CHAPTER ONE

ACL Functions

In this chapter you will find the ACL commands classified according to their functions. The brief descriptions will help you compare and select the command most suitable for your specific programming and operating requirements. For more detailed descriptions of the commands, refer to Chapter Three.

Robot Control Commands

MOVE	OPEN	HOME
MOVED	CLOSE	CLR
MOVEL	JAW	
MOVELD	SPEED	CON
MOVEC	SHOW SPEED	COFF
MOVECD		TON
MOVES	EXACT	TOFF
MOVESD	MPROFILE	
	INT	SET ANOUT
CLRBUF		SHOW DAC

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
MOVE				
	MOVE <pos>	Moves the robot to the specified position at the current speed.	DIRECT, EDIT	Read the detailed explanation before using this command.
	MOVE <pos> <time>	Moves the robot to the specified position within the time specified.	DIRECT, EDIT	
	MOVED <pos> {<time>}	Same as MOVE except that program continues to next command only when it has accurately reached the position.	EDIT	The execution of this command is affected by the EXACT command.

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
MOVEC				
	MOVEC <pos1> <pos2>	Moves the robot to position 1, along a circular path, passing through position 2.	DIRECT, EDIT	
	MOVECD <pos1> <pos2>	Same as MOVEC, except that program continues to next command only when it accurately reaches position.	EDIT	Refer to the EXACT command
MOVEL				
	MOVEL <pos>	Moves the robot along a linear path to position, at current speed.	DIRECT, EDIT	
	MOVEL <pos> <time>	Moves to position along a linear path, within time specified.	DIRECT, EDIT	
	MOVELD <pos> {<time>}	Same as MOVEL, except that program continues to next. command only when it has accurately reaches the position.	EDIT	Refer to the EXACT command.
MOVES				
	MOVES <pvect> <start> <end>	Moves the robot smoothly through all positions in vector, from start to end positions. No acceleration/ deceleration or pausing at each position. Moves at current speed.	DIRECT, EDIT	
	MOVES <pvect> <start> <end> <time>	Same as MOVES, but subject to time definition.	DIRECT, EDIT	
	MOVESD <pvect> <start> <end>	Same as MOVES, except that program continues to next command only when it has accurately reached end position.	EDIT	Refer to the EXACT command.
CLRBUF				
	CLRBUF	Empties the movement buffer of all axes.	DIRECT, EDIT	
	CLRBUFA/B	Empties the movement buffer of group A or B.	DIRECT, EDIT	
	CLRBUF <axis>	Empties the movement buffer of specific axis.	DIRECT, EDIT	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
HOME				
	HOME {<n>}	Drives all robot axes, or a specific axis, to home position.	DIRECT, EDIT	To run HOME from teach pendant; key in: RUN 0
	HHOME <n>	Drives specific axis home. Searches for hard stop, not microswitch.	DIRECT, EDIT	
CLR				
	CLR <n>	Clears (zeros) the value of specific encoder.	DIRECT	$1 \le n \le 11$
	CLR *	Clears all encoders.	DIRECT	
COFF				
	COFF	Turns off servo control for all axes.	DIRECT	
	COFFA/B	Turns off servo control for groups A or B.	DIRECT	
	COFF <axis>	Turns off servo control for a specific axis.	DIRECT	
CON				
	CON	Turns on servo control for all axes.	DIRECT	
	CONA/B	Turns on servo control for groups A or B	DIRECT	
	CON <axis>	Turns on servo control for a specific axis.	DIRECT	
TON				
	TON {<n>}	Turns on thermic motor protection for all axes, or for specific axis.	DIRECT	System default
TOFF				
	TOFF {<n>}	Turns off thermic motor protection for all axes, or for specific axis.		
SET				
	SET ANOUT [n] = <DAC>	Sets the DAC value for a specific axis. Used for open loop control.	DIRECT, EDIT	$-5000 \le DAC \le 5000$. Use with care. May damage motor.

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
OPEN				
	OPEN {<var>}	Opens gripper until end of motion. Gripper is not in control loop.	DIRECT, EDIT	The standard command for opening gripper.
		Opens gripper with additional force. Sets gripper DAC to <var>. Gripper is not in control loop.		
CLOSE				
	CLOSE	Closes gripper until end of motion. Gripper is not in control loop.	DIRECT, EDIT	The standard command for closing gripper.
	CLOSE <var>	Closes gripper with extra strength. Sets gripper DAC to <var>. Gripper is not in control loop.	EDIT	Use with caution. May damage gripper. $0 \le <var> \le 5000$
JAW (not applicable for ER VII)				
	JAW <var>	Gripper is in control loop. Sets gripper opening to <var> size. Moves at maximum speed.	DIRECT, EDIT	Use with caution May damage motor. $0 \le <var> \le 100$
	JAW <var> <time>	Gripper opening to <var>; <time> sets the time of motion.	DIRECT, EDIT	
SPEED				
	SPEED <val>	Sets the current speed value for all axes.	DIRECT, EDIT	$1 \le <val> \le 100$. Default is 50.
	SPEED[A/B} <val>	Sets speed for group A or B.		
	SPEEDC <val> <axis>	Sets speed for axis in group C.		
EXACT				
	EXACT A/B/C EXACT OFFA/B/C	Sets movement accuracy mode on/off in group A, B or C.	DIRECT, EDIT	Only affects commands with the 'D' suffix: MOVED, MOVELD, MOVECD, MOVESD
MPROFILE				
	MPROFILE PARABOLE A/B/C	Sets velocity profile of motion for selected group to PARABOLOID.	DIRECT, EDIT	PARABOLE is default mode.
	MPROFILE TRAPEZE A/B/C	Sets velocity profile of motion for selected group to TRAPEZOID.	DIRECT, EDIT	
INT				
	INT_ON <axis1> ... <axis 4>	Turns on integral servo control to the specified axes.	DIRECT, EDIT	INT_ON is default mode.
	INT_OFF <axis1> ... <axis 4>	Turns off integral servo control to the specified axes.	DIRECT, EDIT	

Real Time and Program Control Commands

RUN	PRIORITY	POST
A (ABORT)	SET TIME	PEND
STOP	DELAY	QPOST
SUSPEND	WAIT	QPEND
CONTINUE	TRIGGER	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
RUN				
	RUN <prog>	Runs user program.	DIRECT, EDIT	
	RUN <prog> <priority>	Runs user program, subject to priority.	DIRECT	
ABORT				
	A or <Ctrl+A>	Immediately aborts all running user programs, and stops axes movement	DIRECT	
	A <prog>	Aborts specific user program.	DIRECT	
STOP				
	STOP	Aborts all running programs.	EDIT	
	STOP <prog>	Aborts execution of specific program.	EDIT	
SUSPEND				
	SUSPEND <prog>	Suspends execution of a program.	DIRECT, EDIT	
CONTINUE				
	CONTINUE <prog>	Resumes the running of program previously halted by SUSPEND.	DIRECT, EDIT	
PRIORITY				
	PRIORITY <prog> <var>	Sets run time priority of <prog> to <var>. If the CPU is loaded, it will first handle tasks and programs with a higher priority	EDIT	$1 \leq$ <var> ≤ 10. Default is 5.
SET				
	SET <var> = TIME	Sets the value of <var> to TIME.	DIRECT, EDIT	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
DELAY				
	DELAY <var>	Suspends program execution for the time specified.	EDIT	<var> is specified in units of 10 milliseconds.
WAIT				
	WAIT <var1> <cond> <var2>	Suspends program execution, until condition is satisfied (true).	EDIT	Condition can be: $<, >, =, <=, >=, <>$
TRIGGER				
	TRIGGER <prog> BY IN/OUT <n> { <state> }	Executes a program, conditional upon I/O event.	EDIT	$1 \leq n \leq 16$ <state> = 0 (OFF) or 1 (ON)
PEND				
	PEND <var1> FROM <var2>	Suspends the execution of a program until another program posts a non-zero value to <var2>.	EDIT	Works with POST command to synchronize programs.
POST				
	POST <val> TO <var2>	Attaches the value to the specified variable.	EDIT	Works with PEND to synchronize programs.
QPEND				
	QPEND <val> FROM <vect>	Same as PEND, but value is taken from a queue (a vector).	EDIT	
QPOST				
	QPOST <val> TO <vect>	Same as POST but value is put into a queue (a vector).	EDIT	

Position Definition and Manipulation Commands

DEFP	SETPV	UNDEF
DIMP	SETPVC	DELP
HERE	SHIFT	SET PVAL
HERER	SHIFTC	SET PVALC
		SET PSTATUS
TEACH	SETP	
TEACHR		

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
DEFP	DEFP{A/B} <pos> DEFPC <pos> <axis>	Creates (defines) a position in group A or B or axis in group C	DIRECT, EDIT	• <pos> is name of up to 5 characters.
DIMP	DIMP{A/B} <vec[n]> DIMPC <vec[n]> <axis>	Creates a vector of n positions in group A or B or axis in C	DIRECT, EDIT	<vect> is name of up to 5 characters.
HERE	HERE <pos>	Records in joints coordinates the location of an absolute robot position.	DIRECT, EDIT	Joints: encoder units. <Pos> must first be defined using the DEFP or DIMP commands
HERER	HERER <pos>	Sets in joints coordinates the location of a robot position relative to current robot location.	DIRECT	
	HERER <pos2> <pos1>	Records in joints coordinates the location of <pos2> relative to <pos1>.	DIRECT, EDIT	
TEACH	TEACH <pos>	Sets in cartesian coordinates the location of an absolute robot position.	DIRECT	Cartesian: XYZ values in tenths of millimeter; Pitch/roll values in tenths of degree.
TEACHR	TEACHR <pos>	Sets in cartesian coordinates the location of a position relative to current robot position.	DIRECT	
	TEACHR <pos2> <pos1>	Sets in cartesian coordinates <pos2> relative to <pos1>.	DIRECT	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
SETPV	SETPV <pos>	Sets in joints coordinates the location of a robot position.	DIRECT	
	SETPV <pos> <axis> <val>	Sets in joint coordinates one value of an axis at a previously recorded position.	DIRECT, EDIT	$1 \le$ <axis> ≤ 11
SETPVC	SETPVC <pos> <coord> <val>	Sets in cartesian coordinates one value of an axis at a previously recorded position.	DIRECT, EDIT	
SHIFT	SHIFT <pos> BY <axis> <val>	Shifts location of a position by a joints value.	DIRECT, EDIT	$1 \le$ <axis> ≤ 11
	SHIFTC <pos> BY <val> <coord>	Shifts location of a position by a cartesian coordinate value.	DIRECT, EDIT	
SETP	SETP <pos2> = <pos1>	Copies the value of <pos1> to <pos2>.	DIRECT, EDIT	
UNDEF	UNDEF <pos>	Initializes position values. Position values are erased, but position is still defined.	DIRECT	
DELP	DELP <pos> DELP <pvect>	Deletes positions and position vectors from User RAM.	DIRECT, EDIT	
SET	SET <var> = PVAL <pos> <axis>	Assigns the joints value of the axis at position specified to <var>.	DIRECT, EDIT	
	SET <var> = PVALC <pos> <coord>	Assigns one cartesian coordinate value of the position to <var>.	DIRECT, EDIT	
	SET <var> = PSTATUS <pos>	Assigns a value to <var> according to the status of the position.		Must be a robot position.

Mathematical and Logical Functions

SET <var1> = <var2>
SET <var1> = NOT <var2>
SET <var1> = COMPLEMENT <var2>
SET <var1> = ABS<var2>
SET <var1> = <var2> <oper> <var3>

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
SET				
	SET <var1> = <var2>	Assigns the value of var2 to var1.	DIRECT, EDIT	
	SET <var1> NOT <var2>	Assigns the logical negative value of var2 to var1.		
	SET <var1> = COMPLEMENT <var2>	Assigns the axis compliment value of var2 to var1.		
	SET <var1> = ABS<var2>	Assigns the absolute value of var2 to var1.		
	SET <var1> = <var2> <oper> <var3>	Assigns to <var1> > the result of the operation on the other two variables.		<Oper> can be: +, -, <, *, /, SIN, COS, TAN, ATAN, EXP, LOG, MOD, OR, AND

Variable Definition and Manipulation Commands

DEFINE   DIM   DELVAR
GLOBAL   DIMG   SET (see next page)

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
DEFINE				
	DEFINE <var1>...<var8>	Creates (defines) local variables. Up to 8 variables can be defined in one command.	EDIT	A local variable is recognized only by the program in which it is defined.
GLOBAL				
	GLOBAL <var1>...<var8>	Creates (defines) a global variable. Up to 8 variables can be defined in one command.	DIRECT, EDIT	Global variables can be used by any programs.
DIM				
	DIM <var[n]>	Creates (defines) a local vector of n variables	EDIT	<var> is vector name of up to 5 characters.
DIMG				
	DIMG <var[n]>	Creates (defines) a global vector of n variables	DIRECT, EDIT	
DELVAR				
	DELVAR <var>	Deletes variable from User RAM.	DIRECT, EDIT	

I/O Control Commands

LSON   DISABLE   SET OUT
LSOFF   ENABLE   IF IN
            FORCE   TRIGGER (see p.1-6)

SHOW DIN
SHOW DOUT

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
LSON				
LSON	.	Connects the limit switches to the controller's input sensors. Regular input access is inactive.	DIRECT, EDIT	HOME automatically switches to LSON and back to LSOFF.
LSOFF				
LSOFF		Disconnects the limit switches from the controller's input sensors. Regular input access is reactivated.	DIRECT	LSOFF is default mode.
DISABLE				
DISABLE IN/OUT $<n>$		Disconnects physical I/O from logical I/O.	DIRECT	$1 \le n \le 16$
ENABLE				
ENABLE IN/OUT $<n>$		Reconnects the specified input or output to regular system control.	DIRECT	Default mode. Cancels DISABLE.
FORCE				
FORCE IN/OUT $<n>$ $<state>$		When in DISABLE mode, forces the specific input or output to state 0 or 1 (OFF or ON)	DIRECT	
SET				
SET OUT[$<n>$] = $<state>$		Sets the state of the specified output port.	DIRECT, EDIT	$<state>$ = 0 (OFF) or 1 (ON)
IF				
IF ~~OUT~~ IN [$<n>$] = $<state>$		(Refer to the IF command)		$0 \le n \le 9999$

Program Flow Commands

IF   FOR   LABEL
ANDIF   ENDFOR   GOTO
ORIF
ELSE   GOSUB
ENDIF

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
IF				
	IF $<var1>$ $<cond>$ $<var2>$	Checks the conditional relation of two variables.	EDIT	$<Cond>$ can be: $<, >, =, <=, >=, <>$
ANDIF				
	ANDIF $<var1>$ $<cond>$ $<var2>$	Logically combines a condition with other IF commands.	EDIT	
ORIF				
	ORIF $<var1>$ $<cond>$ $<var2>$	Logically combines a condition with other IF commands.	EDIT	
ELSE				
	ELSE	Follows IF and precedes ENDIF. Begins subroutine when IF is false.	EDIT	
ENDIF				
	ENDIF	End of IF subroutine.	EDIT	
FOR				
	FOR $<var>$ = $<val1>$ TO $<val2>$	Loop command. Executes subroutine for all values of variable.	EDIT	
ENDFOR				
	ENDFOR	End of FOR loop.	EDIT	
LABEL				
	LABEL $<n>$	Marks a program subroutine to be executed by GOTO command.	EDIT	$0 \le n \le 9999$
GOTO				
	GOTO $<label>$	Continues program execution with command following $<label>$.	EDIT	
GOSUB				
	GOSUB $<prog>$	Transfers control to another program. Main program suspended until GOSUB completed.	EDIT	

Parameter Manipulation Commands

LET PAR	SHOW PAR

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
LET				
	LET PAR <n> = <val>	Changes the value of system parameters.	DIRECT	Use with caution !

Set-up Commands

CONFIG
INIT CONTROL
INIT EDITOR
INIT PROFILE

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
CONFIG				
CONFIG		Enters the configuration file for defining the controller set-up.	DIRECT	Erases all existing programs and positions.
INIT				
INIT CONTROL		Initializes all system parameters.	DIRECT	Must be executed after changing parameters.
INIT EDITOR		Initializes all user programs and variables in User RAM during installation or configuration.	DIRECT	Warning! Erases contents of User RAM
INIT PROFILE		Initializes the velocity profiles according to the value of parameter 76.	DIRECT	Refer to Appendix B for an explanation of the use of parameter 76.

Report Commands

ATTACH ?	DIR	VER
CONFIG ?	LIST	FREE
DISABLE ?	STAT	
	SHOW	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
ATTACH ?		Displays current ATTACH status.	DIRECT	
CONFIG ?		Displays the current configuration.	DIRECT	
DISABLE ?		Displays a list of all disabled inputs and outputs	DIRECT	
DIR		Displays a list of all user programs	DIRECT	
LIST				
	LIST { <prog>}	Displays all lines of all user programs or a specific program.	DIRECT	
	LISTP	Displays a list of all defined positions.	DIRECT	
	LISTPV <pos>	Displays the joints (encoder) coordinates of the specific position.	DIRECT	Cartesian coordinates also displayed for robot positions.
	LISTPV POSITION	Displays the current location of robot arm.		
	LISTVAR	Displays a list of all user and system variables	DIRECT	
STAT				
	STAT	Displays list of active user programs: name, priority and status.	DIRECT	
SHOW				
	SHOW DIN	Displays status of all 16 inputs. If LSON is activated, will display status of all limit switches.	DIRECT	Input ON = 1 Input OFF = O
	SHOW DOUT	Displays status of all 16 outputs.		Output ON = 1 Output OFF = 0
	SHOW ENCO	Displays the values of all encoders every 0.5 seconds		<Ctrl+C> stops the display.
	SHOW DAC <axis>	Displays the value of DAC in millivolts.		1 ≤ axis ≤ 11
	SHOW PAR <n>	Displays the value of parameter n.		
	SHOW SPEED	Displays the current speed settings.		

Display and User Interface Commands

QUIET	HELP	PRINT
NOQUIET		PRINTLN
ECHO		READ
NOECHO		GET

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
QUIET				
QUIET		Activates mode in which DIRECT commands within running program are not displayed.	DIRECT	
NOQUIET				
NOQUIET		Activates mode in which DIRECT commands within running program are displayed on screen.	DIRECT	NOQUIET is default mode.
ECHO				
ECHO		Displays on screen all characters that are transmitted to controller.	DIRECT	ECHO is default mode.
NOECHO				
NOECHO		Activates mode in which keyboard entries are not displayed on screen.	DIRECT	
HELP				
HELP		Provides on-line help.	EDIT	Different HELP files for DIRECT and EDIT modes.
DO HELP		Provides on-line help.	DIRECT	
PRINT				
PRINT	PRINT "string" PRINT <arg1>...<arg4>	Displays string on screen. Displays value(s) of <arg>.	EDIT	
PRINTLN				
PRINTLN		Same as PRINT, but inserts line break before displayed text.	EDIT	
READ				
READ	READ "string" <var>	Displays the string and waits for value of <var> from keyboard.	EDIT	
GET				
GET	GET <var>	Waits for <var>, one keyboard character, to be pressed.	EDIT	

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
VER				
VER		Displays EPROM version.	DIRECT	
FREE				
FREE		Displays a list of available user memory space	DIRECT	

Program Manipulation Commands

COPY
RENAME
REMOVE
EDIT

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
COPY	COPY <prog1> <prog2>	Copies user program <prog1> to a new user program <prog2>	DIRECT	
RENAME	RENAME <prog1> <prog2>	Changes name of user program from <prog1> to <prog2>.	DIRECT	
REMOVE	REMOVE <prog>	Deletes program from User RAM.	DIRECT	
EDIT	EDIT <prog>	Activates EDIT mode to allow program editing.	DIRECT	

Editing Functions

S   *   END
P   @   <exit>
L
DEL
<enter>

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
S	S	Goes to the first line of the program (when editing).	EDIT	
	S <n>	Takes editor to line n.		
P	P	Goes to previous line (when editing).	EDIT	
L	L <n1> <n2>	Displays list from line <n1> to line <n2>.	EDIT	
DEL	DEL	Erases the current line of program.	EDIT	
<Enter>	<Enter>	Goes to next line in program and displays its number.	EDIT	
*	*"string"	Precedes user comment line.	EDIT	
@	@ <DIRECT command>	Allows the execution of a DIRECT command from running user program.	EDIT	
END	END	End of program. Automatically written by system.		
EXIT	EXIT	Quits EDIT and checks program validity.	EDIT	

Troubleshooting Command

TEST

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
TEST				
TEST		Runs an interactive hardware test program.	DIRECT	To run TEST from Teach Pendant, key in: RUN 999

General System Commands

DO
AUTO
~

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
DO				
	DO <EDIT command>	Executes an EDIT command in DIRECT mode.	DIRECT	
AUTO		A reserved file name for a user program that runs automatically upon system Power ON/Reset.		Created like any other user program in EDIT.
~		Activates and deactivates manual keyboard control of robot.	DIRECT, EDIT	
END				
END		End of program. Automatically written by system at end of program	EDIT	

External Back-up/Restore Commands

SEND
RECEIVE
APPEND

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
SEND				
SEND		Produces lists of User RAM contents to be sent to external computer via RS-232C.	DIRECT	SEND has several options. Refer to the detailed description.
RECEIVE				
RECEIVE		Loads programs, positions and variables from external back-up file to the User RAM.	DIRECT	Warning! Erases current content of User RAM
RECEIVE <prog>		Loads contents of one program from back-up file.	DIRECT	Does not affect other data in User RAM.
APPEND				
APPEND		Adds user programs from external file into User RAM.	DIRECT	Does not affect other data in User RAM.

Teach Pendant Commands

ATTACH
ATTACH OFF

COMMAND	FORMAT	DESCRIPTION	MODE	NOTES
ATTACH				
ATTACH <pvect>		Attaches a position vector to the teach pendant.	DIRECT	
ATTACH OFFA/B/C		Detaches position vector in group A, B or C from teach pendant.	DIRECT	