Using the software

(Examples are for the 83 plus, see our web page for other examples)

Warning, back up all your installed software with a Graph-link to you computer first!

All you need to send commands to the robot processor is the Send(command built in to your Texas Instruments calculator basic programming. See your guidebook that came with your calculator or go on line at: http://education.ti.com/product/prselect.html
Always follow the Send(command with a Get(command. Depending on the command sent, the Get variable might contain important data from the built in touch sensors and timing.

Command	Left direction	Right direction
1=timed movement only	0=backward	0=backward
2=move till switch is hit	1=no motion	1=no motion
3=time or until switch	2=forward	2=forward

The first number sent, is the command. The movement commands format is CLR. Where C is the command, L is the direction of the left servo motor, and R is the direction of the right servo motor.

Format for CLR
C = command
L= left
R=Right
Format for C
1xx goes for certain time (requires second variable 1-65535)
2xx goes till switch is hit
3xx goes until switch or time (requires second variable 1-65535)
Format for L or R servo motor
0 = backwards
1 = stop
2 = forward

Examples:
Send({122,500})
Get(R)
(this will move the robot forward for approx 500 centiseconds)
Send({100,45})
Get(R)
(this will move the robot backward for approx 45 centisecond)
Send({221})
Get(R)
(this will allow the robot to rotate until the front contacts are hit)
Send({322,500})
Get(R)
(this will allow the robot to go forward approx 500 centiseconds or until a switch is hit) (R will contain the time traveled)

The variable from the Get(R) command will contain the time the robot moved.
To display this amount, just use the Disp R command

Switch status command

Command	Switch action
5=check switch	1=check for switch that stopped robot
	2=check for switches as they are now

You have two contact switches on the robot.
If no switches are pressed, you will get the value of zero.
If the right switch is pressed, you will get a value of 1.
If the left switch is pressed, you will get a value of 2.
If both switches are pressed, you will get a value of 3.

Example:
Send({51})
Get(R)
(R will contain a 0, 1, 2, or 3, depending on the switch pressed)

Other valid commands are:

Command	Action
4=calibrate	21=calibrate left forward pulse length
	01=calibrate left backward pulse length
	10=calibrate right backward pulse length
	12=calibrate right forward pulse length
	99=reset all settings to default

421 - calibrate left forward
401 - calibrate left backward
410 - calibrate right backward
412 - calibrate right forward
499- resets all settings to default

These commands are for advanced use. To control the servo motor, we just send a pulse of 1-2 milliseconds. Full speed one way is 1 millisecond; full speed the other way is 2 milliseconds. This command gives you speed control on the servos. A 1.5 millisecond should be stop or very slow. Use this value(127) to calibrate the pot on the servo motor.

Right backwards is a 255 default
Right forward is a 0 default
Left backwards is a 0 default
Left forward is a 255 default
Valid values are 0-255

Example:
Send({421, 200})
Get(R)
(this will slow down the left forward speed)
Send({401, 75})
Get(R)
(this will slow down the left backwards speed)

Note: These setting will be reset when the robot is shut off. Calculators will shut off after a period of time, allow for this in your application.

Visit our website for updates and examples for other models www.smallrobot.com

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Direct Connect Calculator Kit

Photo by Rebbecca Rowland

A great new application for your Texas Instruments Graphing Calculator
(calculator not included)

Complete Kit $99.95
Options
Slide Cover $4.95
Link cable $4.95
Pen Holder $19.95
Order On line at
www.smallrobot.com
Or visit our website for a mail or fax

Calculator Robot

Tel: 702-498-5799
Fax: 702-435-9437

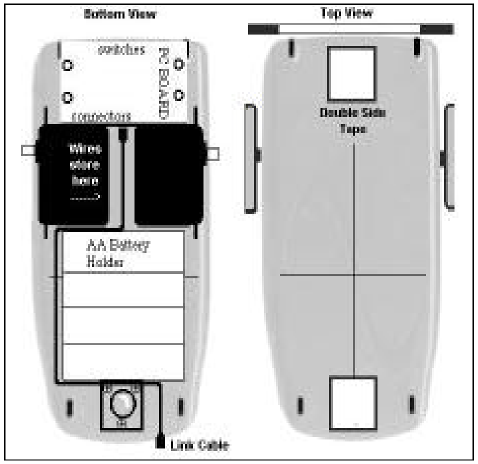
Calculator Instructions www.smallrobot.com

Congratulations on your purchase of the Calculator Robot from Norland Research. Please read all these instructions before beginning. By accepting this kit you will assume all responsibility and damages that may occur.

If not, please return this kit for a full refund.

This kit has been fully tested. But, as with any electronic product it may at times produce undesired effects. You will be adding motion to your calculator and this could result in loss of control and damage. We recommend that you secure any area that you will operate your robot in to be free of objects that can damage it, and add barricades to prevent it from falling. Also, do not operate your robot in a crowd as it could be stepped on. Always use tools as designed, wear eye protection and no loose clothing. Children should always have adult supervision when using tools and operating moving devices. Moving items can become tangled in clothing or hair. Always use caution when soldering, using electricity, and connecting batteries and chargers. Since Norland Research does not control the final product, the kit owner/assembler will assume the safety considerations and responsibility of the final product. The kit owner/assembler will also be responsible for any damage to the products connected to the Norland Research robot kit.

Specifications subject to change without notice.



Tools required or helpful

Tape measure or ruler
Small phillips screwdriver
Wire cutters
Sand paper or file

Items needed but not included in kit

Texas Instrument graphing calculator (73, 82, 83, 83plus, 85(CBL Model), 86, 89, 92*)
Slide case
Link Cable
4 AA batteries

Items useful, but not necessary

Texas Instrument TI-GRAPH LINK TM

Assembly Time

Allow approximately one hour to assemble your Calculator Robot. Be sure to understand the operation of your Calculator and the Graph Link procedures. These instructions are provided from the calculator manufacture. Skills and techniques used in model building are useful. Some edges may need cleaning due to the cutting process. Care in measurement will improve the operation of this kit. E-mail us if you have any questions.

Where to operate the robot

The best place to operate the robot is a table with barriers to prevent it from falling off. You can also use the robot on the floor. We recommend a hard surface. If you plan on using the robot on carpet, be sure to spray if with anti static spray or a static charge could damage the electronics.

Inspection first

Look closely at the robot chassis. Inspect it for any shipping damage. Also look at all edges. If there are any sharp edges from the cutting process, just sand or file them smooth. The link cable should come out and tuck next to the battery holder, through the caster wheel and out the hole at the back of the robot.

Step one, Install the wheels

Take the rubber traction band and stretch it over the wheel and work it around until it is centered and even all the way around. Plan on spending a few minutes making this fit on both wheels. Once the band is installed, remove the Phillips screw from the servo motor, push the wheel on and reinstall the screw. Repeat this on the other servo motor.

*92 will not fit on robot base

Step two, Install the bumper

Remove the backing on the ½ inch double side tape and place on the two contact switches. Place the bumper on these making sure it is level, square and centered. Use the "X" to line up the switches.

Step three, Install the slide cover

You will find (2) ¾ inch double-sided tape squares provided in the kit. Mount the 2 tape squares on the 2 spots as shown on top. Do so by removing the backing to expose the adhesive. Remove the backing on the other side of the tape squares. Now place the slide cover on top of these, being careful to be behind the bumper and center between the wheels. The slide cover will allow the calculator to slide out the rear. If you do not wish to use your slide cover, replacements are available from Texas Instruments or Norland Research. They are also available in colors to give your robot a custom look

Step four, install the calculator

Slide in your calculator (display and keypad up) until you hear a click. Plug in the link cable. Make sure the cable is secured and will not tangle in a wheels or the caster. Also, secure the cable to prevent it from dragging on the ground.

Step five, install the batteries

Install 4 AA Batteries in the Norland Research battery holder on the bottom as marked. We recommend using good quality batteries. Do not mix types and we do not recommend some rechargeable batteries, as they only provide 12 volts each. Please check the voltage on your batteries to insure they are rated at 1.5 volts. Now, slide the switch on the circuit board to on. The red LED light should come on. If not, check the battery installation, voltage and connections. A small jump from the servos is normal. Low batteries will cause unpredictable results

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