.

About the camera coordinates

The camera coordinates are the coordinates to indicate the viewing range of sensor as below.



About the user coordinates (Groove coordinates)

The groove coordinates to be registered as the user coordinates by this command are as follows.

Search method	Outline of the coordinates to be registered
1-point search	Z : *X* direction in the camera coordinates X : Direction of the normal angle detected by sensor Y : Determined by the right-handed system
2-point search	Z : Direction of weld seam line *A'B'* X : Reflection of the normal angle direction on the plane that defines Z axis as a normal line Y : Determined by the right-handed system

The normal angle detected by sensor is the angle that is vertical to the right plate of Z-axis traveling direction in the groove coordinates. For details, refer to the instruction manual for Laser

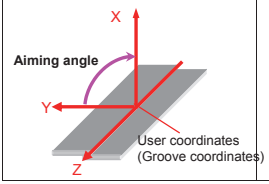
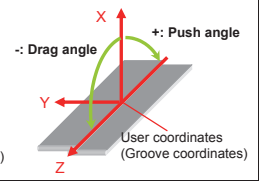
search SF.

The groove coordinates differ from the weld seam line coordinates. Especially, the user coordinates registered by 1-point search greatly differ from the weld seam line coordinates.

About the setting of torch posture (Aiming angle, Push/Drag angle)

The torch posture for setting to a postural component of the pose variable with this command is as follows.

Torch posture	Outline of angle
Aiming angle	Setting the right plate (Y-axis) of Z-axis traveling direction in the groove coordinates as a reference (0 deg.), specify by the left-hand screw oriented angle around Z-axis.
Push/Drag angle	Based on the posture vertical to the traveling direction Z-axis in the groove coordinates, specify by the right-hand screw oriented angle around Y-axis.

Aiming angle	Push/Drag angle
	

With 1-point search, setting for the push/drag angle is not available.

■ **Parameter**

Parameter name		Description
Sensor		Selects the teaching target sensor where two or more sensors are connected. (1 to 12)
Mechanism No.		Displays the mechanism No. where the sensor is in connection.
Task No.		Specifies the task file No. set to the sensor using the sensor attached software **WELDCOM**. (1 to 999)

Task files created by **WELDCOM** have recorded the settings on the groove shape, plate thickness, and image processing for detecting. For details, refer to the instruction manual for **WELDCOM**.

Detection type		Selects the search method. (1-point / 2-point)
Offset of 2nd detection	Move dist.	Specifies the move distance to the 2nd sensing point. (-999.9 to –1.0mm, 1.0 to 999.9mm)
	Move speed	Specifies the move speed to the 2nd sensing point. The interpolation type in moving is LIN. (6.0 to 30000.0cm/min)
Pose No.		Specifies the pose variable No. to save the detected groove position. (1 to 9999)
Setting of torch angle	Aim angle	Specifies the aiming angle to set as a postural component of the pose variable. (0.0 to 180.0deg)
	Push/Drag angle	Specifies the push/drag angle to set as a postural component of the pose variable. It is available only with the 2-point search method. (-90.0 to 90.0deg)
User coordinate No.		Specifies the user coordinates No. to register the detected groove coordinates. (0 to 100, 0:Unnecessary to register)
Gap storage No.		Specifies the GAP file No. to save the detected groove information (Gap, Area, Mismatch, Normal angle). (0 to 999, 0:Unnecessary to save)

SF3 Deviation call	Selects whether to compose the SF3 deviation for the pose variable which is saved by this command and the user coordinates to teach this command in the SF3 section. (OFF:Not compose, ON:Compose)

When the SF3 deviation call is limited (trial motion, etc.), the position excluding the deviation amount is to be saved even if selecting ON.

Search Waiting time		Specifies the wait time to start laser irradiation after moving to the search start point (record position of the last MOVE command). It is effective to exclude impacts of the vibration on torch tip. (0.0 to 99.9 sec.)
Stable Waiting time		Specifies the allowed wait time to detect the groove position since starting laser irradiation. When the workpiece surface is about a mirrored surface, set it longer. This setting value is refered also in the 2nd sensing. (0.0 to 99.9 sec.)
Posture change over watch value		When calculating postural components of the pose variable from the specified torch angle (aiming angle, push/drag angle), the error (Alarm) is detected if the amount of postural change from the search start point (the last MOVE command) has exceeded this setting value. (0.0 to 180.0deg)
Gap watch range	MAX	The error arises when the detected gap amount exceeds this setting value. The error type (Alarm/Information) is selectable by the sensor constant. (-999.0 to 999.9mm)
	MIN	
Area watch range	MAX	The error arises when the detected area exceeds this setting value. The error type (Alarm/Information) is selectable by the sensor constant. (0 to 1999.0mm^2)
	MIN	
Mismatch watch range	MAX	The error arises when the detected mismatch exceeds this setting value. The error type (Alarm/Information) is selectable by the sensor constant. (-999.0 to 999.0mm)
	MIN	
Normal watch range	MAX	The error arises when the detected normal angle exceeds this setting value. The error type (Alarm/Information) is selectable by the sensor constant. (0.0 to 180.0deg)
	MIN	

■ **Example of screen display**

```
ZJLETP[S1, TSK001, ON, P9999, User100, GAP001→]
```

The parameter displayed on the screen indicates the “Sensor No.”, “Task No.”, “Search method (ON : 2-point search, OFF : 1-point search)”, “Pose varible No.”, “User coordinate No.”, and “GAP storage No.”.

See

USE: Select pose file(FN98)
POSESAVE: Pose file save(FN74)

SF3: Deviation call(FN473)

Application command (FN code)

Command name	ASS
FN code	740
Title name	Stitch pulse welding start command Cycle pulse welding start command
General description	Starts arc welding with the specified conditions.

■ General description

This command enables to start Arc welding with the specified conditions. If it has been already started, the welding condition is changed to the specified one.
The welding start position is a move command just before ASS (FN740). To select the command, designate the FN code “740”.

AES and ASS commands with same names, function numbers are used in the Cycle pulse welding and Stitch pulse welding. These commands automatically change from cycle pulse welding to stitch pulse welding depending upon the selected type of welder.

■ Stitch pulse welding start command

- Method to set the welding conditions of the ASS commands is, registering the welding conditions in the welding conditions start file and specifying that file number (conditions file ID) when teaching the welding start commands.
- The "welding speed" in the welding start conditions file corresponds to the speed of movement of the movement pitch. A high welding speed leads to more vibrations of the torch tip. Hence, it is necessary to take precautions.
- If the cooling time is short, ripples produced would be lesser number.

● Arc start control conditions

Conditions	Setting range
Welder No.	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Specify the file number of the welding conditions file to be used in Arc start command. Conditions file number: Set the welding conditions directly by using Start welding command. Do not use the welding conditions file. Conditions file ID1 to 999: Use the file number of the specified file.
Welding time	This specifies the welding time.
Cooling time	This specifies the time required for cooling after the welding is over.
Movement pitch	This specifies the distance between the two welds.
Move cond. no.	The robot movement conditions at welding start and in the welding sections are specified by file numbers. Normally, this item is set to “0.”
RS control for Section start	This sets the RS control (Yes/No) at the time of welding start (ASS commands position, or when the operations are restarted). If "No" is set : RS control is not performed. If "Yes" is set : RS control is performed. These conditions will be displayed only when the DP welding current is used, and can be set only if the following conditions are met. ・Optional software for "RS Control" is installed. ・Arc Constant "RS Control" is set to "Enable".

RS control between the sections	This sets the RS Control (Yes/No) for the interval between the two weldings (points where the welding is repeated more than twice). If "No" is set : RS control is not performed. If "Yes" is set : RS control is performed. These conditions will be displayed only when using the DP welding current, and can be set only if the following conditions are met. ・Optional software for "RS Control" is installed. ・Arc Constant "RS Control" is set to "Enable". ・"RS Control" for Section welding is set to "Yes".

■ **Cycle pulse welding start conditions**

- As a method to set the welding conditions for ASS commands, on specifying the conditions file ID, press f7<edit>, and carry out the settings on the edit window of the welding conditions file.
- The "welding speed" in the welding start conditions file corresponds to the speed of movement of the movement pitch. A high welding speed leads to more vibrations of the torch tip. Hence, it is necessary to take precautions.

● **Arc start control conditions**

Conditions	Setting range
Welder No.	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Specify the file number of the welding conditions file to be used in Arc start command. Conditions file ID0: Set the welding conditions directly by using Start welding command. Do not use the welding conditions file. Conditions file ID1 to 999: Use the file number of the specified file.
Pulse output time	This specifies the time for which the Pulse welding is done.
Direct Current output time	Movement time will be automatically calculated and displayed. This item cannot be entered.
Movement pitch	This specifies the distance between the two welds.
Move cond. no.	The robot movement conditions at welding start and in the welding sections are specified by file numbers. Normally, this item is set to “0.”
RS control for Section start	This sets the RS control (Yes/No) at the time of welding start (ASS commands position, or when the operations are restarted). If "No" is set : RS control is not performed. If "Yes" is set : RS control is performed. These conditions will be displayed only when the DP welding current is used, and can be set only if the following conditions are met. ・Optional software for "RS Control" is installed. ・Arc Constant "RS Control" is set to "Enable".

<table>
<tr>
<td>Re-striking during DC supply</td>
<td>If the arc stops during the DC power supply, this sets the stage at which the arc is re-lit.
<table>
<tr><td>Enable</td><td>Similar to the pulse welding, if the arc stops, it is restored immediately.</td></tr>
<tr><td>Next Pitch (RS)</td><td>After going to the next pitch without the arc, use the RS control to start the arc.</td></tr>
<tr><td>Next Pitch</td><td>After going to the next pitch without the arc, start the arc.</td></tr>
</table>
"Next Pitch (RS)" can, however, be selected only when the following conditions are met.
・Optional software for "RS Control" is installed.
・Arc Constant "RS Control" is set to "Enable".
・"RS Control" for Section welding is set to "Yes".</td>
</tr>
</table>

Regarding RS control

RS control can effectively minimize the spatter at the time of arc start.

Rs control is an optional functionality.

Regarding the re-striking during DC supply

If the relighting is set to "Enable", and the arc is re-lit, some spatter may arise which affects the bead appearance. If the RS control is enabled, set "Next pitch (RS)", under normal conditions. If the RS control is disabled, set "Next pitch (RS)". During the DC power supply, as the bead formation is not done in this section, bead appearance is not greatly affected even if the arc is re-lit in the next pitch.

■ **Example of screen display**

[ ] shows Welder No., Condition file No. (OFF indicates no number is specified), and arc conditions (Current/ Voltage/ Speed) from the left.

See
AS; Arc start (FN414)
AES; End Stitch pulse welding (FN741)

Application command (FN code)

Command name	ASS
FN code	740
Title name	Stitch pulse welding end command Cycle pulse welding end command
General description	Starts arc welding with the specified conditions.

■ General description

This command enables to start Arc welding with the specified conditions. If it has been already started, the welding condition is changed to the specified one.
The arc start position is a move command just before AES (FN741). To select the command, designate the FN code “741”.

AES and ASS commands with same names, function numbers are used in the Cycle pulse welding and Stitch pulse welding. These commands automatically change from cycle pulse welding to stitch pulse welding depending upon the selected type of welder.

■ Stitch pulse arc start command

- Method to set the welding conditions of the AES commands is - registering the welding conditions in the welding end conditions file and specifying that file number (conditions file ID) when teaching the welding end commands.
- If you set the "Crater time" of the arc end conditions to 0.0 (sec), do not carry out the welding at the AES command position.

● Arc start control conditions

Conditions	Setting range
Welder No.	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Specify the file number of the welding conditions file to be used in Arc start command. Conditions file ID0: Set the welding conditions directly by using Arc Start command. Do not use the welding conditions file. Conditions file ID1 to 999: Use the file number of the specified file.

■ Cycle pulse arc start conditions

- As a method to set the welding conditions for AES commands, on specifying the conditions file ID, press f7<edit>, and carry out the settings on the edit window of the welding conditions file.
- If you set the "Crater time" of the arc end conditions to 0.0 (sec), do not carry out the welding at the AES command position.

● Arc start control conditions

Conditions	Setting range
Welder No.	When multiple welders are connected, specify the welder to be used. This setting is unnecessary when there is only 1 welder.
Condition file ID	Specify the file number of the welding conditions file to be used in Arc start command. Conditions file number: Set the welding conditions directly by using Arc Start command. Do not use the welding conditions file. Conditions file ID1 to 999: Use the file number of the specified file.

■ **Example of screen display**

```
AES[W1,001,150A,  +0V,0.0s,0.0s,ACP→]
```

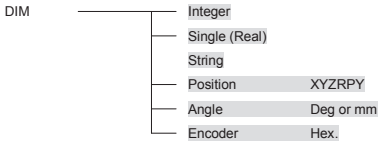
[ ] shows Welder No., Condition file No. (OFF indicates no number is specified), and arc conditions (Current/ Voltage/ Speed) from the left.

See
AE; Arc end (FN415)
ASS; Stitch pulse arc start (F740)

Function commands (FN codes)）

Command name	DIM
FN code	801
Title name	Any variable
General description	You can define some variables as Integer, real and Array, as you like.

■General description
You can define some variables as Integer, real and Array, as you like.
And you define maximum three dimensions of array.



■ **Parameters**

1st Parameter	Variables	Set Data type, Array and Variable name. Data type） Integer, Single(Real), String, Position, Angle, Encoder Array） None, One dimension, two dimension, three dimension(For only Integer, Single and String) Variable name） Initial letter must be English letter. Maximum letters are 20 which can be used some English letters, numbers and underline.

■ Example of screen display

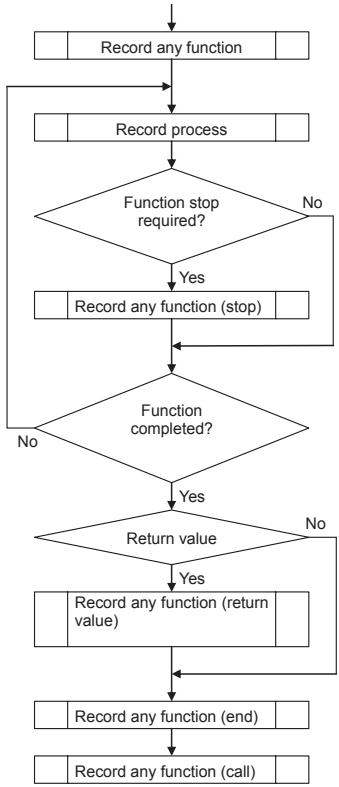
DIM intData[2,2,2] As INTEGER	FN801;DIM
DIM sngData[2,2] As SINGLE	FN801;DIM
DIM strData[2] As STRING	FN801;DIM
DIM posData As POSITION	FN801;DIM
DIM angData As ANGLE	FN801;DIM
DIM encData As ENCODER	FN801;DIM

Function commands (FN codes))

Command name	UsrProc
FN code	802
Title name	User Procedure
General description	Define User Procedure

■General description

You can make some procedures in your programs. And you can call and use the procedures. To read and modify program easily, you should merge some similar procedures by using sub parameter of procedure.



■Example of operation

```
' AREA1 Interlock
  CallProc V1% = InToOut(V11%, V21%)   'Call User Proc
'AREA2 Interlock
  CallProc V2% = InToOut(V12%, V22%)    'Call User Proc
END

UserProc InToOut(intIN As Integer, intOUT As Integer) As Integer
    Dim intSts As Integer
    intSts = INP(intIN)                ' Get Input signal
    Output(O[intOUT], intSts)      ' Ouput signal control
```

```
RetProc InToOut = intSts     ' Set data to return value
EndProc
```

■ **Parameter**

1st parameter	Name	Define User procedure. Initial letter must be English letter. Maximum letters are 20 which can be used some English letters, numbers and underline
2nd parameter	Return value	Define a return value type None Integer Single(Real) String Position Angle Encoder
3rd parameter	Sub parameter	Set Data type, Array, Variable name and number of array You can skip the parameter when you set none of data type.
4th		
5th		
6th		
7th		
8th		
9th		
10th		
11th		
12th		

■ **Example of screen display**

```
UsrProc SignalCheck(intSigNo As INTEGER) As INTEGER
```

See
ExitProc:Exit User procedure(Fn803)
EndProc:End User procedure(Fn804)
RetProc:Return User Procedure(Fn805)
CallProc:Call User procedure(Fn806)

Function commands (FN codes))

Command name	ExitProc
FN code	803
Title name	Exit User Procedure
General description	Stop procedure routine and back to source procedure

■ General description

Stop procedure routine and back to source procedure

■ Example of screen display

ExitProc	FN803;End User procedure

See

UsrProc:User procedure(Fn802)
EndProc:End User procedure(Fn804)
RetProc:Return User Procedure(Fn805)
CallProc:Call User procedure(Fn806)

Function commands (FN codes)

Command name	EndProc
Command name	804
Title name	End Procedure
General description	Finish and exit Procedure, and back to source procedure

■ General description

Finish and exit Procedure, and back to source procedure

■ Example of screen display

```
EndProc                    FN804;End user procedure
```

See

UsrProc:User procedure(Fn802)
ExitProc:Exit User procedure(Fn803)
RetProc:Return User Procedure(Fn805)
CallProc:Call User procedure(Fn806)

Function commands (FN codes)

Command name	RetProc
FN code	805
Title name	Return User Procedure
General description	Set a return value of user procedure

■ General description

Set a return value of user procedure

■ Example of screen display

```
RetProc   AAAA=V1%          FN805;Return User Procedure
```

See

UsrProc:User procedure(Fn802)
ExitProc:Exit User procedure(Fn803)
EndProc:End User procedure(Fn804)
CallProc:Call User procedure(Fn806)

Function commands (FN codes)

Command name	CallProc
FN code	806
Title name	Call User Procedure
General description	Call User procedure

■ General description

Call User procedure.

■ Example of screen display

```
CallProc V1% = AAAA(V11%)          FN806;Call User Procedure
```

See

UsrProc:User procedure(Fn802)
ExitProc:Exit User procedure(Fn803)
EndProc:End User procedure(Fn804)
RetProc:Return User Procedure(Fn805)

Function commands (FN codes)

Command name	POS2POSE
FN code	809
Title name	Set Pose Variable (position)
General description	Set a position variable(As Position)to Pose variable Pn

■ General description

Set a position variable(As Position) to Pose variable Pn.

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Position variable	Set position variable
3th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
4th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.
5rd parameter	Pose variable number	Set Pose variable number (1-9999)

■ Example of screen display

```
POS2POSE[0, posData, 0, 1, Pn]  FN809:Set pose variable(position)
```

See

DIM; Any variable (FN801)
POSE2POS; Set position variable(pose) (FN812)
ANG2POS; Set position variable(angle) (FN813)
ENC2POS; Set position variable(encoder) (FN814)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
GETPOS; Set position variable(pos.data) (FN822)
OPEPOS; Extraction position variable (FN826)

Function commands (FN codes)

Command name	ANG2POSE
FN code	810
Title name	Set Pose Variable (Ange)
General description	Set an Angle variable(As Angle)to Pose variable Pn

■ General description

Set Angle variable(As Angle) to Pose variable Pn.

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Angle variable	Set Angle variable
3rd parameter	Pose variable number	Set Pose variable number (1-9999)

■ Example of screen display

```
ANG2POSE[0, angData, Pn]    FN810;Set Pose Variable (Angle)
```

See

DIM; Any variable (FN801)
ANG2POS; Set position variable(angle) (FN813)
POSE2ANG; Set angle variable(pose) (FN815)
POS2ANG; Set angle variable(position) (FN816)
ENC2ANG; Set angle variable(encoder) (FN817)
ANG2ENC; Set encoder variable(angle) (FN820)
GETANG; Set angle variable(pos.data) (FN823)
OPEANG; Extraction angle variable (FN827)

Function commands (FN codes)

Command name	ENC2POSE
FN code	811
Title name	Set Pose Variable (encoder)
General description	Set an encoder variable(As Encoder)to Pose variable Pn

■ General description

Set encoder variable(As Encoder) to Pose variable Pn.

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Encoder variable	Set Encoder variable
3rd parameter	Pose variable number	Set Pose variable number (1-9999)

■ Example of screen display

```
ENC2POSE[0, encData, Pn]    FN811;Set Pose Variable (Encoder)
```

See

DIM; Any variable (FN801)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POSE2ENC; Set encoder variable(pose) (FN818)
POS2ENC; Set encoder variable(position) (FN819)
ANG2ENC; Set encoder variable(angle) (FN820)
GETENC; Set encoder variable(pos.data) (FN824)
OPEENC; Extraction encoder variable (FN828)

Function commands (FN codes)

Command name	POSE2POS
FN code	812
Title name	Set position Variable (pose)
General description	Set a Pose variable Pn to position variable(As position)

■ General description

Set a Pose variable Pn to position variable (As position).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Pose variable number	Set Pose variable number (1-9999)
3rd parameter	Position variable	Set position variable
4th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
5th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.

■ Example of screen display

```
POSE2POS[0, Pn, posData, 0, 1]  FN812:Set position variable(pose)
```

See

DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
ANG2POS; Set position variable(angle) (FN813)
ENC2POS; Set position variable(encoder) (FN814)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
GETPOS; Set position variable(pos.data) (FN822)
OPEPOS; Extraction position variable (FN826)

Function commands (FN codes)

Command name	ANG2POS
FN code	813
Title name	Set position Variable (angle)
General description	Set an angle variable(As angle) to position variable(As position)

■ General description

Set an angle variable(As angle) to position variable(As position).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Angle variable	Set angle variable
3rd parameter	Position variable	Set position variable
4th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
5th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.

■ Example of screen display

See

DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
POSE2POS; Set position variable(pose) (FN812)
ENC2POS; Set position variable(encoder) (FN814)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
GETPOS; Set position variable(pos.data) (FN822)
OPEPOS; Extraction position variable (FN826)

Function commands (FN codes)

Command name	ENC2POS
FN code	814
Title name	Set position Variable (encoder)
General description	Set an encoder variable(As encoder) to position variable(As position)

■ General description

Set an encoder variable(As encoder) to position variable(As position).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	encoder variable	Set encoder variable
3rd parameter	Position variable	Set position variable
4th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
5th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed "1"if you use other coordinates.

■ Example of screen display

```
ENC2POS[0, encData, posData, 0,1]  FN814:Set position variable(encoder)
```

See

DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
POSE2POS; Set position variable(pose) (FN812)
ANG2POS; Set position variable(angle) (FN813)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
GETPOS; Set position variable(pos.data) (FN822)
OPEPOS; Extraction position variable (FN826)

Function commands (FN codes)

Command name	POSE2ANG
FN code	815
Title name	Set angle Variable (pose)
General description	Set Pose variable Pn to Angle variable(As Angle)

■ General description

Set Pose variable Pn to Angle variable(As Angle).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Pose variable number	Set Pose variable number (1-9999)
3rd parameter	Angle variable	Set Angle variable

■ Example of screen display

```
POSE2ANG[0, Pn, angData]     FN815;Set angle Variable (pose)
```

See

DIM; Any variable (FN801)
ANG2POSE; Set pose variable(angle) (FN810)
ANG2POS; Set position variable(angle) (FN813)
POS2ANG; Set angle variable(position) (FN816)
ENC2ANG; Set angle variable(encoder) (FN817)
ANG2ENC; Set encoder variable(angle) (FN820)
GETANG; Set angle variable(pos.data) (FN823)
OPEANG; Extraction angle variable (FN827)

Function commands (FN codes)

Command name	POS2ANG
FN code	816
Title name	Set angle Variable (position)
General description	Set a position variable(As position) to Angle variable(As Angle)

■ General description

Set a position variable(As position) to Angle variable(As Angle).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Position variable	Set position variable
3th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
4th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.
5rd parameter	Angle variable	Set Angle variable

■ Example of screen display

```
POS2ANG[0, posData, 0, 1, angData]  FN816:Set angle variable(position)
```

See

DIM; Any variable (FN801)
ANG2POSE; Set pose variable(angle) (FN810)
ANG2POS; Set position variable(angle) (FN813)
POSE2ANG; Set angle variable(pose) (FN815)
ENC2ANG; Set angle variable(encoder) (FN817)
ANG2ENC; Set encoder variable(angle) (FN820)
GETANG; Set angle variable(pos.data) (FN823)
OPEANG; Extraction angle variable (FN827)

Function commands (FN codes)

Command name	ENC2ANG
FN code	817
Title name	Set angle Variable (encoder)
General description	Set an encoder variable(As encoder) to Angle variable(As Angle)

■ General description

Set an encoder variable(As encoder) to Angle variable(As Angle).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Encoder variable	Set encoder variable
3rd parameter	Angle variable	Set Angle variable

■ Example of screen display

```
ENC2ANG[0, encData, angData]  FN817:Set angle variable(encoder)
```

See

DIM; Any variable (FN801)
ANG2POSE; Set pose variable(angle) (FN810)
ANG2POS; Set position variable(angle) (FN813)
POSE2ANG; Set angle variable(pose) (FN815)
POS2ANG; Set angle variable(position) (FN816)
ANG2ENC; Set encoder variable(angle) (FN820)
GETANG; Set angle variable(pos.data) (FN823)
OPEANG; Extraction angle variable (FN827)

Function commands (FN codes)

Command name	POSE2ENC
FN code	818
Title name	Set encoder Variable (pose)
General description	Set Pose variable Pn to encoder variable(As encoder)

■ General description

Set Pose variable Pn to encoder variable(As encoder).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Pose variable number	Set Pose variable number (1-9999)
3rd parameter	encoder variable	Set encoder variable

■ Example of screen display

POSE2ENC[0, Pn, encData] FN818;Set encoder Variable (pose)

See

DIM; Any variable (FN801)
ENC2POSE; Set pose variable(encoder) (FN811)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POS2ENC; Set encoder variable(position) (FN819)
ANG2ENC; Set encoder variable(angle) (FN820)
GETENC; Set encoder variable(pos.data) (FN824)
OPEENC; Extraction encoder variable (FN828)

Function commands (FN codes)

Command name	POS2ENC
FN code	819
Title name	Set encoder Variable (position)
General description	Set a position variable(As position) to encoder variable(As encoder)

■ General description

Set a position variable(As position) to encoder variable(As encoder).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Position variable	Set position variable
3th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
4th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.
5rd parameter	Encoder variable	Set encoder variable

■ Example of screen display

```
POS2ENC[0, posData, 0, 1, encData]  FN819:Set encoder variable(position)
```

See

DIM; Any variable (FN801)
ENC2POSE; Set pose variable(encoder) (FN811)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POSE2ENC; Set encoder variable(pose) (FN818)
ANG2ENC; Set encoder variable(angle) (FN820)
GETENC; Set encoder variable(pos.data) (FN824)
OPEENC; Extraction encoder variable (FN828)

Function commands (FN codes)

Command name	ANG2ENC
FN code	820
Title name	Set encoder Variable (angle)
General description	Set an angle variable(As angle) to encoder variable(As encoder)

■ General description

Set an angle variable(As angle) to encoder variable(As encoder).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Angle variable	Set angle variable
3rd parameter	encoder variable	Set encoder variable

■ Example of screen display

```
ANG2ENC[0, angData, encData] FN820;Set encoder Variable (angle)
```

See

DIM; Any variable (FN801)
ENC2POSE; Set pose variable(encoder) (FN811)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POSE2ENC; Set encoder variable(pose) (FN818)
POS2ENC; Set encoder variable(position) (FN819)
GETENC; Set encoder variable(pos.data) (FN824)
OPEENC; Extraction encoder variable (FN828)

Function commands (FN codes)

Command name	CVTCOORDPOS
FN code	821
Title name	Coord. trans（position）
General description	Translate a position variable(As Position）to a designated coordinate.

■ General description

Translate a position variable(As Position）to a designated coordinate.

■ **Parameter**

1st parameter	Mechanism number	Mechanism number(0-9) 0 means all mechanism of the unit.
2nd parameter	Position variable1	Set an acquired position variable.
3rd parameter	Coordinate1	Set a coordinate of an acquired position variable. 0:Base 1:Tool 2:User 3:World 4:Work
4th parameter	Coordinate number1	If you select tool or user coordinate as acquired coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.
5th parameter	Position variable2	Set a substituted position variable.
6th parameter	Coordinate2	Set a coordinate of a substituted position variable. 0:Base 1:Tool 2:User 3:World 4:Work
7th parameter	Coordinate number1	If you select tool or user coordinate as substituted coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.

■ Example of screen display

```
CVTCOORDPOS[0, posData, 0, 1, posData, 0, 1]   FN821;Coord.trans(Position)
```

See

DIM:Any Variable(FN801)
POS2POSE:Set pose variable (position) (FN809)
POSE2POS: Set position variable (pose) (FN812)
ANG2POS: Set position variable (angle) (FN813)
ENC2POS:Set position variable (encoder) (FN814)
POS2ANG: Set angle variable (pos.data) (FN816)
POS2ENC:Set encoder variable (pos.data)(FN819)
GETPOS:Set position Variable (pos.data) (FN822)
OPEPOS:Extraction position variable(FN826)

Function commands (FN codes)

Command name	GETPOS
FN code	822
Title name	Set position variable (pos.data)
General description	Substitute robot position to positional variables

■ General description

The code substitutes the designated mechanism position to positional variables. You can select the mechanism position from below types.

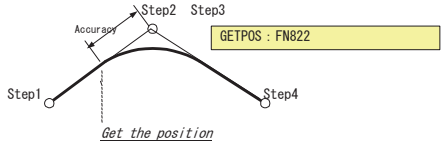
Types

Command position	Get the command position when it does.
Current position	Get the current position when it does.
Target position	Get the target command position where it is recorded. It isn't depended on the accuracy setting of the step. If you use the shift function, the values include the shift values.

The function acts with no motion pause. Then the results are related with the accuracy of the step.

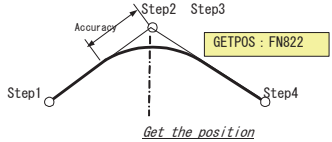
■ Example of operation

Types＝Command or Current position



Get the position when robot reach the inside range of accuracy.
If the position is pause recorded, GETPOS acts after reaching the step position.

Type＝Target position



The function gets the step position where is not related with the accuracy.
If you use the shift function, the value includes the shift values.

■ **Parameters**

1st parameter	Mechanism number	Mechanism number(0-9) 0 means all mechanism of the unit.
2nd parameter	Types	0：Command position 1：Current position 2：Target position
3rd parameter	Position variables	Set position variables.

4th parameter	Coordinate	Set the number of coordinates as below. 0:Base 1:Tool 2:User 3:World 4:Work
5th parameter	Coordinate number	When you select tool or user coordinate, you should select the coordinate number. It will be fixed “1”if you use other coordinates.

■ Example of screen display

GETPOS[0,0,posData,0,1] FN822;Set position variable(pos.data)

See
DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
POSE2POS; Set position variable(pose) (FN812)
ANG2POS; Set position variable(angle) (FN813)
ENC2POS; Set position variable(encoder) (FN814)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
OPEPOS; Extraction position variable (FN826)

Function commands (FN codes)

Command name	GETANG
FN code	823
Title name	Set angle variable (pos.data)
General description	Substitute robot position to angle variables

■ General description

The code substitutes the designated mechanism position to angle variables. You can select the mechanism position from below types.

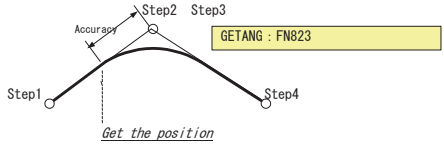
Types

Command position	Get the command position when it does.
Current position	Get the current position when it does.
Target position	Get the target command position where it is recorded. It isn't depended on the accuracy setting of the step. If you use the shift function, the values include the shift values.

The function acts with no motion pause. Then the results are related with the accuracy of the step.

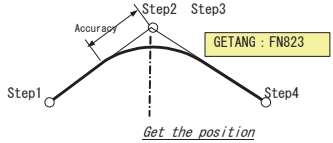
■ Example of operation

Types=Command or Current position



Get the position when robot reach the inside range of accuracy.
If the position is pause recorded, GETANG acts after reaching the step position.

Type=Target position



The function gets the step position where is not related with the accuracy.
If you use the shift function, the value includes the shift values.

■ **Parameters**

1st parameter	Mechanism number	Mechanism number(0-9) 0 means all mechanism of the unit.
2nd parameter	Types	0 : Command position 1 : Current position 2 : Target position
3rd parameter	Angle variables	Set angle variables.

■ Example of screen display

```
GETANG[0, 0, angData]    FN823;Set angle variable(pos.data)
```

See
DIM; Any variable (FN801)
ANG2POSE; Set pose variable(angle) (FN810)
ANG2POS; Set position variable(angle) (FN813)
POSE2ANG; Set angle variable(pose) (FN815)
POS2ANG; Set angle variable(position) (FN816)
ENC2ANG; Set angle variable(encoder) (FN817)
ANG2ENC; Set encoder variable(angle) (FN820)
OPEANG; Extraction angle variable (FN827)

Function commands (FN codes)

Command name	GETENC
FN code	824
Title name	Set encoder variable (pos.data)
General description	Substitute robot position to encoder variables

■ General description

The code substitutes the designated mechanism position to encoder variables. You can select the mechanism position from below types.

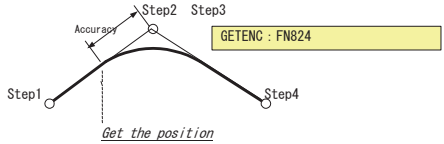
Types

Command position	Get the command position when it does.
Current position	Get the current position when it does.
Target position	Get the target command position where it is recorded. It isn't depended on the accuracy setting of the step. If you use the shift function, the values include the shift values.

The function acts with no motion pause. Then the results are related with the accuracy of the step.

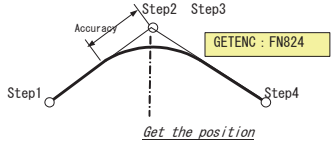
■ Example of operation

Types＝Command or Current position



Get the position when robot reach the inside range of accuracy.
If the position is pause recorded, GETENC acts after reaching the step position.

Type＝Target position



The function gets the step position where is not related with the accuracy.
If you use the shift function, the value includes the shift values.

■ **Parameters**

1st parameter	Mechanism number	Mechanism number(0-9) 0 means all mechanism of the unit.
2nd parameter	Types	0 : Command position 1 : Current position 2 : Target position
3rd parameter	Encoder variables	Set encoder variables.

■ Example of screen display

```
GETENC[0, 0, encData]    FN824;Set encoder variable(pos.data)
```

See
DIM; Any variable (FN801)
ENC2POSE; Set pose variable(encoder) (FN811)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POSE2ENC; Set encoder variable(pose) (FN818)
POS2ENC; Set encoder variable(position) (FN819)
ANG2ENC; Set encoder variable(angle) (FN820)
OPEENC; Extraction encoder variable (FN828)

Function commands (FN codes)

Command name	OPEPOSE
FN code	825
Title name	Extraction pose Variable
General description	Substitute or Extract a pose variable to a global real variable (V!) or local real variable (L!).

■ General description

Substitute or Extract a pose variable to a global real variable (V!) or local real variable (L!).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Pose variable number	Set pose variable number
3rd parameter	Real variable	Set the global real variable(V!) or Local real variable(L!), any single variable.
4th parameter	Target	Set operation target. 0 : All 1 : X 2 : Y 3 : Z 4 : R 5 : P 6 : Y
5th parameter	Operation	Select Extract or Let(Substitution) to pose variable. 0 : Extract 1 : Let

■ Example of screen display

```
OPEPOSE[0, Pn, sgnData, 0, 0]  FN825:Extraction pose variable
```

See

DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
ANG2POSE; Set pose variable(angle) (FN810)
ENC2POSE; Set pose variable(encoder) (FN811)
POSE2POS; Set position variable(pose) (FN812)
POSE2ANG; Set angle variable(pose) (FN815)
POSE2ENC; Set encoder variable(pose) (FN818)

Function commands (FN codes)

Command name	OPEPOS
FN code	826
Title name	Extraction position Variable
General description	Substitute or Extract a position variable to a global real variable (V!) or local real variable (L!).

■ General description

Substitute or Extract a position variable to a global real variable (V!) or local real variable (L!).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Position variable	Set position variable
3rd parameter	Real variable	Set the global real variable(V!) or Local real variable(L!), any single variable.
4th parameter	Target	Set operation target. 0 : All 1 : X 2 : Y 3 : Z 4 : R 5 : P 6 : Y 7 : Configuration
5th parameter	Operation	Select Extract or Let(Substitution) to position variable. 0 : Extract 1 : Let

■ Example of screen display

```
OPEPOS[0, posData, sgnData, 0, 0]  FN826:Extraction position variable
```

See

DIM; Any variable (FN801)
POS2POSE; Set pose variable(position) (FN809)
POSE2POS; Set position variable(pose) (FN812)
ANG2POS; Set position variable(angle) (FN813)
ENC2POS; Set position variable(encoder) (FN814)
POS2ANG; Set angle variable(position) (FN816)
POS2ENC; Set encoder variable(position) (FN819)
CVTCOORDPOS; Coord. trans(position) (FN821)
GETPOS; Set position variable(pos.data) (FN822)

Function commands (FN codes)

Command name	OPEANG
FN code	827
Title name	Extraction angle Variable
General description	Substitute or Extract an angle variable to a global real variable (V!) or local real variable (L!).

■ General description

Substitute or Extract an angle variable to a global real variable (V!) or local real variable (L!).

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Angle variable	Set angle variable
3rd parameter	Real variable	Set the global real variable(V!) or Local real variable(L!), any single variable.
4th parameter	Target	Set operation target. 0 : All 1 : J1 2 : J2 3 : J3 4 : J4 5 : J5 6 : J6
5th parameter	Operation	Select Extract or Let(Substitution) to angle variable. 0 : Extract 1 : Let

■ Example of screen display

```
OPEANG[0, angData, sgnData, 0, 0]  FN827:Extraction angle variable
```

See

DIM; Any variable (FN801)
ANG2POSE; Set pose variable(angle) (FN810)
ANG2POS; Set position variable(angle) (FN813)
POSE2ANG; Set angle variable(pose) (FN815)
POS2ANG; Set angle variable(position) (FN816)
ENC2ANG; Set angle variable(encoder) (FN817)
ANG2ENC; Set encoder variable(angle) (FN820)
GETANG; Set angle variable(pos.data) (FN823)

Function commands (FN codes)

Command name	OPEENC
FN code	828
Title name	Extraction encoder Variable
General description	Substitute or Extract an encoder variable to a global integer variable (V%) or local integer variable (L%), any integer variable.

■ General description

Substitute or Extract an encoder variable to a global integer variable (V%) or integer real variable (L%), any integer variable.

■ Parameters

1st parameter	Mechanism number	Mechanism number (0-9) 0 means all mechanism of the unit
2nd parameter	Position variable	Set position variable
3rd parameter	DINT variable	Set the global integer variable(V%) or Local integer variable(L%), any integer variable.
4th parameter	Target	Set operation target. 0 : All 1 : J1 2 : J2 3 : J3 4 : J4 5 : J5 6 : J6
5th parameter	Operation	Select Extract or Let(Substitution) to encoder variable. 0 : Extract 1 : Let

■ Example of screen display

```
OPEENC[0, encData, intData, 0, 0]  FN828:Extraction encoder variable
```

See

DIM; Any variable (FN801)
ENC2POSE; Set pose variable(encoder) (FN811)
ENC2POS; Set position variable(encoder) (FN814)
ENC2ANG; Set angle variable(encoder) (FN817)
POSE2ENC; Set encoder variable(pose) (FN818)
POS2ENC; Set encoder variable(position) (FN819)
ANG2ENC; Set encoder variable(angle) (FN820)
GETENC; Set encoder variable(pos.data) (FN824)

Function commands (FN codes)

Command name	GETTOOL
FN code	830
Title name	Get Tool Parameters
General description	This command is used to get the tool parameter values.

■ General description

Using this command makes it possible to assign the tool length and tool angle of the specified tool number of the specified mechanism to the six global real variables consecutive from the specified number.
The real variable register consecutive, it will be assigned tool length X of you want to get tool number, tool length Y, tool length Z, tool angle X, tool angle Y, in the order of the tool angle Z.

■ Parameter

Parameter No. 1	Mechanism No.	This specifies the mechanism No. 1- 9
Parameter No. 2	Tool No.	This specifies the tool No. 1- 32
Parameter No. 3	Global Real Variable Register No	This specifies the first number of real variables register six values of the acquired tool length and angle is assigned. (1-250,301-500)

■ Example of screen display

```
GETTOOL [1,1,V1!]          FN830;  Get tool length param
```

See
SETTOOL: Set tool parameter (FN831)

Function commands (FN codes)

Command name	SETTOOL
FN code	831
Title name	Set Tool Parameters
General description	This command is used to set the tool parameter values from real variable register.

■ General description

Using this command makes it possible to assign the tool length and tool angle of the specified tool number of the specified mechanism from the six global real variables consecutive from the specified number.
The real variable register consecutive, it will be assigned tool length X of you want to set tool number, tool length Y, tool length Z, tool angle X, tool angle Y, in the order of the tool angle Z.
Change of tool change amount limit, if you press the shift key at the tool constant setting screen, enter the setup menu from the button that appears on the right side of the screen.

■ Parameter

Parameter No. 1	Mechanism No.	This specifies the mechanism No. 1- 9
Parameter No. 2	Tool No.	This specifies the tool No. 1- 32
Parameter No. 3	Global Real Variable Register No	This specifies the first number of real variables register six values of setting the tool length and angle is assigned. (1-250,301-500)

■ Example of screen display

```
SETTOOL [1,1,V1!]          FN831 ; Set tool length param
```

See
GETTOOL: Get tool parameters (FN830)

Function commands (FN codes)

Command name	KILLMCR
FN code	833
Title name	Kill UserTask
General description	Stop the specified user task from function commands in robot program or user task.

■ General description

Stop the specified user task from function commands in robot program or user task.

■ Example of operation

Depending on the processing situation, it may take some time for User Task to actually stop after executing the user task stop instruction.

(1) If you want to make sure the user task is stopped and then run the next step

```
1 KILLMCR 1,1,1
2 FORKMCR 1
3 MOVE
```

This is an example of stopping user tasks in KILLMCR step in advance so that the FORKMCR step does not detect duplicate startup errors in User tasks.

Error Detect = 1,
Shelter Step = KILLMCR itself

If the user task you are trying to stop is not stopped, run KILLMCR again.

(2) Even if the specified user task is not stopped when you confirm that the user task is stopped, perform the following steps:

```
1 KILLMCR 1,0,1
2 MOVE
3 MOVE
```

Error Detect = 0,
Shelter Step = 1 (Any value from 1 to 9999)

■ Parameter

1st parameter	User Task No.	Set the User Task No. that you would like to stop.
2nd parameter	Error Detect	Determines whether to detect an error if the user task is not stopped when you confirm that the user task is stopped.
3rd parameter	Shelter Step	Set the shelter step if the step detects error.

■ Example of screen display

KILLMCR[1,1,1]	FN833; Kill UserTask

See
CHKMCR ; Check UserTask(FN834)

Function commands (FN codes)

Command name	CHKMCR
FN code	834
Title name	Check UserTask
General description	Check the specified user task status from function commands in robot program or user task.

■ General description

Check the specified user task status from function commands in robot program or user task.

First, perform a status check on the specified user task.
It then performs the processing of the (1) Error detection unit, the (2) output unit to integer variable.

Error detection unit	Error Detect-Disable	Do nothing.
	Error Detect-Enable, & Error Logic-“1”	It is normal if the specified user task runs. If the specified user task is stopped, it detects an error or moves to the shelter step.
	Error Detect-Enable, & Error Logic-“0”	It is normal if the specified user task stops. If the specified user task runs, it detects an error or moves to the shelter step.
output unit to integer variable	0	Do nothing.
	1～500	Sets the two-bit sum of the thread of the user task being running to the specified integer variable number register. Ex. User task 1 runs at thread 1 and thread 4 Set number 1+8=9 to the specified integer variable register.

■ Example of operation

In this example, the KILLMCR step does not detect the error, and the CHKMCR step detects the error. If the specified user task is not stopped, rerun the KILLMCR step.

```
1 FORKMCR 5
2 KILLMCR 5, 0, 1
3 CHKMCR 5, 1, 0, 2, V1%
```

■ Parameter

1st parameter	User Task No.	Set the number of user tasks you would like to check.
2nd parameter	Error Detect	Sets whether to detect errors. You can use error detection as a "1 " (enabled) if you’d like to move to an error detection or shelter step depending on the status of the specified user task you are checking. If you would not like to find an error, "0 " (disable).

3rd parameter	Error Logic	Sets the logic for error detection. Set it to "1 " (positive logic), if the correct state is the user task running. Set it to "0 " (negative logic), if the correct state is the user task stopping.
4th parameter	Shelter Step	Set the shelter step if the step detects error.
5th parameter	Integer Variable Number	Set the integer variable number to output the two-bit sum of the thread of the user task being running.

■ **Example of screen display**

```
CHKMCR[1,1,0,1,V1%]                FN834; Check UserTask
```

See
KILLMCR ; Kill UserTask(FN833)

Function commands (FN codes)

Command name	MSRTM
FN code	835
Title name	Measure Time
General description	Measure processing time from start-point A to end-point B.

■ **General description**

Measure processing time from start-point A to end-point B.

■ **Example of operation**

```
1 MSRTM 1,1,V1!
2 DELAY 1
3 MSRTM 1,0,V1!
```

■ **Parameter**

1st parameter	Internal Variable No.	Set the internal number to preserve or refer start time.
2nd parameter	Start(1) / End(0)	If the point is start-point of measure, set 1. If the point is end-point of measure, set 0.
3rd parameter	Real variable register number	Set the processing time value to the real variable register number.

■ **Example of screen display**

MSRTM[1,1,V1!]	FN835; Measure Time

Function commands (FN code)

Command name	APP_CALL
FN code	880
Title name	Call User application
General description	Start the user application and wait for it to finish.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before the end user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_CALL[1, -1]      FN880;Call User application
```

See
APP_FORK: Fork User application (FN883)
APP_WAIT; Wait User application (FN886)
APP_SHOW; Show User application (FN890)
APP_HIDE; Hide User application (FN891)
APP_CEVENT; Create event the User application (FN892)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_FORK
FN code	883
Title name	Fork User application
General description	Start the user application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)

■ Example of screen display

```
APP_FORK[1]      FN883;Fork User application
```

See
APP_CALL: Call User application (FN880)
APP_WAIT; Wait User application (FN886)
APP_SHOW; Show User application (FN890)
APP_HIDE; Hide User application (FN891)
APP_CEVENT; Create event the User application (FN892)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_WAIT
FN code	886
Title name	Wait User application
General description	Wait before the end user application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before the end user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_WAIT[1, -1]      FN886;Wait User application
```

See
APP_CALL: Call User application (FN880)
APP_FORK: Fork User application (FN883)
APP_SHOW; Show User application (FN890)
APP_HIDE; Hide User application (FN891)
APP_CEVENT; Create event the User application (FN892)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_SHOW
FN code	890
Title name	Show User application
General description	Show me the user application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Page name(ID)	This specifies the page name (ID) to be created by the user application.
Parameter No. 3	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before the show user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_SHOW[1, 'ABC', -1]      FN890;Show User application
```

See
APP_CALL: Call User application (FN880)
APP_FORK: Fork User application (FN883)
APP_WAIT; Wait User application (FN886)
APP_HIDE; Hide User application (FN891)
APP_CEVENT; Create event the User application (FN892)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_HIDE
FN code	891
Title name	Hide User application
General description	Hide the user application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before the hide user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_HIDE[1, -1]      FN891;Hide User application
```

See
APP_CALL: Call User application (FN880)
APP_FORK: Fork User application (FN883)
APP_WAIT; Wait User application (FN886)
APP_SHOW; Show User application (FN890)
APP_CEVENT; Create event the User application (FN892)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_CEVENT
FN code	892
Title name	Create event the User application
General description	Create an event in the User application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Page name (ID)	This specifies the page name (ID) to be created by the user application.
Parameter No. 3	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before create an event in user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_CEVENT[1, 'ABC', -1]      FN892;Create event the User application
```

See
APP_CALL: Call User application (FN880)
APP_FORK: Fork User application (FN883)
APP_WAIT; Wait User application (FN886)
APP_SHOW; Show User application (FN890)
APP_HIDE; Hide User application (FN891)
APP_WEVENT; Wait event the User application (FN893)

Function commands (FN code)

Command name	APP_WEVENT
FN code	893
Title name	Wait event the User application
General description	Wait for the event from the User application.

■ Parameter

Parameter No. 1	User application No.	This specifies the number of user Application entry. (1-4)
Parameter No. 2	Page name (ID)	This specifies the page name (ID) to be created by the user application.
Parameter No. 3	Character string variable number	This specifies the number of the character string variable in which the received character string is to be stored. (1-50)
Parameter No. 4	Wait Time[Infinite size inputs -1]	This specifies the number of time to wait before event from the user application. (∞ (-1), 0-99)

■ Example of screen display

```
APP_WEVENT[1, 'ABC', V1$, -1]    FN892;Wait event the User application
```

See
APP_CALL: Call User application (FN880)
APP_FORK: Fork User application (FN883)
APP_WAIT; Wait User application (FN886)
APP_SHOW; Show User application (FN890)
APP_HIDE; Hide User application (FN891)
APP_WEVENT; Wait event the User application (FN893)

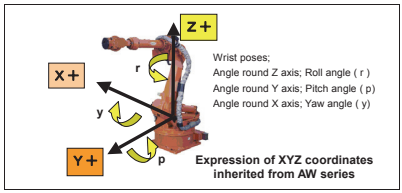
Move commands

Command name	MOVE
FN code	-
Title name	(move command)
General description	Move robot to the position expressed by the AW coordinate system

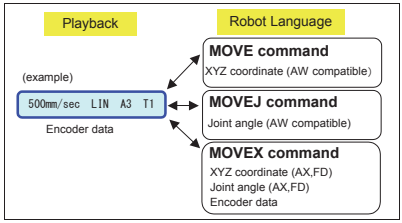
■ General description

This is the move command in which robot position is expressed by XYZ value of tool top and rpy (roll, pitch and yaw) angle of wrist attitude. To keep upper compatibility with NACHI-Fujikoshi AW controller, coordinate system is same as AW (front is Y). X and Y axis direction is different from world wide standard coordinate system.
Wrist attitude is fixed by the rotation on the order of r -> p -> y.
New functionalities developed in this controller such as synchronize control, Smooth and others can not be described by this command.

<Format> MOVE Interpolation, Pose, Speed (or Time), Accuracy, Tool
<Example> MOVE L,P1,S=500,A=3



There are 3 move commands. MOVE and MOVEJ is prepared to keep upper compatibility with NACHI-Fujikoshi AW controller. Please use MOVEX as usual.



■ Parameter

Interpolation	This is to define the interpolation to move the desired position, by L or C or P description. L Linear interpolation C Circular interpolation P Joint move (interpolation OFF)	
Pose	This is to define the desired position. Following list shows its variety to describe the robot pose. XYZ coordinate system is same as NACHI-Fujikoshi AW.	
	(X,Y,Z,r,p,y)	Pose constant
	Pn (or P[n])	Pose variable
	Pn + (X,Y,Z,r,p,y)	Pose variable + Shit constant
	Pn + Rn	Pose variable + Shit variable
	P* + (X,Y,Z,r,p,y)	Current position + Shit constant
	P* + Rn	Current position + Shit variable

	R,p and y angle is written in degree. If there are some aux. axes, maximum two axis angle data is added following the (X,Y,Z,r,p,y) statement. (X,Y,Z,r,p,y,J7) (X,Y,Z,r,p,y,J7,J8) J7 and J8 angle is written in degree.
Speed (or Time)	This is to define the speed or time to achieve the desired position. (1[mm/s]〜5000[mm/s] or 0.1[s]〜100[s]) S for TCP speed, T for time. S=100 TCP line speed is 100mm/sec. T=5 Time to achieve next position is 5 seconds. S=V1% Speed is designated by global variable V1%. T=L![1] Time is designated by local variable L![1]. Variables can be used as followed. Vn% (or V%[n]) global variable (integer) Vn! (or V![n]) global variable (float) Ln% (or L%[n]) local variable (integer) Ln! (or L![n]) local variable (float)
Accuracy	This is to define the accuracy number. If omitted, accuracy defined in previous step is use. When in-position check is necessary, add “P”. (1 – 8, 1P – 8P) A=1 Accuracy number is 1
Tool	This is to define the tool number. If omitted, tool defined in previous step is use. (1 - 32) H=1 Tool number is 1.

See
MOVEJ; (Move command)
MOVEX; (Move command)

Move commands

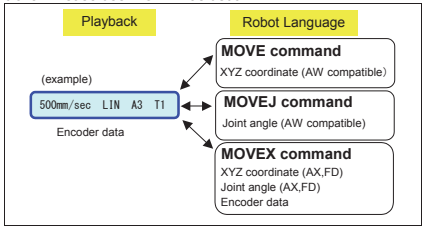
Command name	MOVEJ
FN code	–
Title name	(move command)
General description	Move robot to the position expressed by the AW axis angle

■ General description

This is the move command in which robot position is expressed by axis angle. To keep upper compatibility with NACHI-Fujikoshi AW controller, J3 value is the angle from ground level. Except J3 angle, this is same as MOVEX-J command.
New functionalities developed in this controller such as synchronize control, Smooth and others can not be described by this command.

<Format> MOVEJ Interpolation, Pose, Speed (or Time), Accuracy, Tool
<Example> MOVEJ L,(0,90,0,0,0,0),S=500,A=3

There are 3 move commands. MOVE and MOVEJ is prepared to keep upper compatibility with NACHI-Fujikoshi AW controller. Please use MOVEX as usual.



■ Parameter

Interpolation	This is to define the interpolation to move the desired position, by L or C or P description L Linear interpolation C Circular interpolation P Joint move (interpolation OFF)
Pose	This is to define the desired position. Axis angle is degree. (J1,J2,J3,J4,J5,J6) Pose constant If there are some aux. axes, maximum two axis angle data can be added. (J1,J2,J3,J4,J5,J6,J7,J8)
Speed (or Time)	This is to define the speed or time to achieve the desired position. (1[mm/s]～5000[mm/s] or 0.1[s]～100[s]) S for TCP speed, T for time. S=100 TCP line speed is 100mm/sec. T=5 Time to achieve next position is 5 seconds. S=V1% Speed is designated by global variable V1%. T=L![1] Time is designated by local variable L![1]. Variables can be used as followed. Vn% (or V%[n]) global variable (integer) Vn! (or V![n]) global variable (float) Ln% (or L%[n]) local variable (integer) Ln! (or L![n]) local variable (float)
Accuracy	This is to define the accuracy number. If omitted, accuracy defined in previous step is use. When in-position check is necessary, add “P”. (1 – 8, 1P – 8P) A=1 Accuracy number is 1

Tool	This is to define the tool number. If omitted, tool defined in previous step is use. (1 - 32) H=1 Tool number is 1.

See
MOVE; (Move command)
MOVEX; (Move command)

Move commands

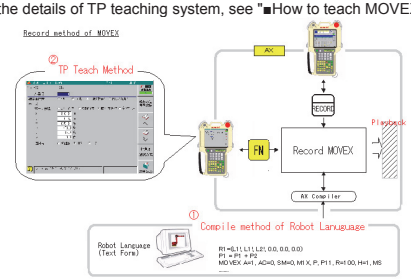
Command name	MOVEX
FN code	645
Title name	(move command)
General description	Moves the robot

■ General description

This is the move command.
- XYZ value of tool top and rpy (roll, pitch and yaw) angle of wrist attitude.
- Axis angle
- Axis encoder data

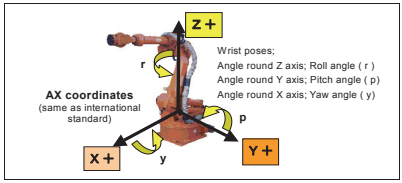
MOVEX command supports the above three statement of robot positions.
XYZ coordinate system is the same as international standard (front = X).
In Rpy notation, wrist attitude is fixed by the rotation in the order of r -> p -> y. Note that the wrist attitude changes in accordance with the sequence of rotation.
All information, including Synchronized control, Smooth, etc. can be described.

※ To record the MOVEX command, there are two manners provided; Robot language compile system (1) and TP teaching system (2). For the details of TP teaching system, see "■How to teach MOVEX on TP" in this document.

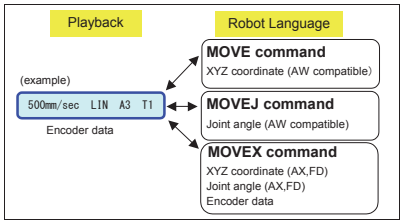


<Format>
MOVEX Accuracy, Acceleration, Smooth, Conveyor, Synchronize
Mechanism, Interpolation, Pose, Configuration, Speed, Tool
Mechanism, Interpolation, Pose, Speed, Tool
Mechanism, Interpolation, Pose, Speed, Tool

<Example>
MOVEX A=1, AC=1, SM=1, HM=1
M1W, P, P1, S=100, H=1,
M2X, L, P2, S=100, H=2, MS
M3J,L,(0,0,0,0,0,0),S=100,H=3

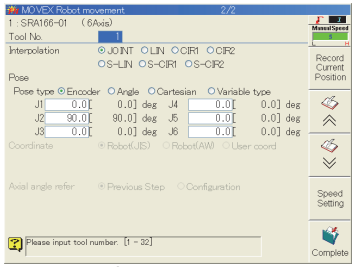


There are 3 move commands. MOVE and MOVEJ is prepared to keep upper compatibility with NACHI-Fujikoshi AW controller. Please use MOVEX as usual.



■ MOVEX Teach Method from TP

(1) Select FN645 “Record MOVEX”.



(2) Set the required parameters (described in the following).

(3) Press F12 <Complete> to record MOVEX.

■ Parameter

* The setting example of parameter is indicated as “(1)” for the robot language compile system and “(2)” for the TP teaching system. (Without any specific indication of “(2)”, the description indicates the robot language compile system.)

Accuracy	This is to define the accuracy number. If omitted, tool defined in previous step is use. When in-position check is necessary, add “P”. (1 – 8, 1P – 8P)	
	(1): A=1	Accuracy number is 1
	(2): Input 1 in [Accuracy number].	Accuracy number is 1
Acceleration	This is to define the acceleration. Bigger value is smaller acceleration. No description is treated as 0. (0 to 3)	
	(1): AC=1	Acceleration number is 1
	(2): Input 1 in [Acceleration].	Acceleration number is 1
Smooth	This is to define the smoothness. Bigger value is larger smoothness. No description is treated as 0. (0 to 3)	
	(1): SM=1	Smoothness number is 1
	(2): Input 1 in [Smoothness].	Smoothness number is 1
Synchronize	This is to define the master robot of synchronize control. This is significant only when plural mechanism exits. If not described, synchronizing is executed as same start control.	
	(1): HM	Mechanism 1 is master
	(2): Select “Synchronize” in [Synchronize].	Mechanism 1 is master
Mechanism	This is to define pose of each mechanism. (varies from 1 to 9) “M”, “mechanism number” and “pose definition”.	
	(1): M2X “M2” is mechanism 2, “X” means that pose is described by AX coordinate system (international standard)	
	(1): M3J “M3” is mechanism 3, “J” means that pose is described by axis angle.	
	(1): M4E “M4” is mechanism 4, “E” means that pose is described by axis encoder data.	
	(2): Select the proper mechanism and pose definition in [Pose type].	

	Before the first “M” is specified, all statement is treated as for the mechanism 1. The specified M is valid till the next M specification. “Pose definition” can be omitted, then treated as “X”. Pose definition “M*X” is significant only when its mechanism is the manipulator.
Interpolation	This is to define the interpolation to move the desired position, by L or C1 or C2 or P description. (1): L Linear interpolation C1 Circular interpolation (start of circle) C1 Circular interpolation (end of circle) P Joint move (interpolation OFF) (2): Select any of the following in [Interpolation]. LIN Linear interpolation CIR1 Circular interpolation (start) CIR2 Circular interpolation (end) JOINT Joint interpolation (interpolation OFF)
Pose	This is to define the desired position. The following list shows its variety to describe the robot pose. ● In case that pose definition is “X” Pose is expressed by XYZ coordinate system that is the same as the international standard (front = X). (1): (X,Y,Z,r,p,y) Pose constant (2): Select “Decalt Coordinate System” in [Pose type]. Pose constant (1): (X,Y,Z,r,p,y)U Pose constant (User coordinate) (2): Select “User Coordinate System” in [Pose type]. Pose constant (User coordinate) (1): Pn (or P[n]) Pose variable (2): Select “Variable type” in [Pose type]. Pose variable (1): Pn + (X,Y,Z,r,p,y) Pose variable + Shift constant (1): Pn + Rn Pose variable + Shift variable (1): P* + (X,Y,Z,r,p,y) Current position + Shift constant (1): P* + Rn Current position + Shift variable The unit of r, p and y angle is [deg]. ● In case that pose definition is “J” Pose is expressed by axis angle (degree). (1): (J1,J2,J3,J4,J5,J6) Pose constant (2): Select “Axial angle” in [Pose type]. Pose constant J3 is not the angle from ground level. No expression for J7 and after. They are next mechanism. ● In case that pose definition is “E” Pose is expressed by axis encoder data (HEX). (1): (E1,E2,E3,E4,E5,E6) Pose constant (2): Select “Encoder” in [Pose type]. Pose constant
Configuration	This is to define the supplement information to fix robot pose. This is significant only when pose is expressed by XYZ coordinate system. (1): CONF=ijk i; 0:LEFTY / 1:RIGHTY / 2:FRONT / 3:REAR(*) (left hand / right hand/ less than ±90 deg/ more than ±90 deg) j; 0:FLIP / 1:NONFLIP (wrist flip / no flip) k; 0:ABOVE / 1:BELOW (upper elbow / lower elbow)

	Select “Configuration” in [Axial angle reference], and then the configuration type in each axis. [J1]: “Left”, “Right”, "Less than 90deg", "More than 90deg" (*) [J3]: "On elbow", "Under elbow" [J5]: "Flip", "Non Flip" (*) About “Less than 90 deg” and “More than 90 deg” These are available only when [16 Configuration J1 Extend] has been set [Enable] by proceeding to [Constant] - [5 Operation Constants] - [1 Operation condition]. When no description of configuration is given, robot pose is determined as the nearest pose with a previous pose.
Speed (or Time)	This is to define the speed or time to achieve the desired position. (1[mm/s]~5000[mm/s] or 0.1[s]~100[s]) S for TCP speed, T for time. (1): S=100 TCP line speed is 100mm/sec. (1): T=5 Time to achieve next position is 5 seconds. (1): D=0.1 Wrist angle speed 0.1 degree/sec (1): R=50 50% ratio compared with maximum power (1): S=V1% Speed is designated by global variable V1%. (1): T=L! [1] Time is designated by local variable L![1]. (1): D=L! [1] Angle speed is designated by local variable L![1]. (1): R=V1% Ratio is designated by global variable V1%. (2): Press [F11 Speed Setting] to specify the speed. Variables can also be used. Variables can be used as follows. Vn% (or V%[n]) global variable (integer) Vn! (or V![n]) global variable (float) Ln% (or L%[n]) local variable (integer) Ln! (or L![n]) local variable (float)
Tool	This is to define the tool number. If omitted, tool defined in previous step is use. (1 to 32) (1): H=1 Tool number is 1. (2): Input 1 in [Tool number]. Tool number is 1.
Speed master definition	This is to define the speed master robot. This is significant only when synchronize control enabled. Plural mechanism can be speed master. (1): MS speed master robot. (2): Input the number in [Speed base mechanism]. speed master robot.

See
MOVE; (Move command)
MOVEJ; (Move command)

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