

References for the SAM Programs

Basic SAM Robot Programs:

SAMGO		SAM Go distance, D	
Required input		D, SAM's linear distance in cm (Negative <u>distances</u> cause SAM to move backwards.)	
Optional input		V, SAM's linear speed in cm/s (Only absolute value is used. The default linear speed from \perp SAM is used instead if V is zero or if it exceeds the maximum.)	
		W (Flag: 1= SW1 on, 2= SW2 on, 4=suppress screen display. The values may be added. For example, W=7 turns on both switches and suppresses the screen display.)	
Physical Outcome		SAM goes forward or back a distance, D, at speed, V	
SAMGOST		SAM Go S Steps	
Required input		S, number of steps (Must be a positive integer.)	
Optional input		V, SAM's linear velocity in cm/s. (Negative <u>velocities</u> cause SAM to back up.)	
		W (See SAMGO above)	
Physical Outcome		SAM goes forward or back S steps	
SAMGOF		SAM Go For Time, T	
Required input		T, time in seconds (Must be positive)	
Optional input		V, SAM's linear velocity in cm/s. (Negative <u>velocities</u> cause SAM to back up.)	
		W (See SAMGO above)	
Physical Outcome		SAM moves forward or back for time, T	
SAMGOW		SAM Go While Y_8 is not Zero	
Required input		Function in Y_8	
Optional inputs		V, SAM's linear velocity in cm/s	
		W (See SAMGO above)	
Output variable		E (sensor value from analog channel 1)	
Physical Outcome		SAM moves forward or back while measuring the input on analog channel 1 until Y_8 becomes zero or the user presses any key	
SAMPIV		SAM Pivot Angle, A	
Required input		A, SAM's angular <u>displacement</u> in degrees (positive or negative)	
Optional input		U, SAM's angular speed in deg/s (Negatives are ignored.)	
		W (See SAMGO above)	
Physical Outcome		SAM pivots left or right by angle, A	
SAMPIVF		SAM Pivot For Time, T	
Required input		T, time in seconds (Must be positive.)	
Optional input		U (SAM's angular velocity in deg/s) Default is counterclockwise. Rotation is clockwise if $U < 0$.	
		W (See SAMGO above)	
Physical Outcome		SAM pivots for time, T	

SAMPIVW	SAM Pivot While Y_7 is not Zero
Required input	Function in Y_7
Optional inputs	U, SAM's angular velocity in deg/s W (See SAMGO above)
Output variable	E, sensor value from analog channel 1
Physical Outcome	SAM pivots CCW (or CW if $U < 0$) while measuring analog channel 1 until Y_7 becomes zero or the user presses any key
SAMPUT0	SAM Put all servos at zero
Required input	None
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	All servos move to zero position.
SAMPUT1	SAM Put Servo 1 at Position, A
Required input	A, servo's angular position in degrees
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Servo moves to angular position, A
SAMPUT2	SAM Put Servo 2 at Position, A
Required input	A, servo's angular position in degrees
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Servo moves to angular position, A
SAMPUT3	SAM Put Servo 3 at Position, A
Required input	A, servo's angular position in degrees
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Servo moves to angular position, A
SAMPUT4	SAM Put Servo 4 at Position, A
Required input	A, servo's angular position in degrees
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Servo moves to angular position, A
SAMPUT	SAM Put Servos in the positions from ${}_L A$
Required input	${}_L A$, a list of desired servo positions, $\{A_1, A_2, \dots\}$
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Each servo is moved to the specified position.
SAMSW1F	SAM Activate Switch 1 for Time, T
Required input	T (time in seconds)
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Terminals deliver 12 V (100 mA max) for T seconds
SAMSW2F	SAM Activate Switch 2 for Time, T
Required input	T (time in seconds)
Optional input	W (Suppress screen output if $W \geq 4$)
Physical Outcome	Terminals deliver 12 V (100 mA max) for T seconds
SAMSETUP	SAM Set Up
Required input	None except through inputs while the program is running
Optional input	None
Physical Outcome	The SAM turns under direct user control
Software Outcome	The list ${}_L SAM$ is created (or modified if already present). The program can then be deleted and the list itself copied from one calculator to another.

Other Related Programs:

<i>DCUINIT (from Vernier Software)</i>	<i>Verify and Initialize the Connection between the Calculator and the CBL, CBL2, or LabPro</i>
Required input	None
Optional input	None
Physical outcome	Interface is tested and set for sustained output.
Software outcome	A warning appears on the calculator screen if the calculator is not correctly connected, and the program waits for the user to correct the problem.
<i>READ1</i>	<i>Read the Value from the Sensor in Analog CH 1</i>
Required input	None
Optional input	W (Suppress screen output if W=4)
Physical outcome	Channel 1 is activated to auto identify the sensor and take a series of 5 readings at 0.05 s intervals.
Software outcome	Variable E is set to the average value returned from the sensor
<i>READ2</i>	<i>Read the Value from the Sensor in Analog CH 2</i>
Required input	None
Optional input	W (Suppress screen output if W=4)
Physical outcome	Channel 2 is activated to auto identify the sensor and take a series of 5 readings at 0.05 s intervals.
Software outcome	Variable F is set to the average sensor value.
<i>READ3</i>	<i>Read the Value from the Sensor in Analog CH 3</i>
Required input	None
Optional input	W (Suppress screen output if W=4)
Physical outcome	Channel 3 is activated to auto identify the sensor and take a series of 5 readings at 0.05 s intervals.
Software outcome	Variable G is set to the average sensor value.
<i>READ4 (LabPro Only)</i>	<i>Read the Value from the Sensor in Analog CH 4</i>
Required input	None
Optional input	W (Suppress screen output if W=4)
Physical outcome	Channel 4 is activated to auto identify the sensor and take a series of 5 readings at 0.05 s intervals.
Software outcome	Variable H is set to the average sensor value.

Variables Used or Designated:

Variables	Use	Used but not changed	Changed or deleted	Never used
A	Angle (degrees)	X		
B	Short-term internal use		X	
C	Short-term internal use		X	
D	Distance (centimeters)	X		
E	Ch1 Sensor		X	
F	Ch2 Sensor		X	
G	Ch3 Sensor		X	
H	Ch4 Sensor (LabPro only)		X	
I	Counter		X	
J	Counter		X	
K	Key		X	
L	<i>Reserved for higher level programs</i>			X
M	<i>Reserved for higher level programs</i>			X
N	<i>Reserved for higher level programs</i>			X
O	<i>Reserved for higher level programs</i>			X
P	<i>Reserved for higher level programs</i>			X
Q	Hardware specific data • EDE1200: auto speed settings		X	
R	Pulse width		X	
S	Step Counter		X	
T	Time (s)	X		
U	Angular Velocity (degrees/second) (SAM's pivot speed in SAM programs, robot pivot speed in SAM programs)		X	
V	Velocity (cm/s)		X	
W	Flag: 1= SW1 on, 2= SW2 on, 4=suppress screen display. (The values may be added. For example, W=7 turns on both switches and suppresses the screen display.)	X		
X	<i>Reserved for higher level programs</i>			X
Y	<i>Reserved for higher level programs</i>			X
Z	<i>Reserved for higher level programs</i>			X
θ	<i>Reserved for higher level programs</i>			X

Several named lists (L_{SAM} , L_A , L_{SAMOFF} , etc.) are used, created, changed or deleted by the basic SAM programs. The “standard” TI-83 lists (L_1 , L_2 , etc.) are not used by the basic SAM programs, and therefore are available for higher level programs.

Lists Used or Designated:

List	Use	Changed or deleted in basic programs?
L _A	Angles	No
L _B	Short-term use	No
L _C	Short-term use	No
L _D	Distances	No
L _E	Ch1 Sensor	Yes
L _F	Ch2 Sensor	Yes
L _G	Ch3 Sensor	Yes
L _H	Ch4 Sensor (LabPro only) and temporary use	Yes
L _I	List of numbers	No
L _R	Pulse Widths for Servo	Yes
L _T	Times	No
L _{SAM}	Interface and SAM characteristics (see below)	No, except SAMSETUP
L _{SSLB}	Setup list for boards	Yes
L _{SSRB}	Setup list for boards	Yes
L _{SSB}	Setup list for boards	Yes
L _{SSOFF}	Zero all outputs	Yes

L _{SAM} (1)	interface Code (1 = CBL, 2 = CBL2/LabPro, 3=LabPro)
L _{SAM} (2)	PCB Code (1 = SVP A, 2 = SVP D, 3= SVP C)
L _{SAM} (3)	Step size (degrees)
L _{SAM} (4)	Wheel radius (cm)
L _{SAM} (5)	Robot radius (cm)
L _{SAM} (6)	Default motor speed for forward and back (degrees/second)
L _{SAM} (7)	Default motor speed for pivots (degrees/second)
L _{SAM} (8)	Maximum motor speed (degrees/second)