



# Operating Instructions for the RS232 Laser Rangefinder Module

## RS100/RS400/RS800

### General Usage:

The Opti-Logic RS100/RS400/RS800 modules are laser range-finding instruments that output measured distance readings to an RS232 compatible port. The range data can be output as either raw (relative) or calibrated (actual) distances. This information can then be used in several applications. The RS100, RS400, and RS800 units offer similar operation features, with the only difference being their sensitivity to ranges of 100, 400, or 800 yards, respectively.

The Opti-Logic RS100/RS400/RS800 in their current configurations have five wire outputs: two for power (+9 volts and Ground) and three for RS-232 communications (Transmit, Receive, and signal Ground) to a properly configured computer, hand held device, PLC, or any other compatible display or data acquisition device.

Once the display or data acquisition device is selected the unit can be configured to display data in either raw or calibrated distance readings. The raw readings will be output as counts from 0 to 4095. The counts number will get larger as the target gets further away. This mode gives a relative reading. In the calibrated data mode the unit will output actual range in the selected units of feet, meters, or yards. This mode will give you actual distance measurement.

On power down the unit will retain the current settings in non-volatile memory. On power up the unit will resume operation with the previous settings.

### Output Wiring:

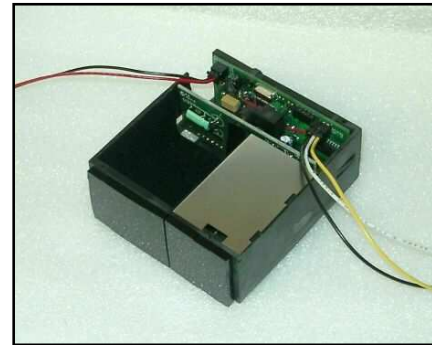
**Power Wires**  
Red: +7 to +9 Volts DC  
Black: Ground

#### RS232 Com Wires (For Standard DB9 Female Serial Connector):

Yellow: Transmit (Pin2)  
White: Receive (Pin3)  
Black: Ground (Pin5)

### RSX00 Specifications:

**Accuracy:** +/- 1 yard  
**Com. Protocol:** RS232-8,N,1  
**Baud Rate:** 19200  
**Raw Data Rate:** ~200 Hz  
**Calibrated Data Rate:** ~10 Hz  
**Laser:** Class I (eye-safe)  
905nm +/- 10nm  
**Power:** 7-to-9 Vdc  
**Typical Range:** RS100: 100 Yards  
RS400: 400 Yards  
RS800: 800 Yards



### Supplemental Specifications

**Laser Wavelength:** 905 nm +/- 10 nm  
**Laser Divergence:** Vertical axis -- 3.5 mrad half-angle divergence  
Horizontal axis -- 1 mrad half-angle divergence  
(Approximate beam footprint at 100 m is 5 cm x 5 cm)  
**Laser Rep Rate:** 200 Hz nominal  
**Data Rate:** ~200 Hz raw counts for uncalibrated operation  
~10 Hz for calibrated operation (averaging algorithm seeks 8 good readings)  
**Accuracy:** +/- 1 m on 1x1 m<sup>2</sup> diffuse target with 50% (+/-20%) reflectivity  
Optimum accuracy is achieved by underfilling target with laser  
Accuracy is enhanced by averaging N readings ( ~1/√N)  
12 bit A/D resolution limits range resolution to 1:2000  
Longer range units provide better stability and accuracy on smaller targets at longer distances.  
**Resolution** 0.2 m  
**Power:** 7-9 VDC conditioned power  
~200 mA current draw at full power ( ~ 1.8 W)  
**Dimensions:** 32 x 78 x 84 mm (lens face cross section is 32 x 78 mm)  
**Weight:** < 8 oz  
**Casing:** RS100/RS400/RS800 units are supplied as OEM modules consisting of an open chassis containing optics and circuit boards. Custom housings can be designed and built on request.

**Note:** Maximum distance is achieved when using the 'Averaged Range' mode (Mode 'R'), due to internal data sorting and post-processing algorithms.

## Available Serial Commands:

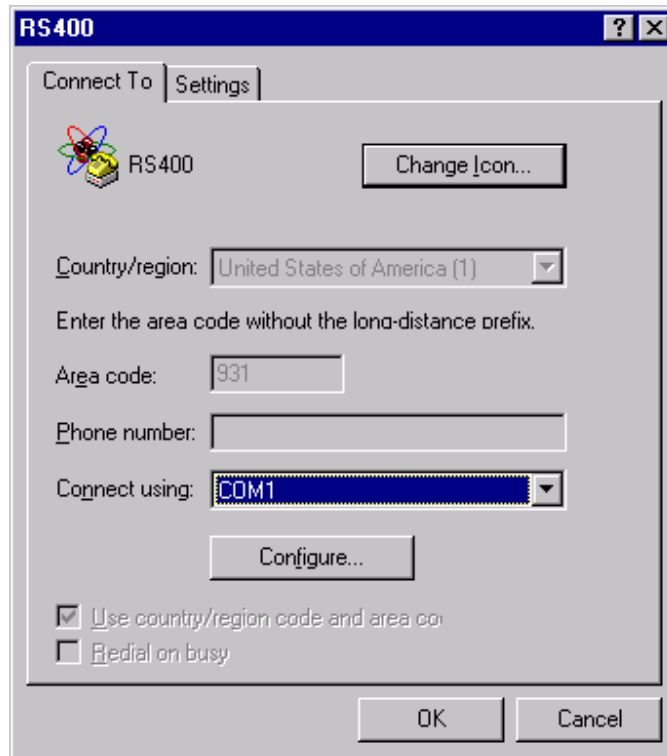
Note: All serial commands should be followed by a 'Carriage Return'.

<b>Change Units:</b>	'F'	Set mode 'R' or 'G' to report in feet (requires user to calibrate).
	'M'	Set mode 'R' or 'G' to report in meter (requires user to calibrate).
	'Y'	Set mode 'R' or 'G' to report in yards (requires user to calibrate).
	'O'	Stop mode command
<b>Data Reporting:</b>	'H'	<p><b>RAW COUNTS mode:</b> Start continuous range with the data output as raw range counts at a 200Hz interval. The data is output as an ASCII string with the following format: "COUNTS:XXXX" where XXXX is the relative range distance from 0 to 4095. To stop ranging, send the 'O' command.</p> <p>Note: If the RS module is aimed at a target that is outside of its receiving range, it will output a null counts reading: "COUNTS:0000"</p>
	'G'	<p><b>FAST RANGE mode:</b> Start continuous range with the data output as feet, meters, or yards at approximately 200Hz. The unit must be calibrated first for this mode to function properly. The data is output as an ASCII string with the following format: "DIST:XXXX.YYU" where XXXX.YY is the calculated distance and U is the unit of measure. To stop ranging, send the 'O' command.</p> <p>Note: If the RS module is aimed at a target that is outside of its receiving range, it will output a null distance reading: "DIST:0000.00Y" (or respective unit of measure)</p>
	'R'	<p><b>AVERAGED RANGE mode:</b> Start continuous range with the data output as feet, meters, or yards at approximately 10 Hz. The unit must be calibrated first for this mode to function properly. The data is output as an ASCII string with the following format: "DIST:XXXX.YYU" where XXXX.YY is the calibrated average distance and U is the unit of measure. To stop ranging, send the 'O' command.</p> <p>Note: If the RS module is aimed at a target that is outside of its receiving range, it will not yield an output. In Averaged Range mode, the RS module must receive enough 'good data' to produce an accurate calibrated range measurement.</p>
<b>Status:</b>	'B'	Reports the current status of the instrument Feet, Meters, or Yards and High Speed, Calibrated range, or idle.
<b>Power Up/Down:</b>	'P'	Toggles the power state of the rangefinder module. When the module is 'Idle' Mode (not ranging), sending this command will shut down the power to the laser and receiver sections of the module. This can be used as a power conserving mechanism in an application. While the unit is powered down, sending either an 'H', 'G', or 'R' will power up the unit and begin ranging.
<b>Calibration Commands:</b>	'S' + value	Use to enter in your short-distance calibration value, measured in yards. Example: entering "S7.5" followed by a carriage return will save the short-distance calibration value at 7.5 yards.
	'L' + value	Use to enter in your long-distance calibration value, measured in yards. Example: entering "L175" followed by a carriage return will save the long-distance calibration value at 175 yards.
	'C'	Enter Calibration Mode. When the unit is in calibration mode, it will output a raw count ASCII sting in the format: "XXXX" where XXXX is the relative range distance from 0 to 4095. Once in calibration mode, the unit will be waiting for the 'D' command to record the short-distance calibration value.
	'D'	Confirms the short or long distance calibration value. Used after the 'C' or 'A' calibration commands once the unit is aimed and hitting the desired calibration targets.
	'A'	Continues Calibration Mode. When the unit is in calibration mode, it will output a raw count ASCII sting in the format: "XXXX" where XXXX is the relative range distance from 0 to 4095. Once returned to calibration mode, the unit will be waiting for the 'D' command to record the long-distance calibration value.

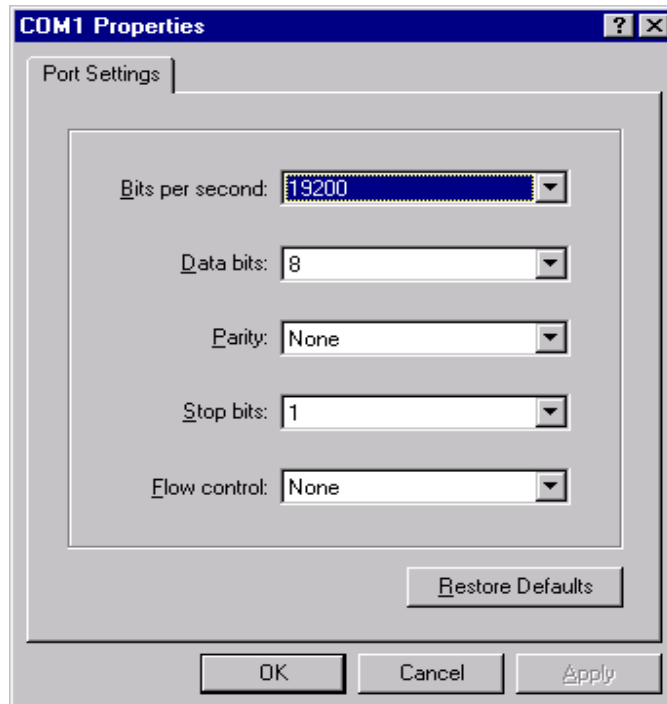
## Setup and Testing Using Windows Hyper Terminal

### *Hyper Terminal Setup:*

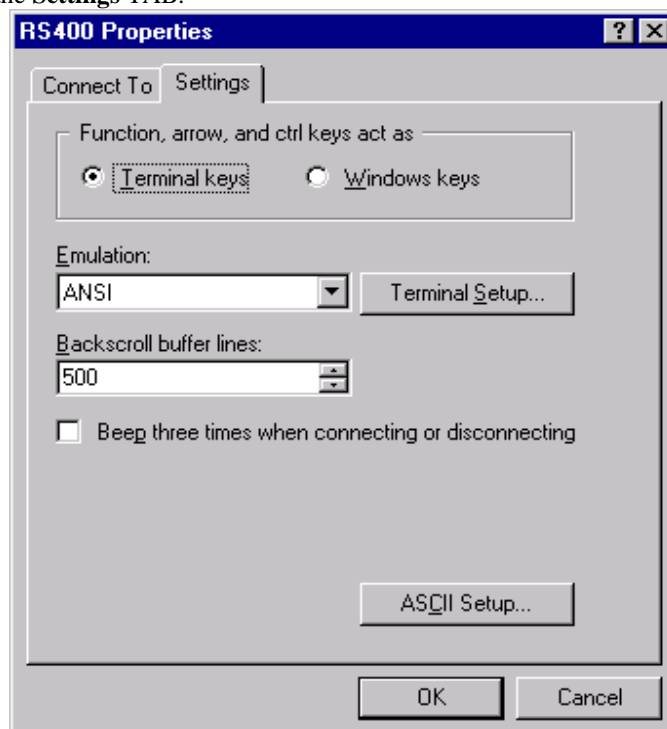
1. Connect the RS100/RS400/RS800 to an available communications port on the PC.
2. Start Hyper Terminal.
3. The following screen shots show the proper configuration.
  - Select **File | Properties**.
  - Change the *Connect using:* to the communications port connected to the RS400 unit (COM1, COM2, COM3, etc.).



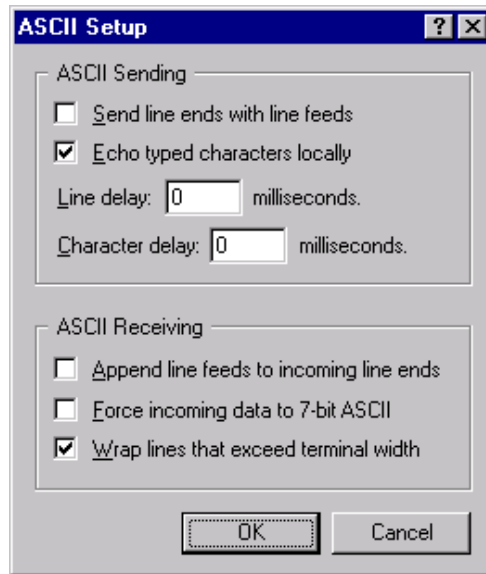
- Select Configure.
- Configure the program as shown in the screen shots below.



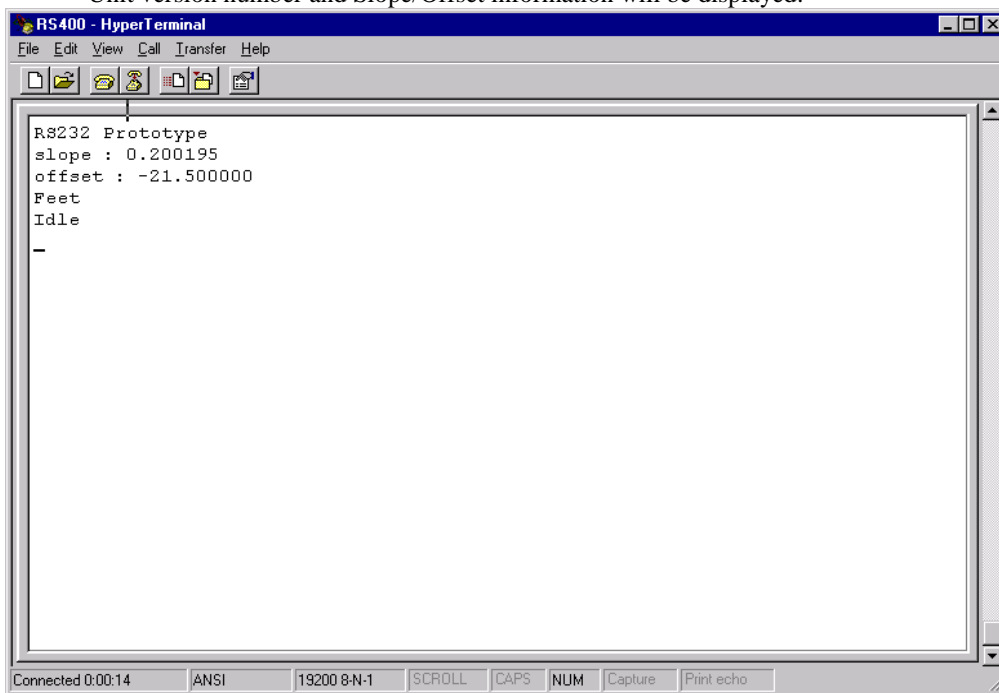
- Select OK.
- Select the **Settings** TAB.



- Configure as shown.
- Select **ASCII Setup...**



- Configure as shown.
- Select **OK** and **OK**.
- This should return to the standard hyperterminal terminal window.
- Select **Call | Disconnect**.
- Select **Call | Connect**.
- Power the RS unit.
- Unit version number and Slope/Offset information will be displayed.

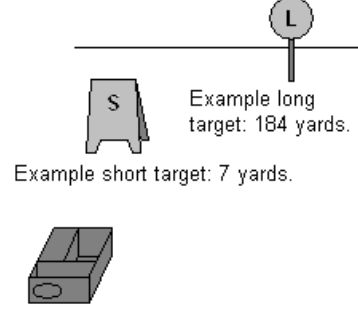


- Use the associated keys from Available Serial Commands: to operated the unit. For instance if you wish to toggle the calibrated range on and off press "'R' ENTER."

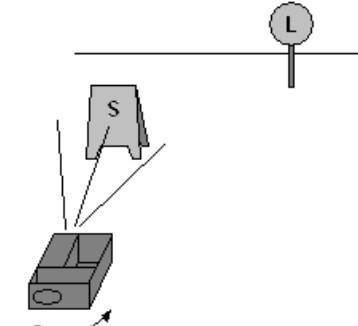
## Calibration Procedure:

Pick out two targets, one at a known short distance and one at a known long distance. The correct distances, measured in yards, need to be **known** to do the proper calibration. For this example we will use an 7.0 yard and a 184 yard target.

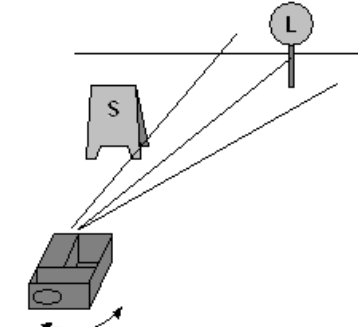
1. Connect the RS unit to a communication program (see Sections above) that is compatible with the RS232 communications protocol, (i.e. Hyper Terminal).
2. Supply power to the RS unit and make sure you received the unit Status string to confirm that the unit and communications program are talking.
3. Send the short calibration distance by typing **SX.X**, where X.X is the distance to the short target in YARDS, and hitting '**Enter**'. For our example, we would type **S7.0** (you can also just type **S7** without the decimal) then hit '**Enter**'.
4. Send the long calibration distance by typing **LXXX.X**, where XXX.X is the distance to the long target in YARDS, and hitting '**Enter**'. For our example, we would type **L184.0** (you can also just type **L184** without the decimal) then hit '**Enter**'.

 <p>Example short target: 7 yards.</p> <p>Example long target: 184 yards.</p>	<p>Example Data:</p>	<p>Type Commands:  <b>S7.0</b> "Enter"  <b>L184</b> "Enter"</p>
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5. Type **C** then hit '**Enter**' to start the calibration process. You should see raw distance data sent to your communications program.
6. Aim the RS unit at the short distance target.

	<p>Example Data:</p> <p>870 ← missing short target  871  871  870  118 ← hitting short target  117  118  117  898 ← missing short target  897  898  898</p>	<p>Type Commands:  <b>C</b> "Enter" ← starts short calibration search.</p> <p>When satisfied the short target is being ranged, type:  <b>D</b> "Enter" to store calibration value.</p>
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7. When you are satisfied you are hitting the correct short distance target (scanning the unit slowly across the intended target and looking for the lowest distance data numbers is a good way to correctly identify your target) type **D**, then '**Enter**' to set the short calibration number.
8. Aim the RS unit at the long distance target.
9. Type **A**, then '**Enter**'. You again should see raw distance data sent to your communications program.

	<p>Example Data:</p> <p>870 ← missing long target  871  871  870  544 ← hitting long target  542  543  544  898 ← missing long target  897  898  898</p>	<p>Type Commands:  <b>A</b> "Enter" ← starts long calibration search.</p> <p>When satisfied the long target is being ranged, type:  <b>D</b> "Enter" to store calibration value.</p>
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10. When you are satisfied you are hitting the correct long distance target type **D**, then '**Enter**' to set the long calibration number, and finish the calibration procedure.