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# CruzPro<sup>®</sup>

## MaxRp110

CE



4/8 Channel  
NMEA 0183 Data Repeater

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# Introduction

The MaxRp110 remote NMEA 0183 data repeater will simultaneously display five sets of data on three digital displays and two bar graphs. The MaxRp110 can display up to eight separate NMEA 0183 data sentences arriving on four different NMEA 0183 inputs. You can view NMEA data such as depth, wind speed/direction, GPS bearing and distance to waypoint, exhaust gas temperature, battery volts, etc.

The MaxRp110 recognizes over 5,800 different NMEA sentences which can be displayed in a variety of different formats. High and Low alarms can be set for each set of data. Display damping can be programmed for four of the eight input channels to average the readings and slow the speed at which the displayed value can change.

Separate scaling and end limits can be set for the two bar charts so you can zoom into the data range of interest. For example you can set a bar chart limit from 0.00 to 24.00 to view NMEA battery volts or you could zoom into the range of 11.25 to 12.50 if you wish.

You can quickly switch between sixteen different sets of display configurations for each of the three digital displays and the two bar charts using the front panel keys. Display configurations 1 - 6 have been factory pre-programmed to display some popular NMEA data but can easily be reprogrammed to show different NMEA data.

The front panel keys are also used to select from five backlight levels (including OFF). Backlights can also be externally switched ON/OFF. A built-in editor enables you to set/change alarm levels and change display damping. Changes are automatically saved to a nonvolatile memory.

There are 19 different icons such as “DEPTH”, “RPM”, and “SPEED”

that you can display to help you understand what data is being viewed. The figure below shows all the icons that are available for your use. You have complete control over which icons are displayed on any of the 16 display configurations.



The MaxRp110 is supplied with software that runs under Windows 98, WinXP, WinNT, Win2K and Vista to select NMEA sentences, edit the display configurations, set high and low alarms and display damping values. Settings can be quickly uploaded to the MaxRp110 using either a RS232 port or USB port (using the supplied serial to USB converter).

The internal software can be updated via the internet to add additional features as they become available. The MaxRp110 works on both 12 VDC and 24 VDC.

# Installation and Wiring

*Before starting the installation, please read this entire section first. Finger tighten the screws that mount the instrument bracket - It is not necessary or recommended to use tools.*

- Drill a 2-1/8" (55mm) mounting hole where you desire to mount the instrument (Figure 1).
- Remove the adhesive backing protection from the bulkhead gasket and carefully align the waterproof bulkhead gasket on the back of the instrument.
- Connect the various wires as shown in Figure 2.
- Carefully check all your wiring then mount the instrument in the hole. Use only finger tension to tighten the bracket hold-down nuts

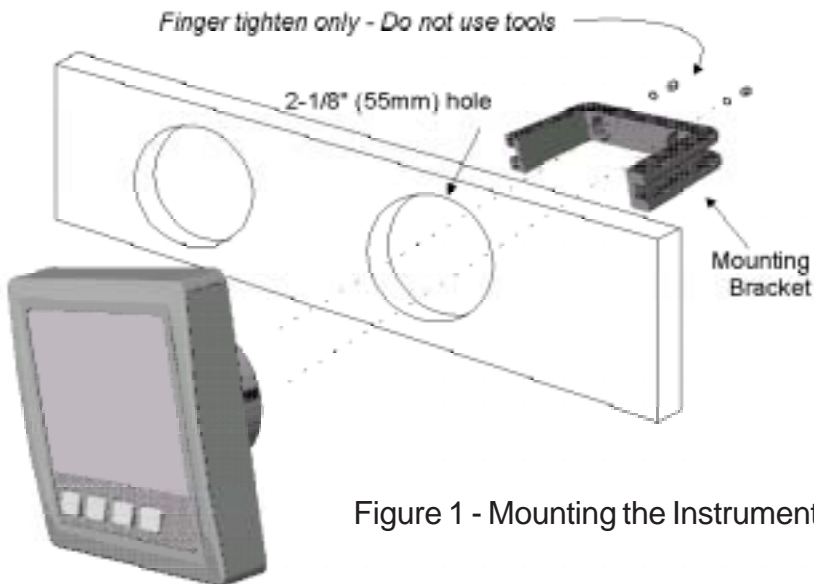
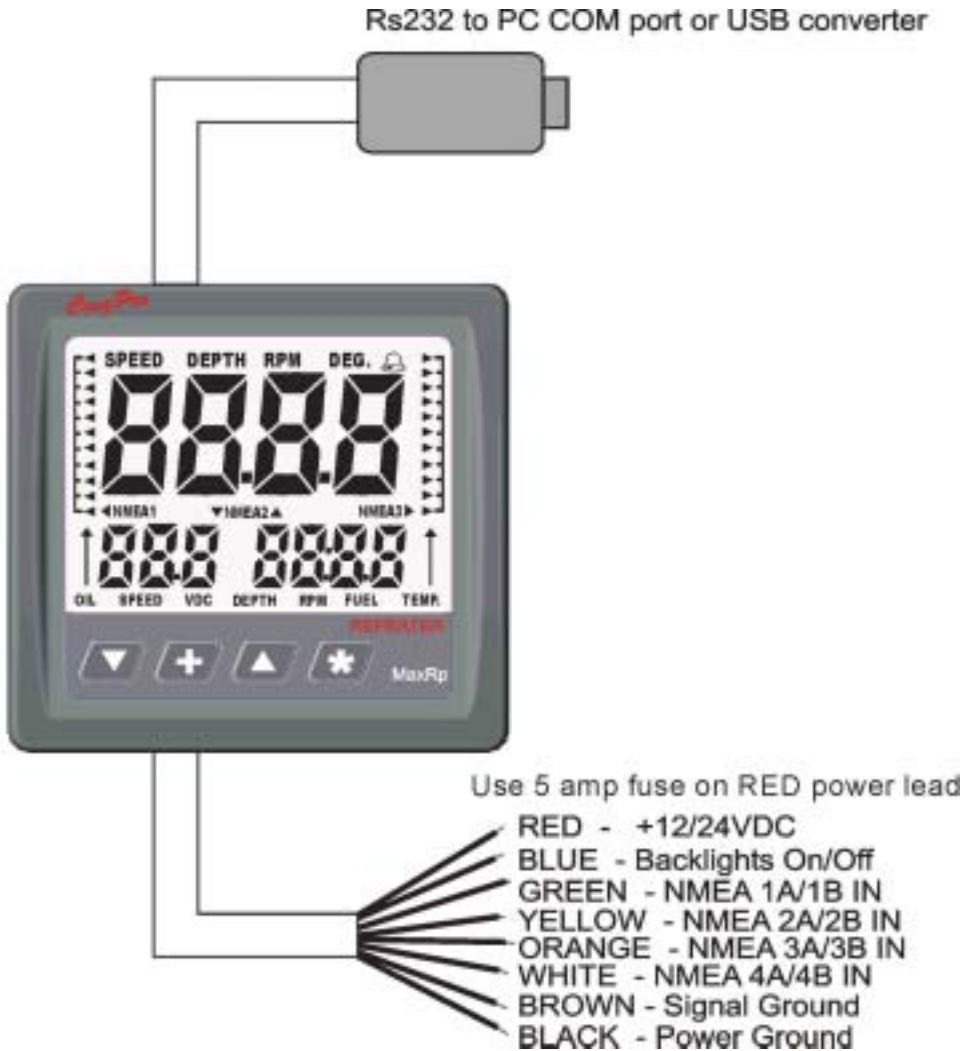


Figure 1 - Mounting the Instrument

Figure 2 - MaxRp110 Wiring Diagram





# Operation of the MaxRp110

## Key Functions

The **t**, **:**, **S** and **\*** keys are used to select and set backlight levels, select display configurations, view/set alarm values and display damping. Changes are automatically saved to a nonvolatile memory. A complete summary of all the possible key functions is shown in Appendix G.

## Turning Display ON/OFF

Press and hold the **\*** key for five seconds to turn the MaxRp110 **display OFF** or simply switch off the **power to screw terminal “A”**. Press and hold the **\*** key for three seconds to re-enable the **display**.

## Changing and Controlling Backlight Intensity

Press the **:** key for 1/2 second to adjust the backlight level for night viewing. Each time you press the **:** key for 1/2 second, the level will get brighter 1, 2, 3, 4, OFF, 1, 2, ... etc. The backlight ON/OFF wire provides external backlight control and this wire must be switched to +12/24V for the backlights to work.

## Selecting a Display Configuration

Simultaneously press both the **S** and **\*** keys or press both the **t** and **\*** keys to cycle UP or DOWN through the sixteen display configurations. Display configurations 1 through 6 are programmed at time of manufacture with the configurations shown in Figures 4 to 9. Display configurations 7 through 15 are left unprogrammed. Display configuration 16 is a factory test configuration. You can delete or change these display configurations at any time using the supplied Windows software. Any changes are automatically stored to a nonvolatile memory.

## Summary of Display Configurations 1-16

Each time you select a new display configuration the Current Display Configuration number (in this case #1) is displayed for one second as shown in Figure 3. After one second the display shows the data for display configuration #1 as shown in figure 4. All 16 of the factory default display configurations are shown in figures 4-10.

Figure 3 - Current Display Configuration (#1)



Figure 4  
Display configuration 1

Depth (NMEA#2A on Display #1)  
Boat Speed (NMEA#1A on Display #2)  
Sea Water Temp.(NMEA#1B on Display #3)



**Figure 5**  
**Display configuration 2**

Boat Speed (NMEA#1A on Display #1)  
Battery Volts(NMEA#3A on Display #2)  
Depth (NMEA#2A on Display #3)



**Figure 6**  
**Display configuration 3**

Depth (NMEA#2A on Display #1)  
Bearing to GPS Waypoint (NMEA4A on Display #2)  
Distance to GPS Waypoint (NMEA4B on Display #3)



**Figure 7**  
**Display configuration 4**

Depth (NMEA#2A on Display #1)  
Battery Volts(NMEA#3A on Display #2)  
Sea Water Temp.(NMEA#1B on Display #3)

**Figure 8**  
**Display configuration 5**

Depth (NMEA#2A on Display #1)  
 Boat Speed (NMEA#1A on Display #2)  
 Bearing to GPS Waypoint (NMEA4A on Display #3)



**Figure 9**  
**Display configuration 6**

Boat Speed (NMEA#1A on Display #1)  
 Bearing to GPS Waypoint (NMEA4A on Display #2)  
 Distance to GPS Waypoint (NMEA4B on Display #2)  
 Depth (NMEA#2A on Left Bar Chart)  
 Sea Water Temp.(NMEA#1B on Right Bar Chart)

**Figure 10**  
**Display configurations 7-15**  
 Not Programmed

**Display configuration 16**  
 Factory Test Page (May be deleted)



## Turning Alarms ON/OFF

To “arm” the alarms, press and hold the ▲ key 1/2 second. The Bell symbol will be displayed when the alarms are “armed”. To disable the alarms press and hold the ▼ key for 1/2 second. Any press between 1/2 and 2 seconds will work. A press of less than 1/2 second or longer than 2 seconds will be ignored. When an alarm value is breached, the affected display or barchart will flash and if the alarms are armed, the internal 85dB alarm buzzer will sound. If the alarms are not armed, then the display will flash but no audible alarm will sound.

## Setting High and Low Alarm Values

To View and/or Set the High Alarm value for any of the five current displays, press and hold the ▲ key for ten seconds (until you hear a long beep). To View and/or Set the Low Alarm value for any of the displays, press and hold the ▼ key for ten seconds. The alarm value, display identifier (1, 2, 3, L or r) and the word “HiAL” or “LoAL” will be displayed as shown in Figure 11. Quick press the + key to select the desired display (1, 2, 3, L or r). Press and hold the ▼ or ▲ keys to change the alarm value. Press the + key for 1 second (until the long beep) to accept the new alarm values, save them to memory and exit the Alarm Editor mode.



**Figure 11 - Alarm Editor**

Editing the Hi Alarm  
for display #3

To prevent confusion, the High and Low alarm values are unique for each Data Source (NMEA1A, NMEA2B, etc.). For example, if you change the high alarm

value for NMEA2B in one display configuration, then the high alarm value for NMEA2B will automatically change for each display configuration where NMEA2B is displayed.

### Setting Display Damping

It is possible to slow down how fast the numbers on the display change by adding “Display Damping” to NMEA channels 2A, 2B, 3A, and 3B. Filter values between 0 (No damping) and 250 (Extremely slow response) are allowed.

Press and hold both the ▼ and \* keys for ten seconds to enter the Display Damping Editor (until you hear a long beep). The filter value, display identifier (1, 2, 3, L or r) and the word “Filt” will be displayed as shown in Figure 12. Quick press the + key to select the desired display identifier (1, 2, 3, L or r). Press and hold the ▼ and ▲ keys to change the filter value. Press the + key for 1 second (until the long beep) to accept the new value, save it to memory and exit the Display Damping Editor mode.

If the selected data source cannot be filtered (such as NMEA4A or NMEA1B) then “---” will be displayed for the Filter value.



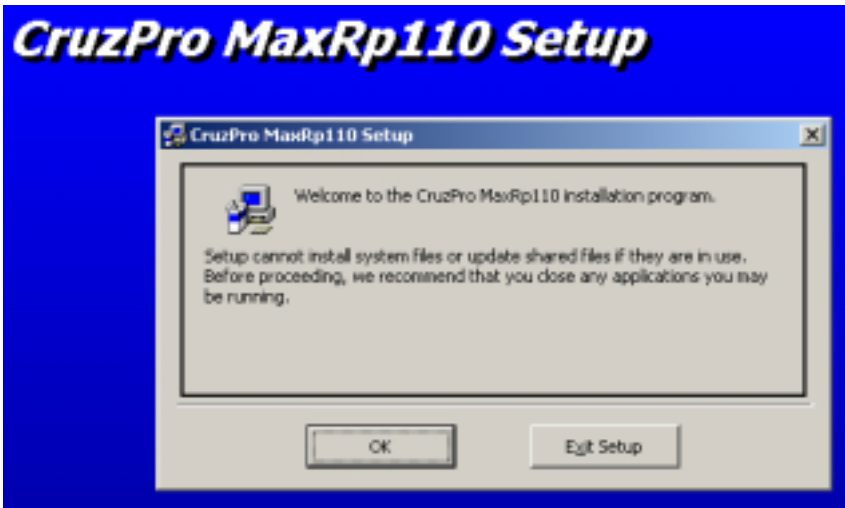
**Figure 12 - Display Damping Editor**

Setting the Filter Value to “7” for the Data Source shown on digital display #3

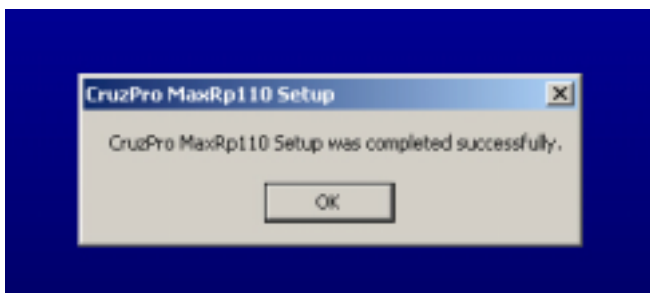
# Operation of the Windows Software

## Software Installation

Place the distribution CD into your CD/DVD drive and the install program should launch automatically. If it does not, click on “Start”, “Run” and type “D:\setup.exe” (substitute your CD ROM drive letter for “D” if your CD ROM is on another drive than “D”).



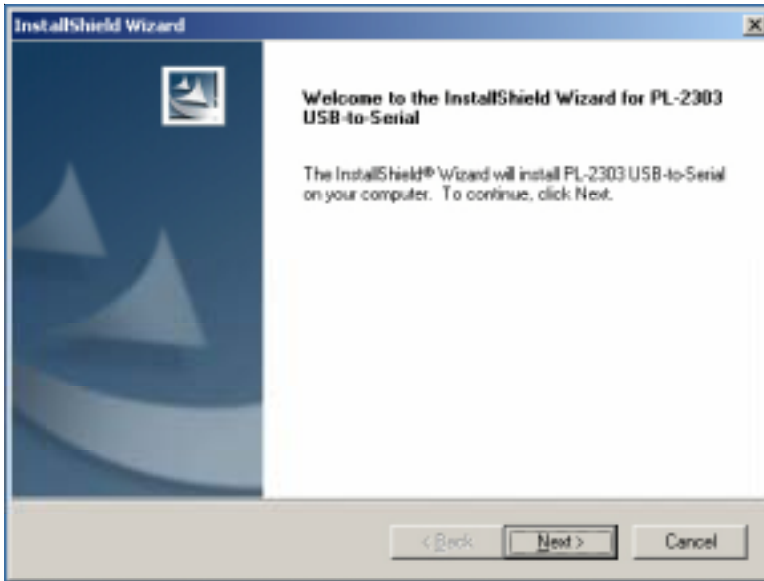
Click OK and follow the instructions. Use the defaults unless you have a good reason not to. If the installation was successful, you should see:



If you connect to the MaxRp110 to your PC using a RS232 serial port then you can skip the following USB Driver Installation section and proceed directly to the “Connecting to the MaxRp110” section.

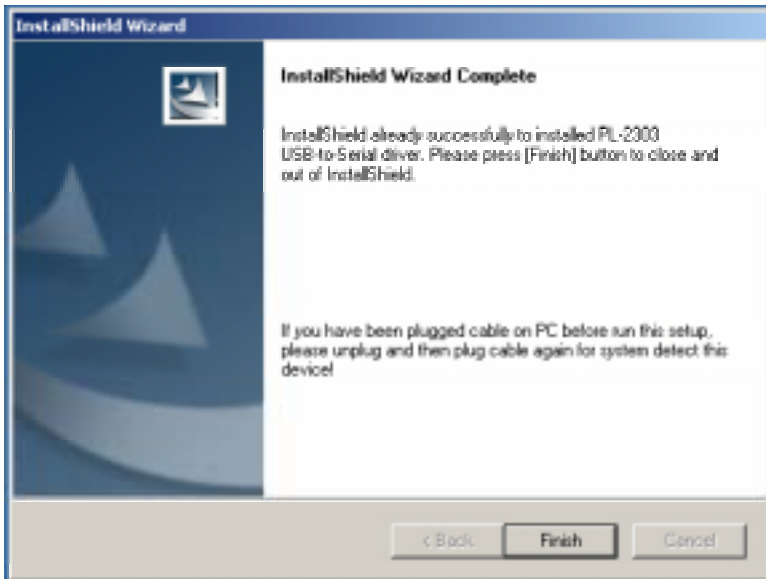
### USB Driver Installation

If you plan to connect to the MaxRp110 with a USB cable you will first need to install the USB driver BEFORE you plug the supplied USB cable into your PC. Place the distribution CD in the CD ROM drive and navigate to the “DRIVERS” directory. Double click and run the program: HL-2303.EXE. After a few seconds you will see the following screen:

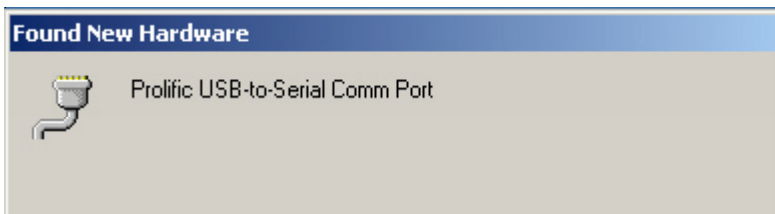


Click “Next” and click “Finish” when you see the following screen:





Now plug the supplied USB/RS232 cable into the MaxRp110 instrument and your PC USB port. The first time you plug the USB cable into your PC Windows will detect the new hardware and install the correct driver. Depending on your version of Windows after a few seconds you will see a message similar to:



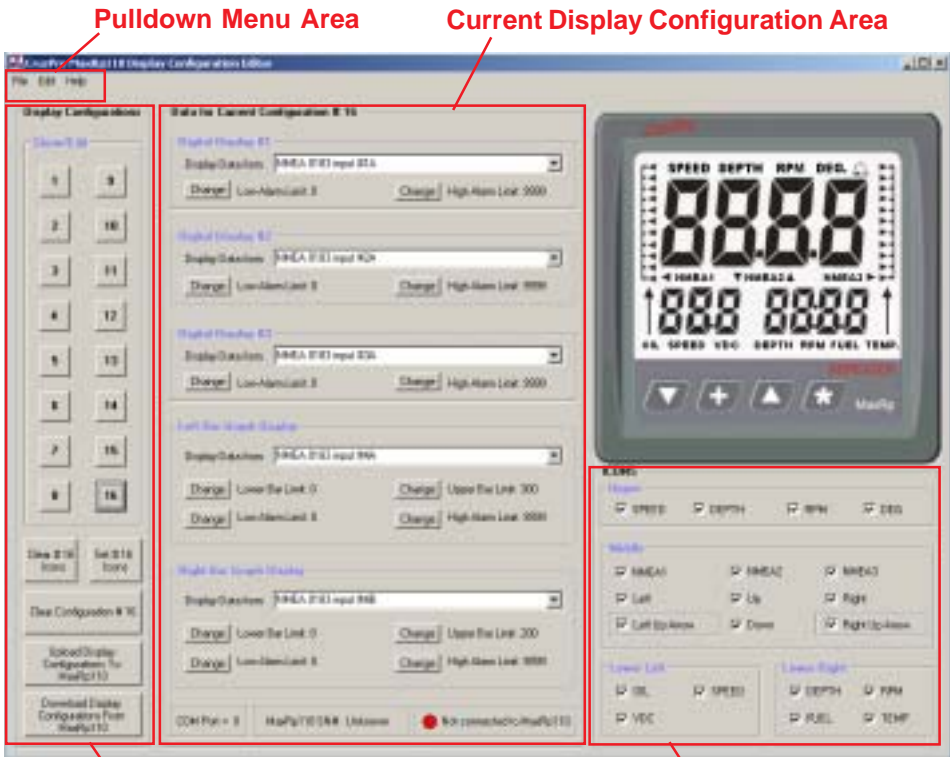
Your USB cable is now ready to use.

## Connecting to the MaxRp110

Connect the MaxRp110 to your PC using either a RS232 cable or the supplied USB cable (See USB Driver Installation FIRST). The Windows software will look for the MaxRp110 instrument when you wish to upload or download information to or from the instrument.

## Main Screen

The Main Screen is divided into 4 areas: Pulldown Menus, Display Configurations, Data for Current Display Configuration and an ICONS area.



Display Configurations Area

ICONS Area

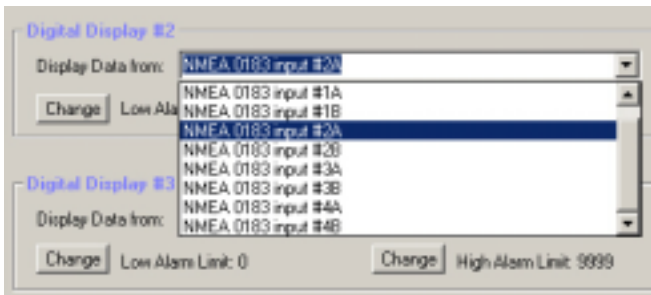
## Display Configurations Area

The data being displayed, where it is displayed and the alarm limits for each display is called a “Display Configuration”. The Display Configurations Area shows 16 buttons numbered 1 to 16 corresponding to each of the 16 possible display configurations. When you click on one of the 16 buttons all the information in the “Current Display Configuration” area and the “ICONS” area will be updated to show the correct information for that Display Configuration.

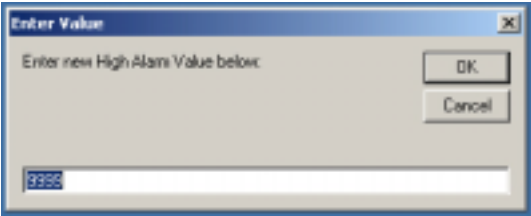
In addition to the 16 display configuration buttons, there are 5 buttons that will clear or set all the icons for the current display configuration or completely clear both the current display configuration and all the icons for the current display configuration. The two remaining buttons in the Display Configuration area are used to upload display configurations to the MaxRp110 and download display configurations from the MaxRp110 (See “Uploading and Downloading Display Configurations”).

## Current Display Configuration Area

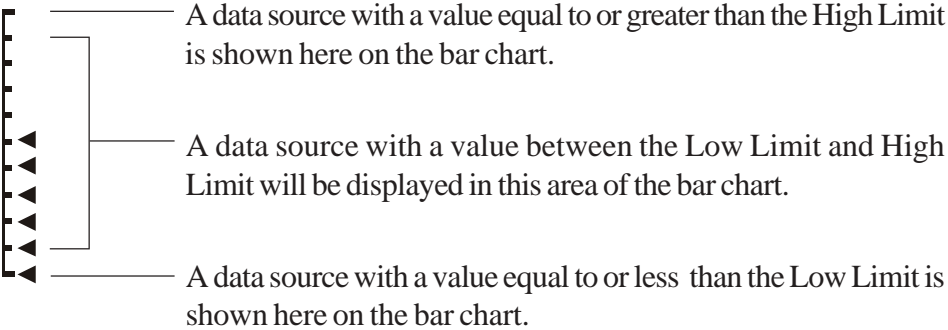
*Data Sources:* All the information that specifies what data sources to display in each of the three digital displays and the two bar charts, the alarm limits and the upper and lower bar chart limits are defined in the Current Display Configuration area. Each of the three digital displays and two bar charts show what Data Source is going to be shown on the MaxRp110 LCD. Clicking the ▼ button in one of these areas results in a pulldown menu listing all the NMEA 0183 Data Source options available for that display as shown below. You can scroll through the list of up to 8 different NMEA inputs and select the item you wish to see.



*High and Low Alarm Values:* The High and Low alarm values assigned to the data source for each of the five displays (1, 2, 3, L, R) are shown in the Current Display Configuration area with a “change” box next to each. Clicking the “Change” box allows you to change the High and Low alarm limits as shown below. **Be sure to read the warnings about alarms in the *Important Notes and Warnings* section about which conditions will sound an audible alarm.**



*High and Low Limit Values for Bar Charts:* Similarly the High and Low Limit values of the two bar charts are shown in the Current Display Configuration area along with “Change” boxes. Clicking on the “Change” box allows you to change the High and Low Limit values for the two bar charts. The high limit is the value that displays at the top of the bar chart and the low limit is the value that displays at the bottom of the bar chart.



Selecting the High and Low Limit values appropriately allows you to scale the data or “zoom” into the area of interest to you. For example if you direct the battery voltage of a 12V battery to one of the bar charts you can set the Low Limit value at 11.5 V and the High Limit value to 12.5 V providing an expanded scale for battery voltage. The High and Low Limit values are completely independent of the high and low alarm limits.

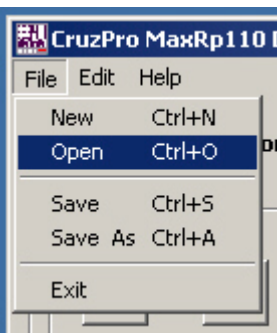
## ICONS Area

Icons are words or symbols like the word “DEPTH” or “SPEED” that help remind you what data is being displayed. The ICON area contains numerous checkboxes - one for each possible display icon. Checking a box will cause that icon to be “On”. Unchecking the box will clear that icon from the display. The icons are not specifically tied to any data source. You have the freedom to check or uncheck any or all the icons you want. Each of the 16 different display configurations has its own set of icons that you can set or clear.

## Pulldown Menu Area

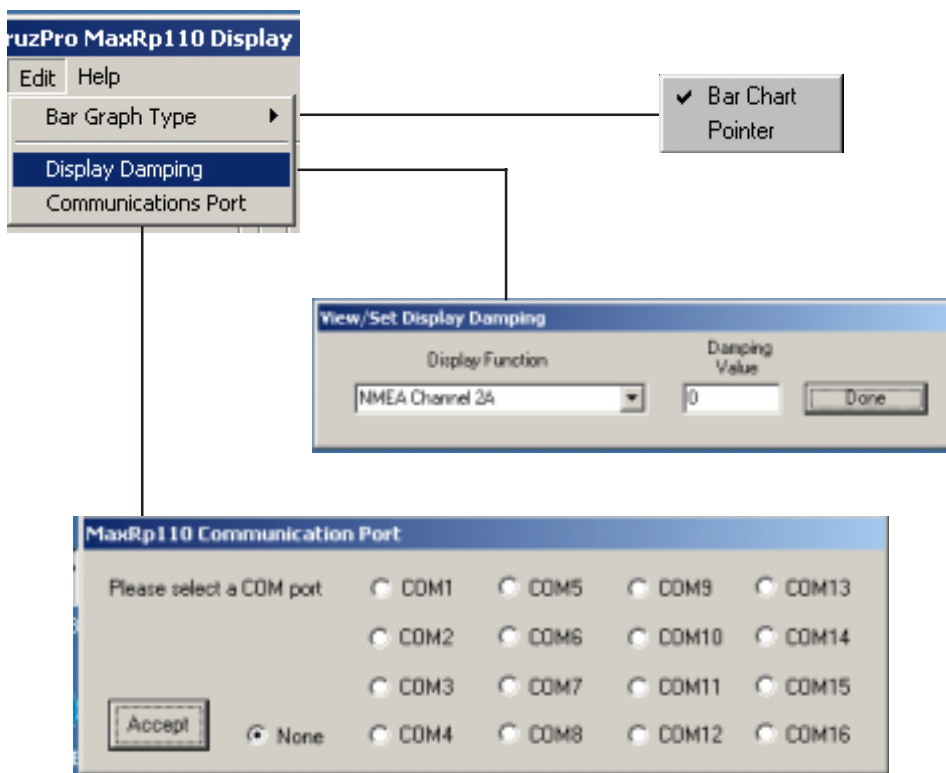
There are standard Windows pulldown menus to save/recall configuration files, edit various parameters such as Bar Graph Type, Display Damping or set the communications port to talk to the MaxRp110. Clicking on some pulldown menus can result in a second pulldown menu being displayed which may offer additional choices.

*Files Menu:* The Files menu shown below enables you to save and recall complete sets of Display Configurations along with the associated High and Low Alarm settings, High and Low bar chart limits and Icons. Clicking “Save” will



save the current set of display configurations into the default file which is loaded when the program starts. Clicking “Save As” will enable you to save the current set of display configurations into a new named file for later recall using the “Open” menu item. Clicking on “New” will clear the current display configurations to the factory defaults.

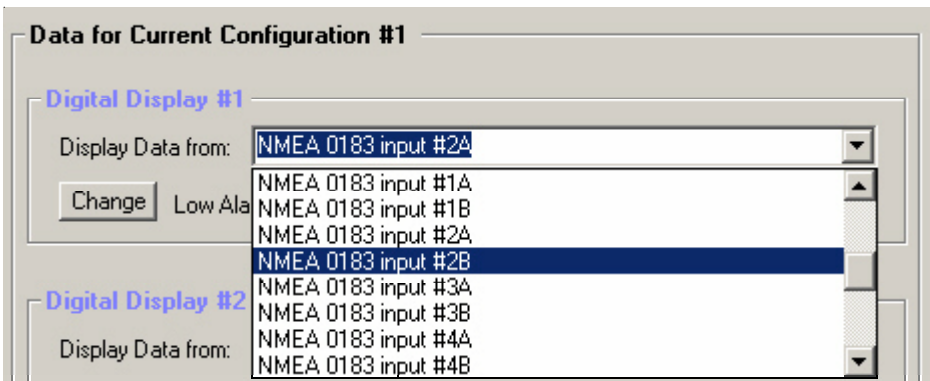
*Edit Menu:* The Edit menu is where you select from two different bar graph formats, set display damping for different Data Sources, etc. A summary of the Edit Menu choices are shown here:



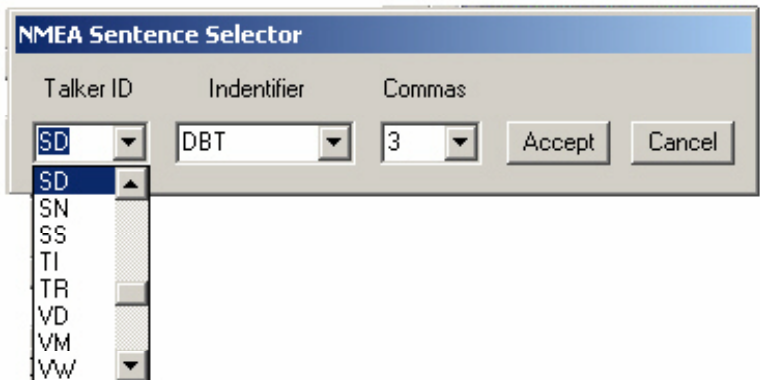
*Help Menu:* Click on the Help Menu to see the version number of the Windows software, the instrument internal firmware version and serial number.

### Selecting an NMEA Sentence to Display

The MaxRp110 can display up to eight different sets of NMEA 0183 data coming in on one of the four NMEA 0183 compatible input channels (up to two different sentences per data line). The selected data can be displayed on one of three digital displays or one of the bar charts. The NMEA data to be displayed is selected on the “Current Configuration” screen using the pull down menus.



When you click on one of the eight possible input channels (#1A to #4B) another pull down menu lets you select the NMEA 0183 string to search for as shown here:



You can select from 49 different “Talker ID’s” and 120 different sentence “Formatters”. You must also specify the correct data field to display by counting the number of commas. For example, a typical NMEA 0183 depth sentence output by many depth sounders is the \$SDDBT sentence shown here:

**\$SDDBT,015.7,f,004.8,M,002.6,F\*0D**

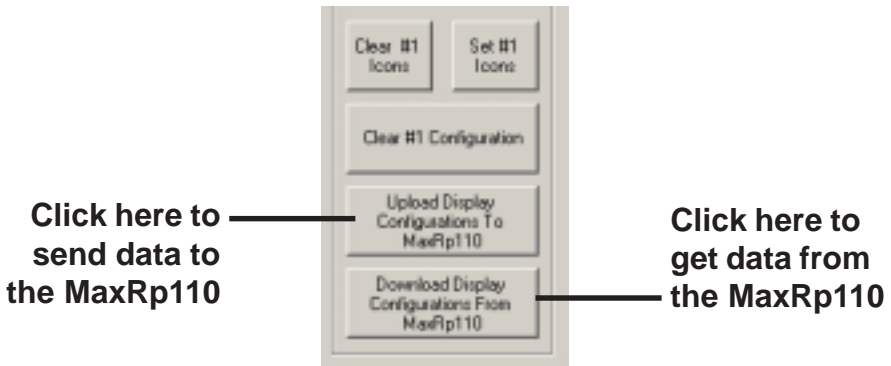
The first two characters after the \$ symbol “SD” (Sounder Depth) is called the Talker ID and the next three characters “DBT” (Depth Below Transducer) is called the Sentence Formatter. The complete list of NMEA 0183 Talker ID codes and Sentence Formatters is shown in Appendix F along with some limitations of what can and cannot be displayed on the MaxRp110.

In the above sample NMEA sentence the first field “015.7” is located after the first comma and contains the depth in Feet. The second field “004.8” is located after the third comma and contains the depth in Meters. By selecting the appropriate field and counting commas we can display depth in Feet, Meters or Fathoms on the MaxRp110.

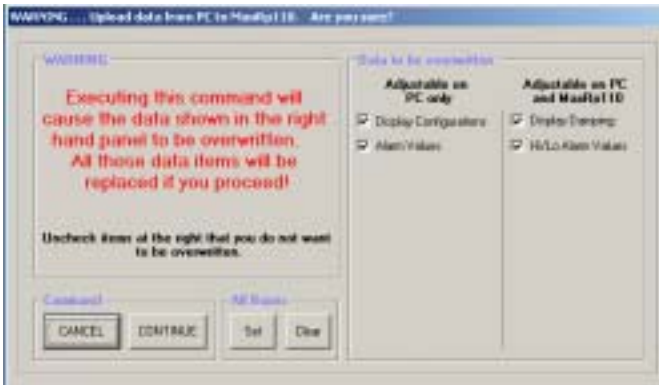


## Uploading and Downloading Display Configurations

To upload and download display configuration data to and from the MaxRp110 instrument you must connect it to your PC using either the RS232 serial connector or to a USB port using the supplied RS232/USB converter. **Turn off the power to the MaxRp110** and click the “Upload Display Configurations to MaxRp110” box or the “Download Display Configurations From MaxRp110” box in the display configurations area of the Windows software.

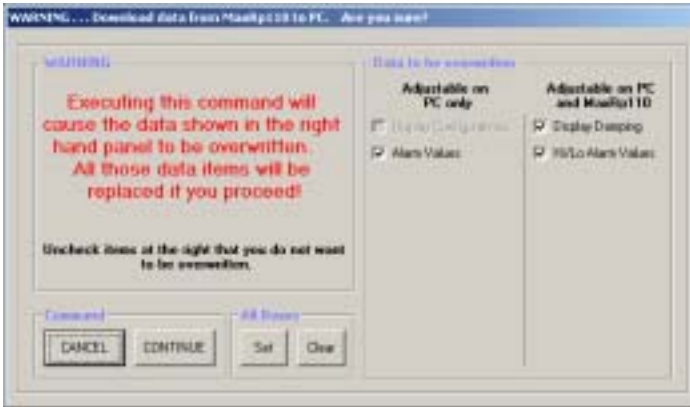


You will be shown a warning box and presented with the following choices when *uploading* data:

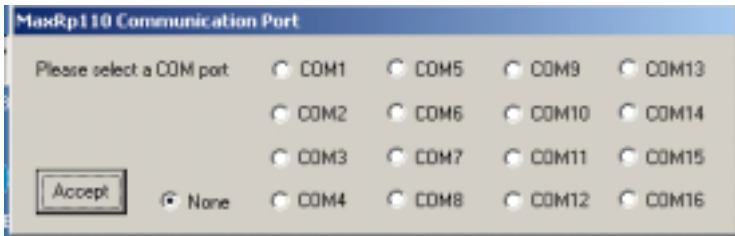


Uncheck the items that you do NOT want to transfer to the MaxRp110 and click CONTINUE.

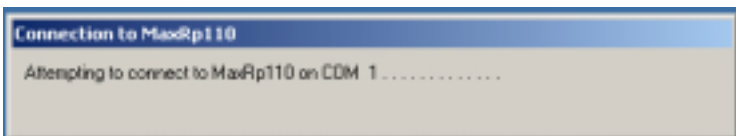
When *downloading* data from the MaxRp110 you will be shown a slightly different warning box. Uncheck the items that you do NOT want to transfer from the MaxRp110 to the PC and click CONTINUE.



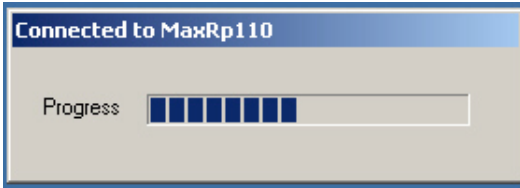
If this is the first time that you have transferred data between the MaxRp110 and the PC you will be asked which communications port to use to connect to the MaxRp110:



Select the port that connects to the MaxRp110 and the following information box is displayed while the PC tries to find the MaxRp110 instrument:

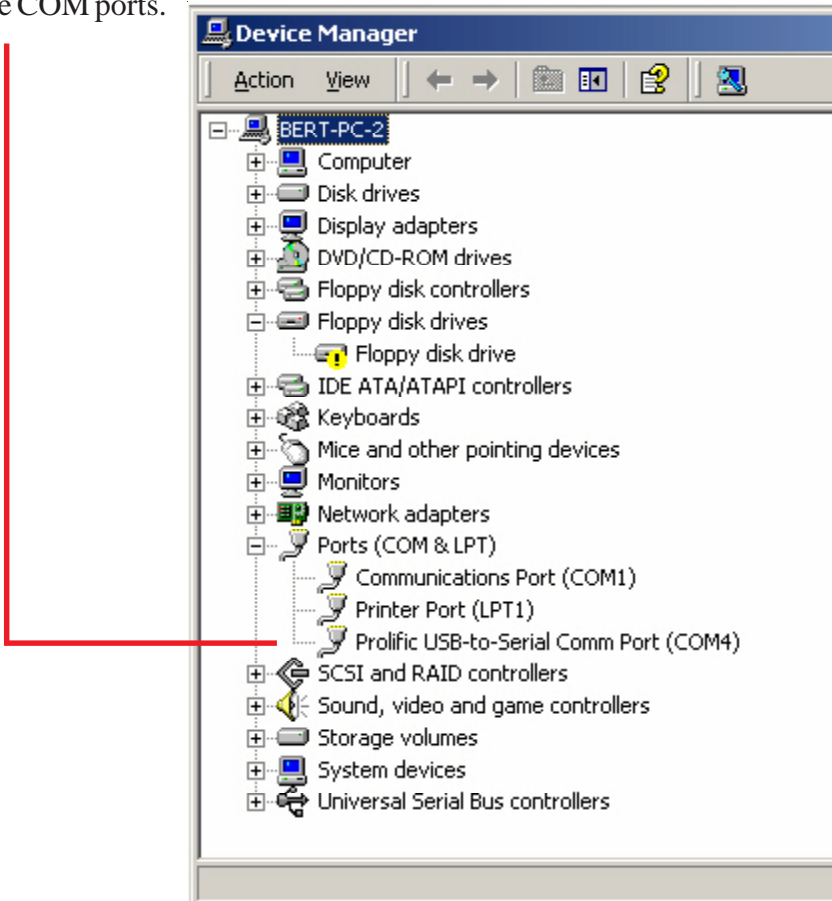


**Turn ON the MaxRp110 instrument** and a progress screen is displayed while the data is being transferred between the instrument and the PC.



**Progress screen displayed while data is being transferred between MaxRp110 and PC.**

If you do not know which communications port the MaxRp110 is connected to you can use the Windows Device Manager to show you the hardware configuration of the COM ports.



## Appendix A - Specifications

**Power supply:** 12/24 VDC (9.5 to 33.0), 0.10 A nominal

**Operating temperature:** 32° to 122° F ( 0° to 50° C)

**Size:** 4.3" x 4.3" x 3.5" deep (110 x 110 x 89 mm).

**Display:** LCD, 3 digital, 2 Bar Charts, 16 different configurations

**Backlighting:** 5 levels (including OFF), plus external backlight On/Off control.

**Alarms:** Individual high and low alarms for each of the 3 displays and 2 Bar Graphs

### **Data Sources/Inputs:**

NMEA1A and NMEA1B  
NMEA2A and NMEA2B  
NMEA3A and NMEA3B  
NMEA4A and NMEA4B

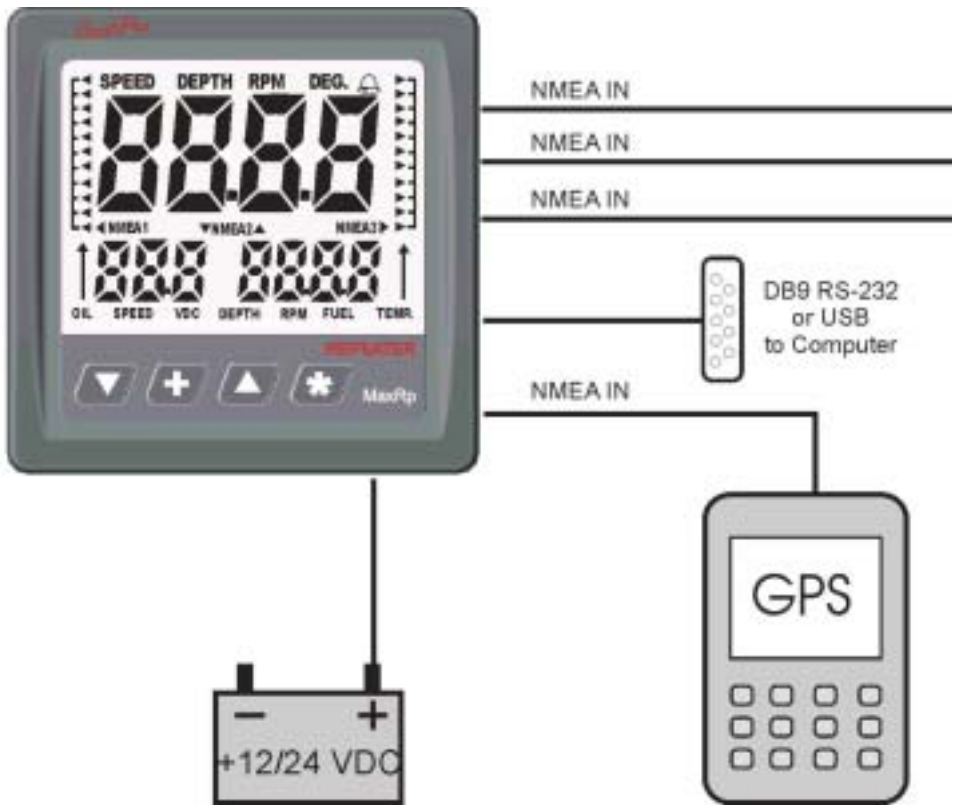
**Memory:** Nonvolatile memory for alarms, current display configuration, backlight levels, etc.  
Data retention for ten years without power.

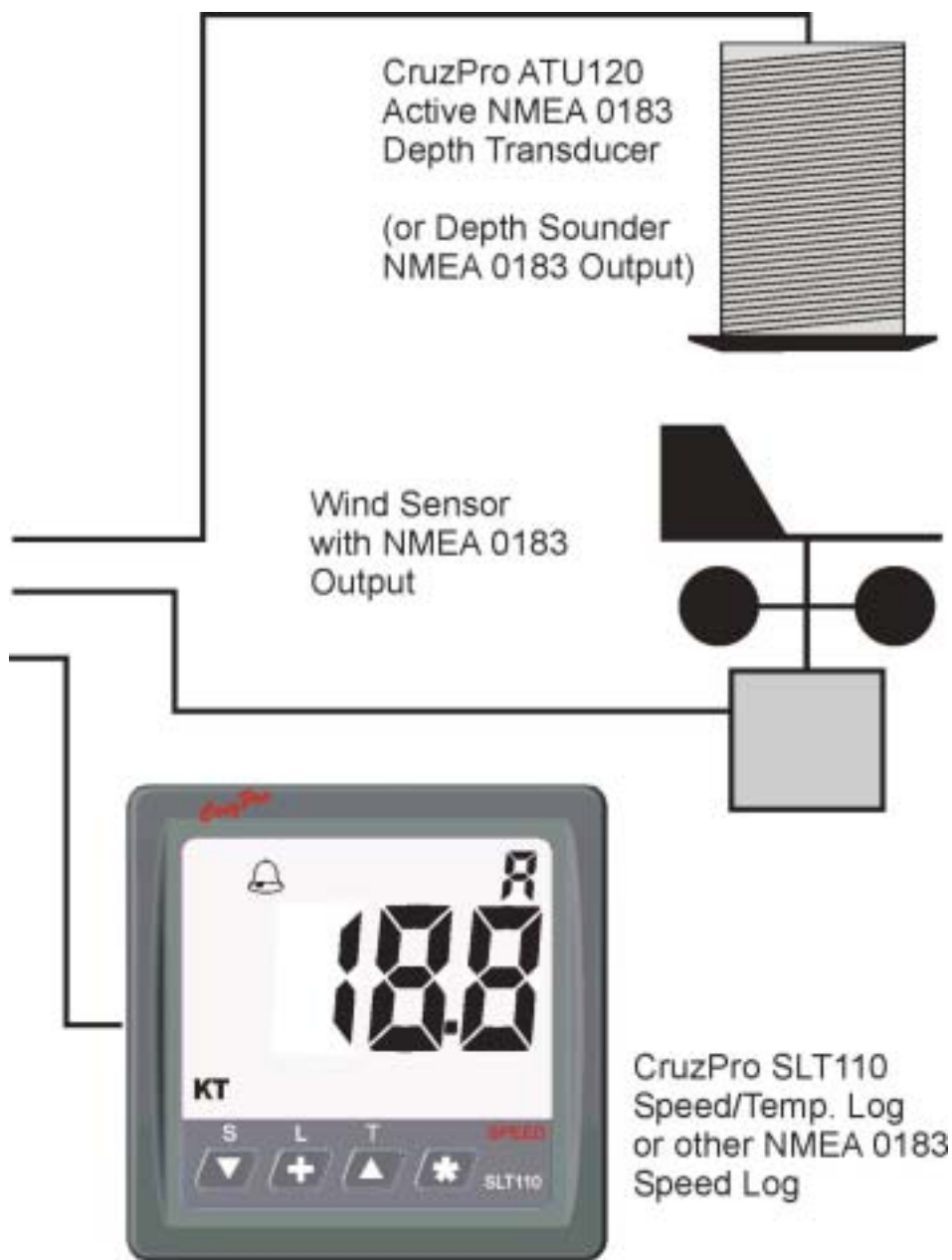
## **Appendix B - Packing List**

The MaxRp110 package is supplied with the following items:

- 1) MaxRp110 instrument
- 2) Dust/rain cover
- 3) Closed cell foam waterproof bulkhead gasket (adhesive one side).
- 4) USB/Serial converter
- 5) Printed user manual
- 6) Warranty card
- 7) Windows software CD with USB drivers, user manual

## Appendix C - Typical Setup





## Appendix D - Important Notes and Warnings

- 1) The front of the MaxRp110 is splash proof. The back is not sealed and must be protected from water.
- 2) The nonvolatile memory in the MaxRp110 will retain data for a minimum of 10 years without power.
- 3) The lines connecting to the +12/24V Battery should be protected from shorts by placing a 5 amp fuse near the battery side of the connection.
- 4) If you want an alarm to sound for a particular Data Source:
  - a) The alarms must be “armed” (i.e. the Bell symbol must be lit).
  - b) The Data Source value must fall outside the Low or High Alarm limits.
  - c) Only Data Sources being viewed on the display will activate the alarm:
- 5) The displayed value will show “----” or “---” if that Data Source cannot be displayed or modified. For example - while you can change “Display Damping” on NMEA channels 2A, 2B, 3A and 3B, you cannot change “Display Damping” on NMEA channels 1A, 1B or 4A, 4B. A “---” or “----” will be also be shown if the displayed number is larger than will fit on the display (e.g. the four digit number 1734 will not fit on 3 digit display).
- 14) Turning Power ON/OFF. Press and hold the \* key to turn the MaxRp110 **display** OFF. The clock will keep running. Press and hold the \* key again to enable the **display**. The Time-Of-Day clock will have to be set again **if you turn OFF the power to the MaxVu110 “A” terminal**.
- 7) After settings are changed it can take up to 30 seconds to save the data to the nonvolatile memory. If power is removed from the MaxRp110 during this time the changes may not be saved to memory and the older settings will be used when power is reapplied.
- 8) Both High and Low alarms for NMEA data can only be set in full units (i.e. full Feet or full Meters for Depth data, not tenths).
- 9) When using the t and S keys to change a value, holding them down will cause the value to scroll fast after three seconds and very fast after ten seconds.



## Appendix E - Key Function Summary

### *In normal display mode*

Keys		Secs	Function
▼	*	0.1	Scroll DOWN display configurations
	▲ *	0.1	Scroll UP display configurations
	+ *	0.1	Display Version and Serial Number for 5 seconds
▼		0.5	Disable Alarms (Turns off BELL symbol)
	+ *	0.5	Scroll UP through 5 backlight levels
	▲	0.5	Enable alarms (Turns on BELL symbol)
	*	5	Turn Power OFF/ON (Disable/Enable Display)

Keys		Secs	Function
▼		10	Enter "Set Low Alarm Values" Mode
	▲	10	Enter "Set High Alarm Values" Mode
▼	*	10	Enter "Set Display Damping" Mode

### *In “Set Low/High Alarm Values” Mode*

Keys	Secs	Function
<b>+</b>	0.1	Scroll through Display Number (1, 2, 3)
<b>▼</b>	0.1	Decrease displayed reading (hold to go faster)
<b>▲</b>	0.1	Increase displayed reading (hold to go faster)
<b>+</b>	1.0	Save new calibration value(s) to memory

### *In “Set Display Damping” Mode*

Keys	Sec.	Function
<b>+</b>	0.1	Scroll through Display Number (1, 2, 3)
<b>▼</b>	0.1	Decrease selected display damping (hold to go faster)
<b>▲</b>	0.1	Increase selected display damping (hold to go faster)
<b>+</b>	1.0	Save new value(s) to nonvolatile memory

## Appendix F - NMEA 0183 Search String Handling and List

Each NMEA input #1-4 can be programmed to search for two different NMEA 0183 strings. Each NMEA search string is identified with a one digit “Talker” index which point to a talker identifier such as “GP” for GPS, a one digit “Search String” index which points to a 3 character search string such as “RMC” and a one digit “Comma Counter”. The talker index, identifier and comma counter are stored as part of the Display Configuration.

Limitations on NMEA string decoding:

- a) Numbers larger than 9999 will display as “----” on a 4 digit display
- b) Numbers larger than 999 will display as “---” on a 3 digit display
- c) Negative numbers smaller than (less than) -999 will display as “----” on a 4 digit display
- d) Negative numbers smaller than (less than) -99 will display as “---” on a 3 digit display
- f) The bar charts will display both positive and negative NMEA 0183 numbers as positive.

Talker

Index	Talker ID Code
0	None - not used
1	AG Autopilot - General
2	AP Autopilot - Magnetic
3	CC Computer - Programmed Calculator (outdated)
4	CD Communications - Digital Selective Calling (DSC)
5	CM Computer - Memory Data (outdated)
6	CR Data Receiver
7	CS Communications - Satellite
8	CT Communications - Radio-Telephone (MF/HF)
9	CV Communications - Radio-Telephone (VHF)
10	CX Communications - Scanning Receiver
11	DE DECCA Navigation (outdated)
12	DF Direction Finder

13	EC	Electronic Chart Display & Information System (ECDIS)
14	EP	Emergency Position Indicating Beacon (EPIRB)
15	ER	Engine Room Monitoring Systems
16	GP	Global Positioning System (GPS)
17	HC	Heading - Magnetic Compass
18	HE	Heading - North Seeking Gyro
19	HN	Heading - Non North Seeking Gyro
20	II	Integrated Instrumentation
21	IN	Integrated Navigation
22	LA	Loran A (outdated)
23	LC	Loran C
24	MP	Microwave Positioning System (outdated)
25	OM	OMEGA Navigation System (outdated)
26	OS	Distress Alarm System (outdated)
27	RA	RADAR and/or ARPA
28	SD	Sounder, Depth
29	SN	Electronic Positioning System, other/general
30	SS	Sounder, Scanning
31	TI	Turn Rate Indicator
32	TR	TRANSIT Navigation System
33	VD	Velocity Sensor, Doppler, other/general
34	VM	Velocity Sensor, Speed Log, Water, Magnetic
35	VW	Velocity Sensor, Speed Log, Water, Mechanical
36	WI	Weather Instruments
37	YC	Transducer - Temperature (outdated)
38	YD	Transducer - Displacement, Angular or Linear (outdated)
39	YF	Transducer - Frequency (outdated)
40	YL	Transducer - Level (outdated)
41	YP	Transducer - Pressure (outdated)
42	YR	Transducer - Flow Rate (outdated)
43	YT	Transducer - Tachometer (outdated)
44	YV	Transducer - Volume (outdated)
45	YX	Transducer
46	ZA	Timekeeper - Atomic Clock
47	ZC	Timekeeper - Chronometer

- 48 ZQ Timekeeper - Quartz
- 49 ZV Timekeeper - Radio Update, WWV or WWVH

String  
Index

Sentence Formatter

- 0 None - not used
- 1 AAM - Waypoint Arrival Alarm
- 2 ALM - GPS Almanac Data
- 3 APA - Autopilot Sentence "A"
- 4 APB - Autopilot Sentence "B"
- 5 ASD - Autopilot System Data
- 6 BEC - Bearing & Distance to Waypoint - Dead Reckoning
- 7 BOD - Bearing - Waypoint to Waypoint
- 8 BWC - Brg and Dist. to Wypt, Lat., N/S, Long.,E/W,UTC, Status
- 9 BWR - Brg and Dist. to Wypt,Rhumb Line, Lat, N/S, Long,E/  
W,UTC,Status
- 10 BWV - Bearing - Waypoint to Waypoint
- 11 DBK - Depth Below Keel
- 12 DBS - Depth Below Surface
- 13 DBT - Depth below transducer
- 14 DCN - Decca Position (obsolete)
- 15 DPT - Depth
- 16 DRU - Dual Doppler Auxiliary Data
- 17 DSC - Digital Selective Calling Information
- 18 DSE - Extended DSC
- 19 DSI - DSC Transponder Initiate
- 20 DSR - DSC Transponder Response
- 21 DTM - Datum Reference
- 22 FSI - Frequency Set Information
- 23 GBS - GPS Satellite Fault Detection
- 24 GDA Dead Reckoning Position
- 25 GGA - Global Positioning System Fix Data, Time, Position and fix
- 26 GLA - Loran-C Positions
- 27 GLC - Geographic Position, Loran-C

28	GLL - Geographic Position - Latitude/Longitude
29	GNS - GNSS fixed data
30	GOA - OMEGA Positions
31	GRS - GNSS Range Residual
32	GSA - GPS DOP and active satellites
33	GST - GNSS Pseudorange Error Statistics
34	GSV - Satellites in view
35	GTD - Geographic Location in Time Differences
36	GXA - TRANSIT Pos.,Lat./Long.,Loc/time of TRANSIT fix at wypt (obs.)
37	HCC - Compass Heading
38	HCD - Heading and Deviation
39	HDG - Heading - Deviation & Variation
40	HDM - Heading - Magnetic
41	HDT - Heading - True
42	HSC - Heading Steering Command
43	HVD - Magnetic Variation, Automatic
44	HVM - Magnetic Variation, Manually Set
45	IMA - Vessel Identification
46	LCD - Loran-C Signal Data
47	MDA - Standard Meteorological Composite
48	MHU - Humidity
49	MMB - Barometer
50	MSK - MSK Receiver Interface (for DGPS Beacon Receivers)
51	MSS - MSK Receiver Signal Status
52	MTW - Water Temperature
53	MWD - Wind Direction & Speed
54	MWV - Wind Speed and Angle
55	OLN - Omega Lane Numbers (obsolete)
56	OSD - Own Ship Data
57	ROO - Waypoints in active route
58	RMA - Recommended Minimum Navigation Information
59	RMB - Recommended Minimum Navigation Information
60	RMC - Recommended Minimum Navigation Information
61	ROT - Rate Of Turn

62	RPM - Revolutions
63	RSA - Rudder Sensor Angle
64	RSD - RADAR System Data
65	RTE - Routes
66	SFI - Scanning Frequency Information
67	SNU - Loran - C SNR Status
68	STC - Time Constant
69	STN - Multiple Data ID
70	STR - Tracking Reference
71	SYS - Hybrid System Configuration
72	TEC - TRANSIT Satellite Error Code & Doppler Count
73	TEP - TRANSIT Satellite Predicted Elevation
74	TGA - TRANSIT Satellite Antenna & Geoidal Heights
75	TIF - TRANSIT Satellite Initial Flag
76	TLL - Target latitude and longitude
77	TRF - TRANSIT Fix Data (obsolete)
78	TRP - TRANSIT Satellite Predicted Direction of Rise
79	TRS - TRANSIT Satellite Operating Status
80	TTM - Tracked Target Message
81	VBW - Dual Ground/Water Speed
82	VDC - Current at Selected Depth
83	VDR - Set and Drift
84	VHW - Water speed and heading
85	VLW - Distance Traveled through Water
86	VPE - Speed, Dead Reckoning Parallel to True Wind
87	VPW - Speed - Measured Parallel to Wind
88	VTA - Actual Track
89	VTG - Track made good and Ground speed
90	VTI - Intended Track
91	VWE - Wind Track Efficiency
92	VWR - Relative Wind Speed and Angle
93	VWT - True Wind Speed and Angle
94	WCV - Waypoint Closure Velocity
95	WDC - Distance to Waypoint - Great Circle
96	WDR - Distance to Waypoint - Rhumb Line

97	WFM - Route Following Mode
98	WNC - Distance - Waypoint to Waypoint
99	WNR - Waypoint-To-Waypoint Distance, Rhumb Line
100	WPL - Waypoint Location
101	XDR - Transducer Measurements
102	XTE - Cross-Track Error, Measured
103	XTR - Cross-Track Error - Dead Reckoning
104	YWP - Water Propagation Speed
105	YWS - Water Profile
106	ZAA - Timer, Elapsed/Estimated
107	ZCD - Timer
108	ZDA - Time & Date - UTC, day, month, year and local time zone
109	ZDL - Time and Distance to Variable Point
110	ZEV - Event Timer
111	ZFI - Elapsed Time from Point-Of-Interest
112	ZFO - UTC & Time from origin Waypoint
113	ZLZ - Time of Day
114	ZPI - Arrival Time at Point-of-Interest
115	ZTA - Estimated Time Of Arrival at Waypoint
116	ZTE - Estimated Time to Even/Point-Of-Interest
117	ZTG - UTC & Time to Destination Waypoint
118	ZTI - Estimated Time to Even/Point-Of-Interest
119	ZWP - Arrival Time at Waypoint
120	ZZU - Time, UTC



## Appendix G - Display Firmware Ver. and Serial Number

Quick press both the **+** and **\*** keys to display the current Firmware Version and the product Serial Number for five seconds.



## Appendix H - Error Codes

The internal software that runs the MaxRp110 instrument can detect and display some software and hardware errors. A listing of those error codes and their meaning as shown below.

- 0 Contents of internal nonvolatile memory are corrupted and factory defaults are being used. Please check and set/reset all alarm values, etc.
- 1 Unable to communicate with micro U101 - contact dealer
- 2 Unable to communicate with micro U201 - contact dealer
- 3 Unable to communicate with micro U301 - contact dealer
- 4 Unable to communicate with micro U401 - contact dealer
- 5 Contents of nonvolatile memory corrupted and factory defaults are being used. Please check and set/reset Total Log.
- 6 Supply voltage below the minimum 11.2 VDC required to update data to the nonvolatile memory. Check power.
- 7 Unable to program or read nonvolatile memory - contact dealer.
- 8 Error reading Current Configuration Data from nonvolatile memory. Contact dealer if unable to reprogram.
- 9 Not used
- 10 Not used
- 11 Not used
- 12 Not used
- 13 Activation code error - contact dealer.

## **Appendix I - Updating The Internal Firmware**

The internal software that runs the MaxRp110 instrument (firmware) can be updated via the USB connector or RS232 serial port as new versions become available with additional features. Each firmware update is supplied with complete instructions. Be sure to return the MaxRp110 registration card and/or send your contact details to [support@cruzpro.com](mailto:support@cruzpro.com) to ensure that you will be informed of new updates as soon as they become available.

Your suggestions for improvements and new features are welcomed. Please email suggestions to [support@cruzpro.com](mailto:support@cruzpro.com).

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- | Multi-Function Gauges
- | Digital DC Volts Gauge/w Alarms
- | Digital DC Volts Gauge/w Alarms for 3 Battery Banks
- | Digital Amps Gauge
- | DC Volts/Amps/Amp-Hour Monitors
- | AC Volts/Amps/Freq/kW Monitors
- | LPG/Petrol Gas Detectors/Alarms
- | Bilge Water Alarms/w Stainless Steel Water Sensor
- | Intelligent Bilge Pump Controllers/w Stainless Steel Water Sensors
- | Intelligent Windlass Controller/Chain Counters
- | Digital Fuel Gauges & Fuel Consumption Calculator
- | Digital Tank Level Gauges for 1 or 3 Tanks/w Separate Alarms
- | Smart 4 step Alternator Regulator
- | Marine Security System/w Reliable Intrusion Sensors
- | RPM/Engine Hours/Elapsed Time Gauges/w Alarm
- | Digital Engine Temperature Gauge/w Alarms
- | Digital Oil Pressure Gauge/w Alarms
- | Digital Temperature Gauges for 1 or 3 Areas/w Alarms
- | Digital Clock/Watch/Race Timers/w 8 Alarms
- | 8 and 16 Amp Light Dimmers/Motor Speed Controller
- | Solar Panel Charge Controllers 6/8/9 & 20 Amps
- | 4 & 8 Channel NMEA Combiners/RS-232 Convertors
- | Engine/Exhaust Temp. Monitor & Digital Pyrometer
- | NMEA 0183 Remote Data Repeaters/w 4 and 8 Input Channels
- | High Pressure Digital Hydraulic Pressure Gauge
- | Engine Hours/Elapsed Trip Time/Engine Maintenance Alarm Gauge

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