

# QUANTERRA – MANUAL

## Configuring a Q330 for operation

Version: 1.3

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# 1. Presentation of the Quanterra Q330

## 1.1 Equipment and supplies you need before starting:

- A Q330



Figure 1: Front of a Q330

- A PB14 Baler



Figure 2: Front of a PB14 Baler

- A PN110906 Qnet cable with Cat 5 Ethernet patch cable and power input pigtail to connect the Q330 to the baler.



*Figure 3: PN110906 Qnet cable*

- A 12V power supply (customer supply)



*Figure 4: 12V power supply cable*

- A GPS antenna with 15' cable



*Figure 5: A GPS antenna with 15' cable*

- Willard Version 1.39 or later, and Socorro Version 1.20 or later installed on a PC. The Cimarron Application and sample configuration are useful but optional.

**To connect to the Q330, either:**

- A PN109476-M serial cable to connect PC to the console port of the Q330, or an Ethernet cable to connect PC to the baler (in this case the baler need to be switched on in order to communicate to the Q330)

## **1.2 Setup of Q330**

Note: The setup below is only for running the Q330 in a stand-alone modus, in which the Baler is connected through the Qnet port.

Locate the power supply preferably within 3 meters of a window or opening in which the GPS antenna can obtain a partial view of the sky. Connect the GPS antenna to the GPS ANT. port of the Q330. Connect the Qnet cable from the Q330 to the Q330 Packet Baler. Locate the GPS antenna outside or in a window using a small metal backplane to improve the reception. The antenna has a magnetic back and screw-holes to attach to this plate if desired.

Connect either the serial port from the PC to the Q330 or the Ethernet cable from the PC to the Baler. In this last configuration the Baler needs to be switch on in order to communicate to the Q330.

Then connect the 12V power supply to the Power port of the Q330 to turn on the Q330. To turn on the baler, just push the ATTN button and wait until the green LED turns green with a short flash (1s) off. Finally, connect your sensors on either/both Sensor A or/and Sensor B ports of the Q330.

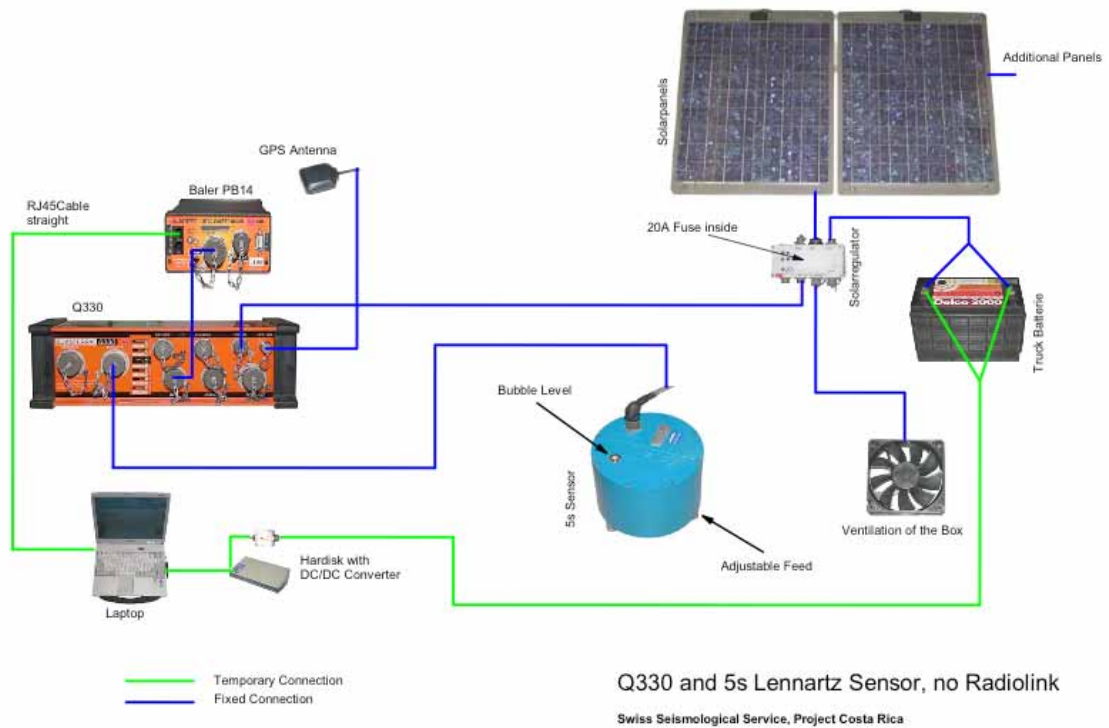


Figure 6: Example of connection of a Q330 station

### 1.3 Interfaces

In this section you can find a description on the basic design of the Q330 (see figure 1).

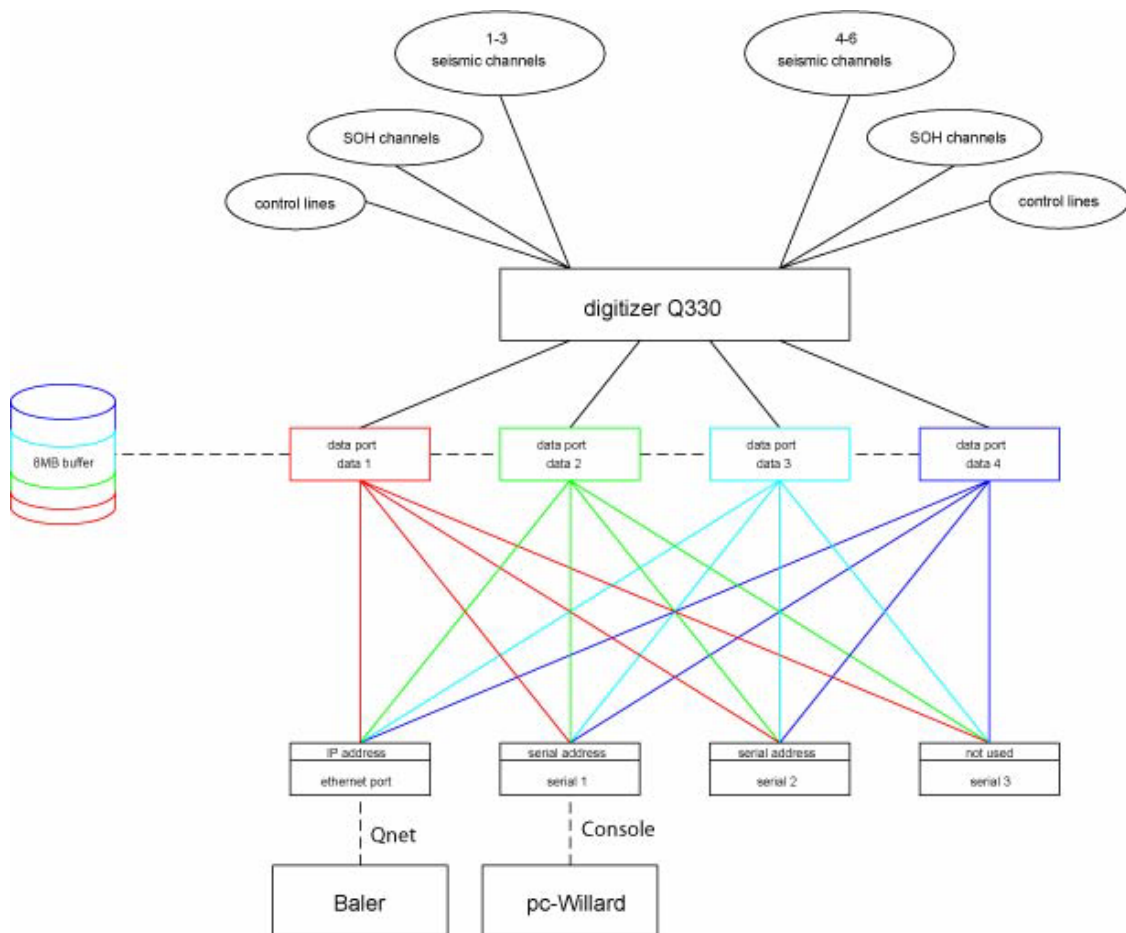


Figure 7: Basic design of a Q330.

The digitizer of the Q330 fills in a 8MB buffer. The Q330 can support up to four independent **Data Processors** also called **Data Ports**. Each of these data ports can have different recording parameters called **Tokens**. All four data ports are available on three physical interfaces: one Ethernet port and two serial ports, serial 1 and serial 2. In the stand-alone modus described in this document, the Baler is connected trough the Ethernet port using the Qnet cable.

### 1.4 Installing Willard

The Quanterra supplied applications Willard, Socorro and Cimarron are compatible with Microsoft Windows operating system including Windows 98, Windows ME, Windows

2000 and windows XP. Copy the Willard.zip file from <http://www.q330.com/Download/Secure/VersionTable.htm> onto your PC and extract it to a new directory named Willard. C:\Willard is a typical installation location.

The location of the applications can be separated from the data collected from a station by specifying a different directory for the station data when the individual station directories are created (see section 2). When updates to the Willard or Socorro applications are installed, it is sufficient to extract the new Willard.zip archive in this directory, the new applications distribution does not affect customer station configurations.

### **Directory structure of the PC application Willard and Socorro**

The directory in which the applications Willard, Socorro and Cimarron are located is called the Willard home directory. Within this directory, a file called station.ini is created by the applications in order to identify subdirectories that are used for each station. These subdirectories may be located beneath the Willard home directory or in a separate volume or directory. Management or editing of the station.ini file is part of the function of either Willard or Socorro.

In the next chapters you will learn the initial steps to connect to the Q330 and how to configure it:

- Create a Willard directory on the PC that will contain connection information to reach a Q330.
- Configure the Q330 parameters with an IP address and recording parameters.
- Save parameters on Q330
- Test PC reconnection to Q330 using the parameters saved on PC.

## **2. Connecting to the Q330**

The Willard application is used to create a “Willard station”. So, why is it important to create a station with Willard? Willard uses XML files to store specific information, and they should only be modified with Willard and Socorro. That is to say, the directory structure necessary to log data and messages, and, as it turn out, stores the station connection parameters in a station.ini file within the “Willard Station” directory. The application Willard uses the station.ini file, once it is setup, to connect to a Q330. The station.ini file does not set any parameters in the Q330.

As said before, there are two ways to communicate with the Q330.

- A console connection
- An Ethernet connection.

We will see in the following how to create a station and how to established a first connection in both cases.

### **2.1 Consol (serial) connection**



To use a serial connection, you first have to know which COM you are using on your PC. As nowadays, most of the PC doesn't have any COM port anymore, you may have to use a Serial to USB adaptor. To know which port is used by the PC, go to: Start-> Settings-> Control Panel-> Performances and Maintenances-> System-> Hardware-> Device Manager-> Port (COM & LPT) and see which port is enabled by the Serial-USB adaptor (in the figure 2, the port used is COM5).

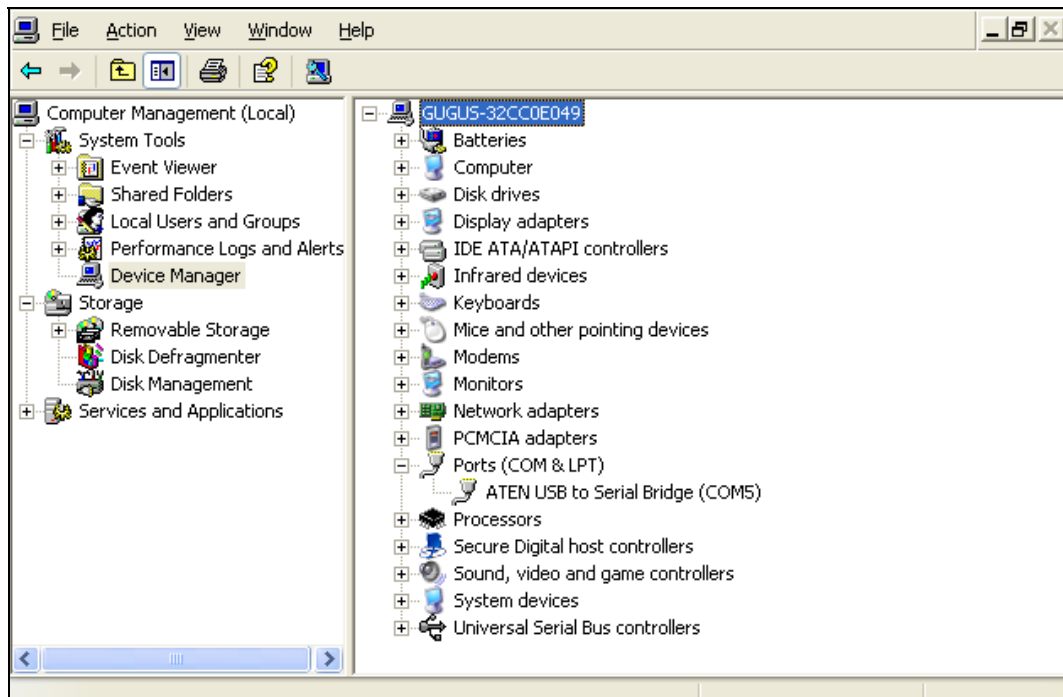


Figure 8: Finding which serial port you are using.

To create a station with the serial port,

- Start Willard

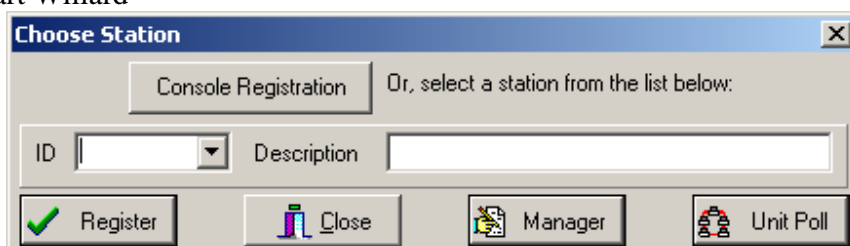


Figure 9: Starting panel of Willard

Note: The following applies only if you create a Willard station for the first time. How to create additional Willard stations, see section 2.2, "Ethernet Connection".

- Click on "Consol Registration"

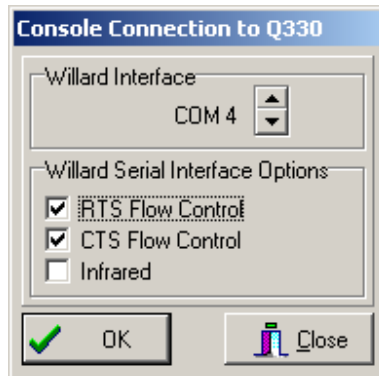


Figure 10: Selecting the Port you want to connect to the Q330

- Choose the right port as Willard interface (in this example, COM 4)
- Click on OK.

Note: Make sure that “RTS Flow Control” and “CTS Flow Control” boxes are checked.

In the next panel you can give an ID to the station and specify the home directory for the station. In order to be coherent, choose the same name of the directory as the name of the station. You can also make a small description of the new station.

Note: The station ID is usually set as TAG[ID of the Q330].

Note: If a Q330 has been configured or used previously the old IP addresses are already filled in. By filling this form, you will change them for your purpose.

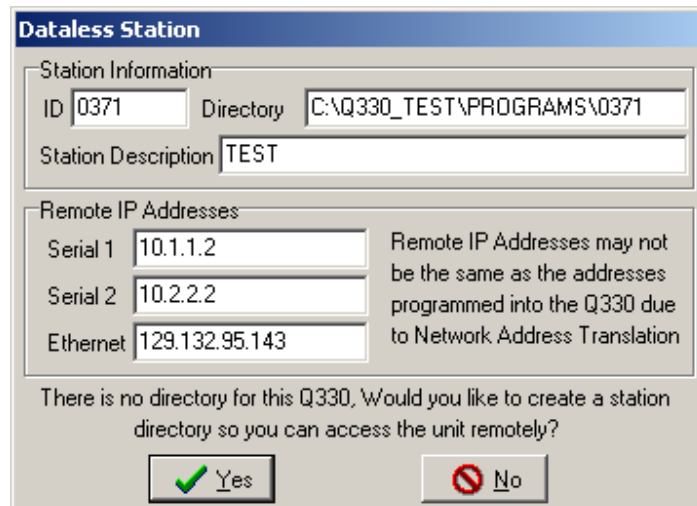
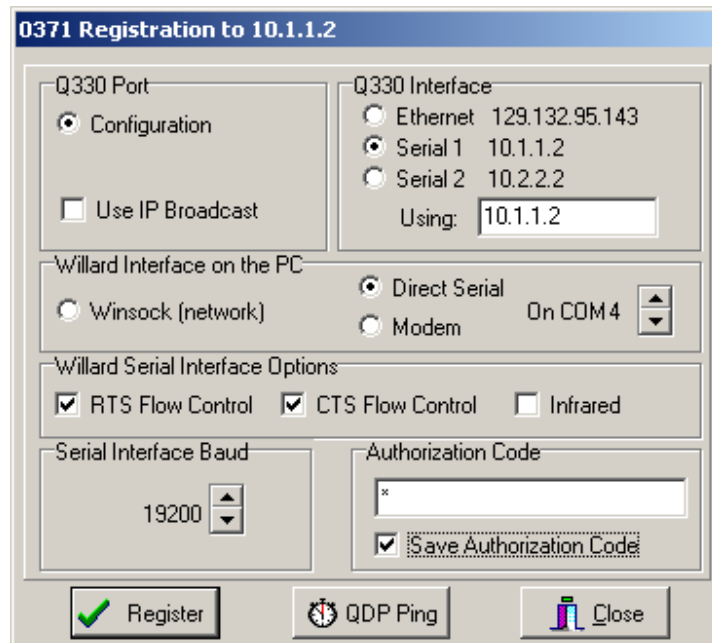


Figure 11: Specifying station ID, home directory and IP addresses.

- Click on “YES” to create the directory.
- Exit Willard.
- Start immediately Willard again.

- Click on Register.



*Figure 12: Willard Registration panel after having created a new station with serial connection*

Now, you have to choose which Serial interface of the Q330 you want to connect, including the IP address corresponding.

- Make sure the Willard interface used on the PC is “Direct Serial”
- Select the right number of the COM used by the PC.
- Check “RTS Flow Control” and CTS Flow Control”
- Select the speed of the connection (usually 19200 baud).
- Enter “0” for the authorization code.
- CHECK “Save Authorization code”.

This is important, as the internal serial number of the Q330 will be later used as authorization code.

- Then click on “Register”.

Then you arrive to the Setup and Control panel of Willard. There are 5 menus in all: Commands, Information, Status, Configuration and Help. To configure a Q330 go to the section 3.

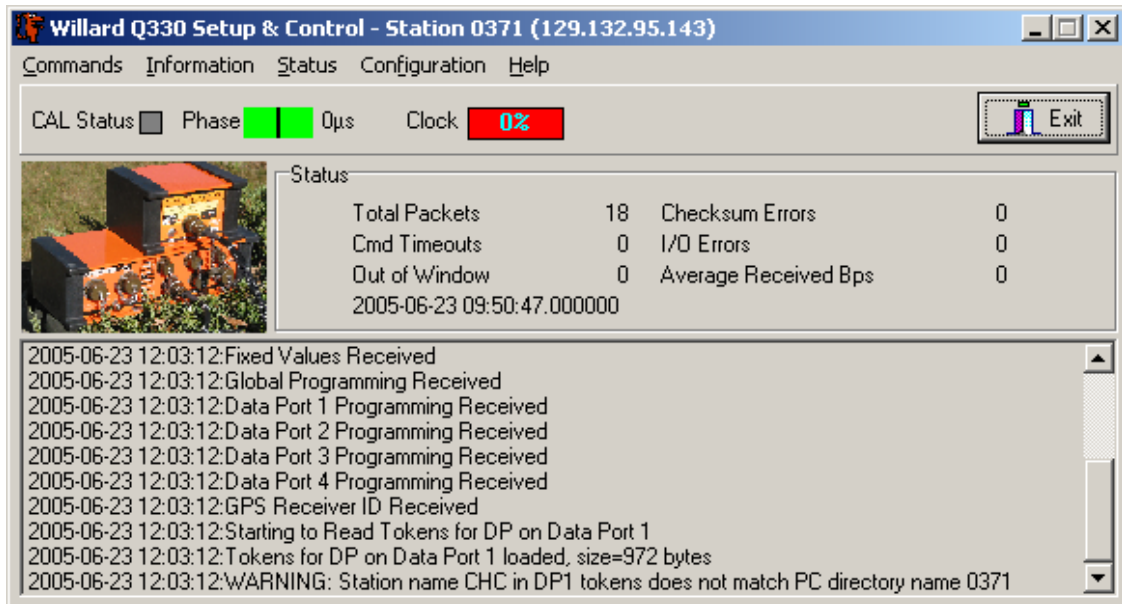


Figure 13: Willard Setup and Control panel

## 2.2 Ethernet connection

Note that a Willard station should only be created with a console connection. An Ethernet connection is only used once a Willard station has been created. Willard can use an Ethernet connection to communicate with the Q330 only if the IP address of the Q330 is known. *What are you doing when the IP address is not known?* Generally, the IP addresses are stored in the station.ini file. So if you want to use an Ethernet Connection in the field, make sure that you know all the IP addresses of your Quanterra data logger before you go.

Before connecting: Make sure that the IP address of the PC is in the same domain as the IP address of the Q330. In our case the IP addresses of our PC are set as follow (see figure 7):

- Subnet mask: 255.255.255.0
- IP address: 129.132.95.144

So, the domain used is composed of the 3 first figures 129.132.95.

To change the IP address on your PC, go to:

- Start-> Settings-> Network connection
- Double click on Local area connection
- Click on Properties
- Double click on Internet protocol (TCP/IP).

For that you need to have the administrator rights.

- Then click on "Use the following IP address" and
- Fill the IP address of the PC, the subnet mask, and the default gateway.

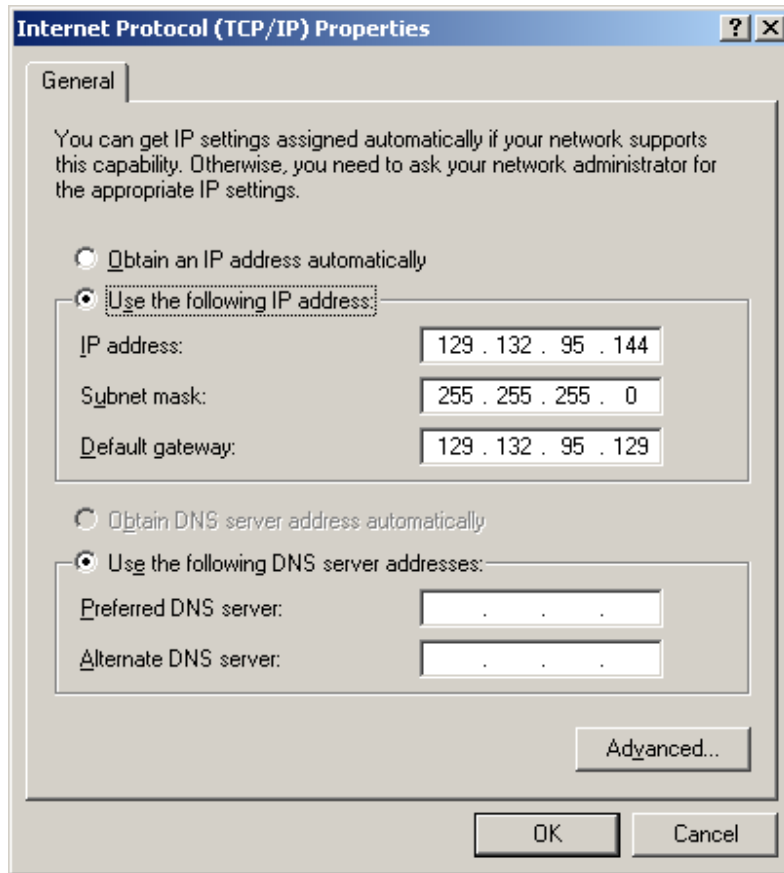


Figure 14: Configuring the IP address of the PC.

- To connect to the Q330 using Ethernet connection, start the Willard application.

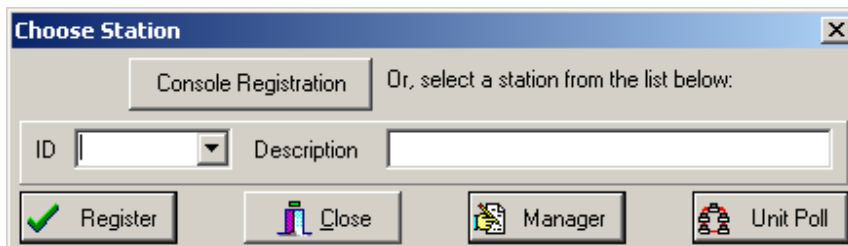


Figure 15: Willard starting panel.

- Click on Unit Poll -> check the option “Poll for Single Q330 Only”
- Click on scan
- Copy the serial number (ctrl-C).
- Close.

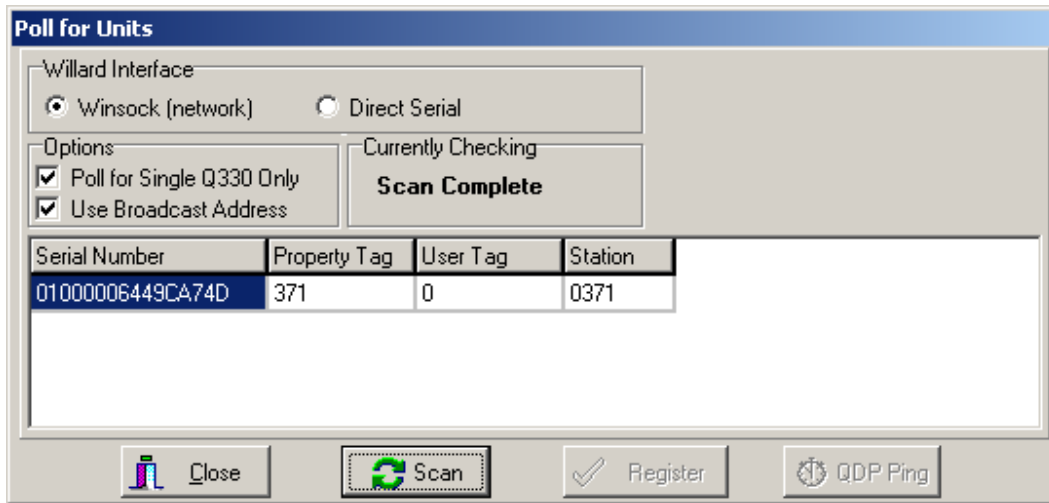


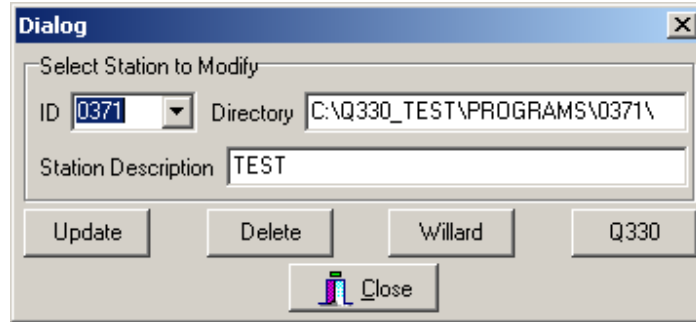
Figure 16: Finding the Serial Number of the Q330.

- Click on “Manager”.

Enter a ID number. You can name the station with any name (up to five character) but typically the station name is either the SEED station code or the Qanterra Tag ID. For example BOBS or 0371 (as chosen in the example) might be used as station name for the Q330 with the Tag ID 371 deployed at the station code BOBS. Choose a directory where you want to store all necessary files used by Willard for this station. By default, a subdirectory for the station is created below the directory containing the Willard application. An alternate directory location can be specified to save data from this station on another disk partition or even a shared hard drive. Later, on start up, the applications Willard Socorro and Cimarron will prompt you to choose a station from the list in the station.ini file. Each application loads connection information for that Q330 from a table of parameters contained in the file station.ini located in the station subdirectory specified. Note that both Willard and Socorro application contain a built-in manager function to edit connection information and to manage the station directories so that reconnection is simple.

You can also describe the station you want to create. This is used in a presentation menu when selecting a connection later on.

- In the “Manager” panel click on Q330.

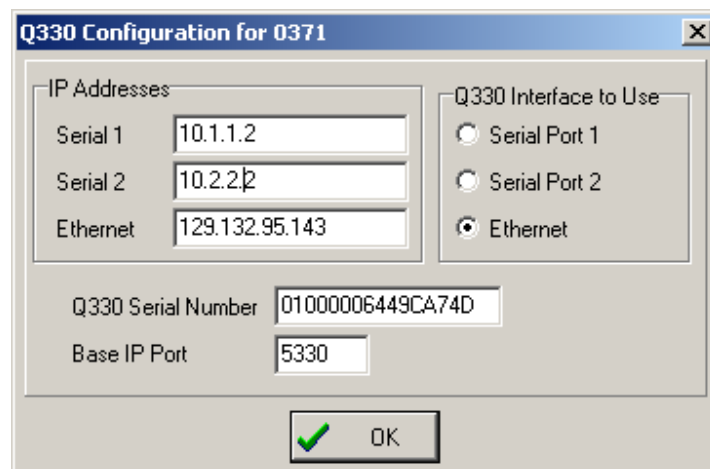


*Figure 17: Selecting a station*

Enter IP addresses of your choice for serial Port 1 and serial Port 2. For the Ethernet you have to enter the IP address of the Quanterra. If you use the Quanterra in a public network, the Ethernet IP address must be a valid one! The PC uses this information in order to reconnect to this Q330. Note that entering an IP address in this panel does NOT set the IP address in the Q330, instead it is to store that address for later use by the PC. Setting the address in the Q330 is done in a later step. However, the IP addresses used within Willard must be the same as set in the Q330. Then select the interface you want to use.

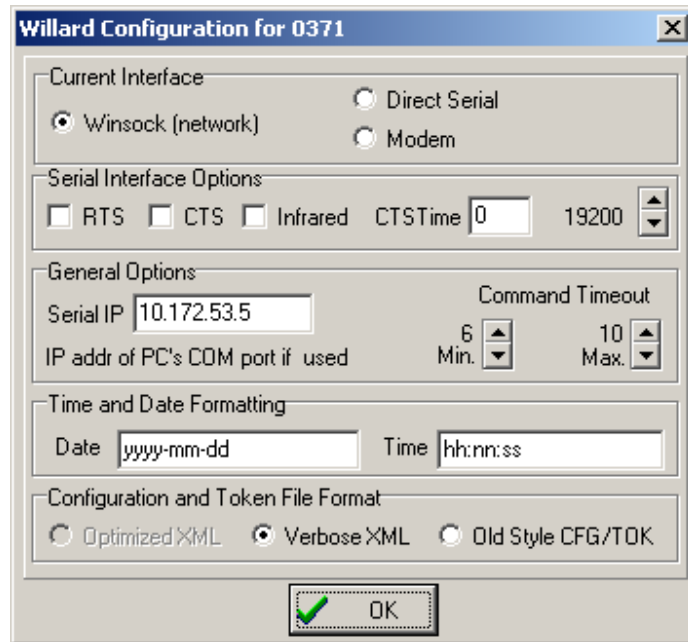
Then copy (ctrl-v) the Q330 Serial Number in the corresponding field.

When you finished entering these information, click on OK to save on the PC for later reconnections.



*Figure 18: Configuration of the Ethernet connection for a new station.*

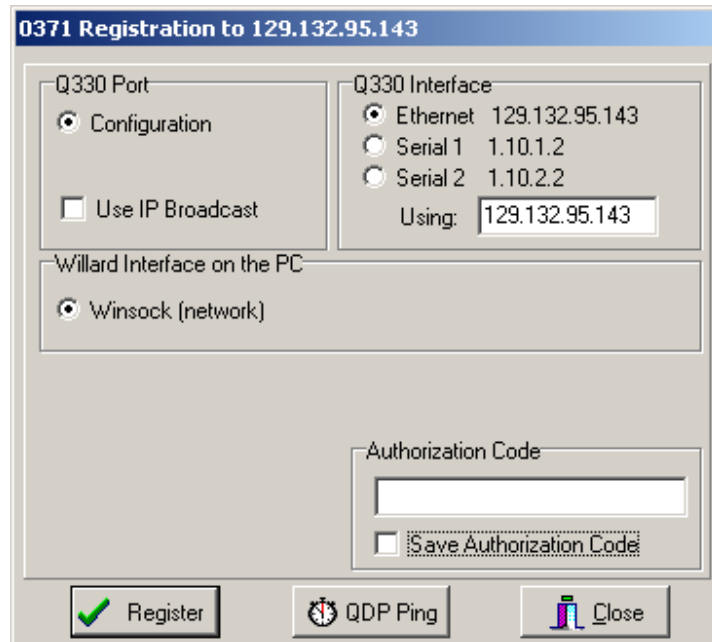
- Click on OK.



*Figure 19: Configuration of the interface for the new station*

- Click on update and
- Close the “Manager” panel.
- Open Willard again.
- Check that the name of your station is selected in the station ID box (see figure 8).
- Check also that the description corresponds and
- Click on register.





*Figure 20: Willard Registration panel after having created a new station with an Ethernet connection.*

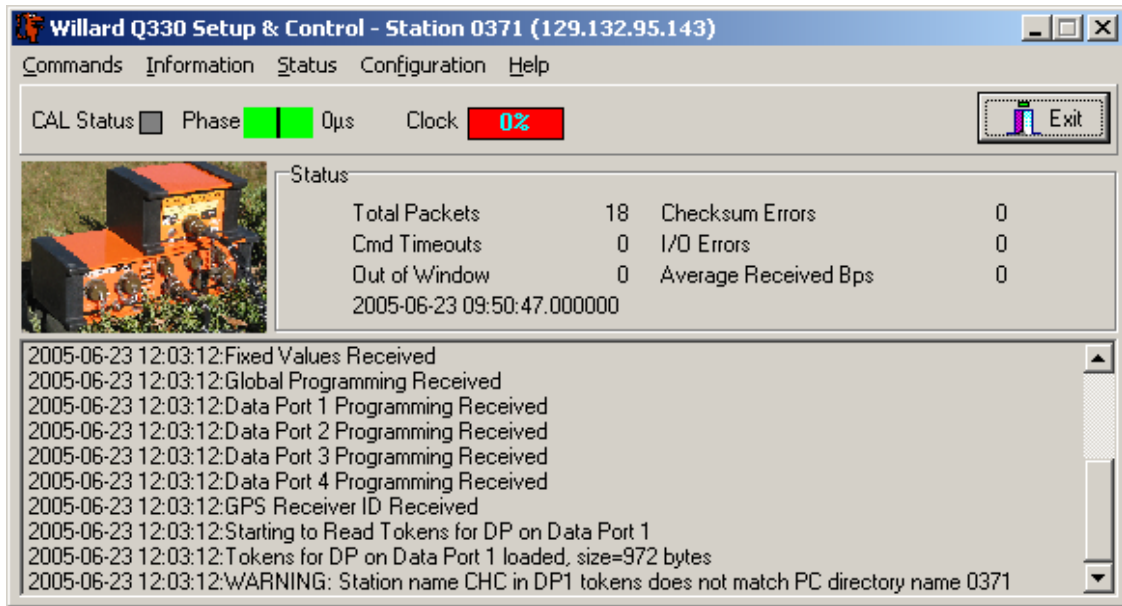
- Select the interface you want to connect with (Ethernet (Winsock) in this case).
- Enter “0” for the authorization code.
- CHECK “Save Authorization code”.

This is important, as the internal serial number of the Q330 will be later used as authorization code.

- Then click on register.

The Q330 IP address is now reachable from the PC and Willard registers using the Winsock interface to the Q330 Ethernet interface.

Then you arrive to the Setup and Control panel of Willard. There are 5 menus in all: Commands, Information, Status, Configuration and Help.



*Figure 21: Willard Setup and Control panel.*

### **2.3 Connecting to the Q330 when a station is created**

After having created a station with the Willard application, you might want to work on it later on. To register to the station you created, start the Willard application, choose the station you want to work with, and click on register. Then choose which interface you want to use to connect to the Q330. If you choose an Ethernet interface, the Willard interface on PC will be automatically a Winsock. If you choose a serial interface to connect to the Q330, then you will have to select the COM port you are using on your PC. In this case, you can also choose the speed of the connection.

Click on “register” to access to the Setup and Control panel of Willard (see figure 14).

### 3. Configuring the Q330

330 operational parameters can be set all at once using a “330 configuration file”. The different panels of the Configuration menu display the current settings. Each panel allows changes to the configuration parameters, which are immediately sent to the Q330. Most of them take effect immediately. Unless the operator execute Commands -> System and GPS control and checks the “Save to EEPROM” command, changes will be lost on reboot of the Q330. The current configuration can be save to a file on the PC at any time and reloaded to other units, duplicating all settings except the Physical Interface IP addresses, which are usually unique to each unit.

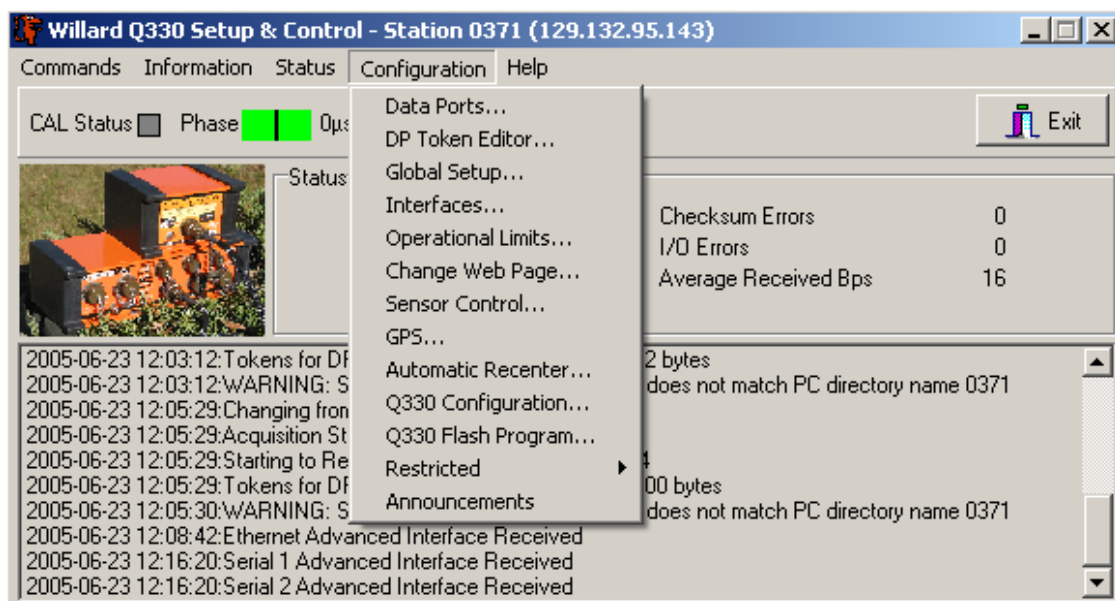


Figure 22: Different panels of the configuration menu.

#### 3.1 Summary:

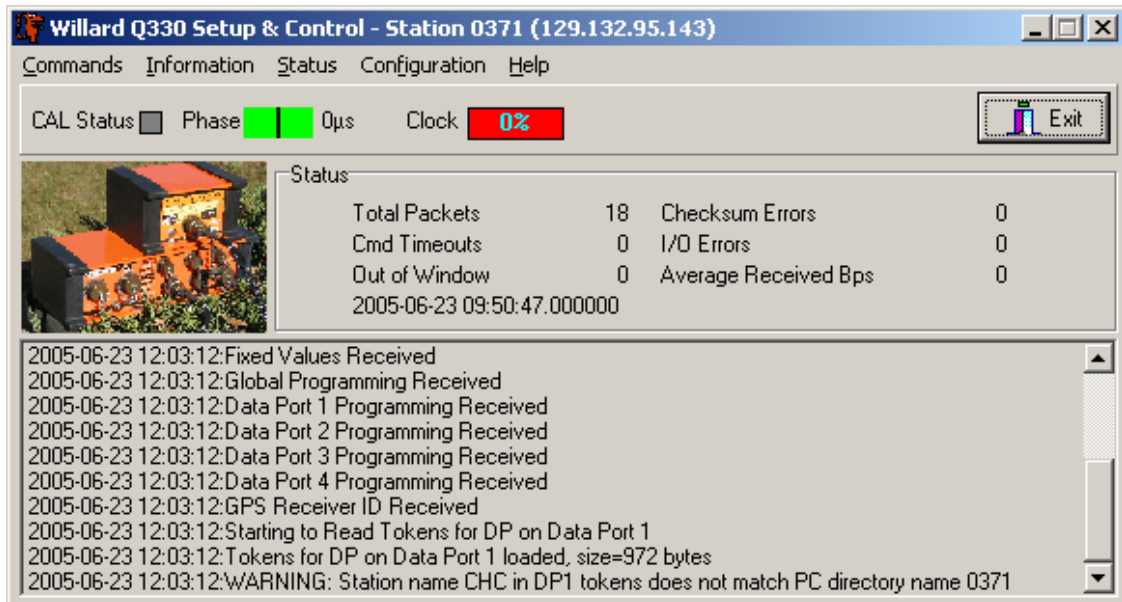
Setting up a Q330 from scratch typically involves:

- 1) Setting the IP addresses in the physical interfaces configuration of Willard.
- 2) Loading a .cfg configuration file suitable for your application.
- 3) Loading a DP token to each of four data ports you might use.
- 4) Saving the parameters to EEPROM and rebooting

#### 3.2 Configuring the Q330 for an operation: Loading configuration and DP token files

- Start Willard
- Select the Station ID from the pull-down list.

- Click on register twice (see figures 8 and 13) to connect to the Q330 and to go to the Willard Setup and Control Panel.

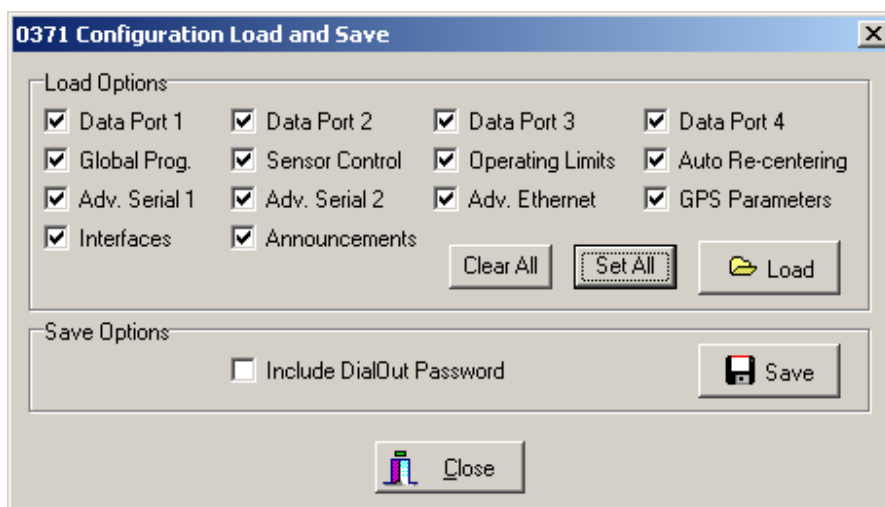


*Figure 23: Willard Setup and Control panel.*

Go to Configuration-> Q330 Configuration...

- Click on "Set all"
- Select Load

Note: Subsets of configuration parameters can be loaded by clicking on "Clear All" and, subsequently checking those parameters that should be loaded from the file.



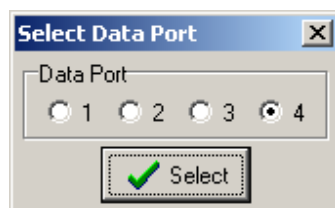
*Figure 24: Loading or saving a configuration file.*

- Browse to locate the desired example configuration file on the PC or CD.
- Click on open
- Click on OK
- Close the form

You also have to select a DP token file to set up data recording parameters. DP token files are XML files.

Go to Configuration -> DP Token editor...

- Choose the data port you wish to configure.



*Figure 25: Selecting a data port*

- Click on Select.



*Figure 26: Loading and saving a DP Token file.*

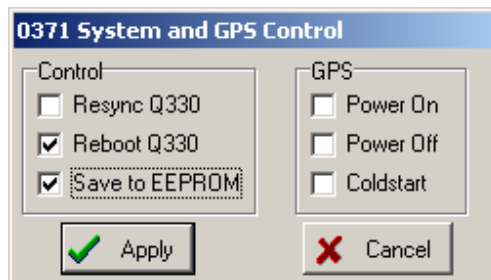
- Click on Load.
- Browse to locate the desired data recording token file on the PC or CD.
- Select OK.
- Edit the Network Id and station name, which is used to identify data, recorded by most applications for this Q330 and the port number.

- Click and “Apply to load the parameters to the Q330.

Note: The data recording parameters and DP Token are configured for each data port. Use the menu “Configuration -> DP Token editor...” to load and send a token to each Logical Port in turn.

If you want keep your parameters and apply any alterations to the data recording, save the parameters as a new configuration file and as new token file to the PC.

Go to Commands-> System and GPS control...



*Figure 27: System and GPS control panel.*

- Check the “Reboot Q330” and “Save to the EEPROM” boxes, this will write the correct configuration in EEPROM of the Q330.
- Click on “Apply” to reboot the Q330

### **3.3 Configuring the Q330 for an operation: Description of the different options.**

In this subchapter, we will describe the role of all the different submenus you can find on Willard “Configuration” menu.

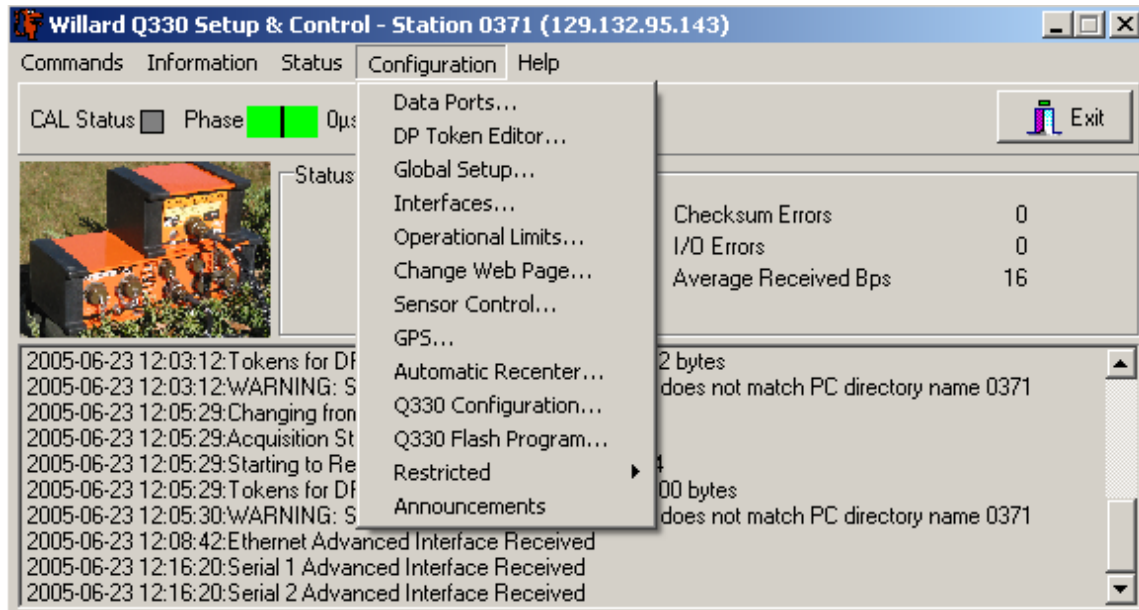


Figure 28: Configuration menu.

## Data ports

Go to Configuration-> data ports...

For each data port you set various communication parameters, the percentage of the data buffer reserved, and some tuning and test options. Presets for the communication parameters are given for standard radio telemetry (Standard), satellite communication, (VSAT), PB14 Baler and POTSC.

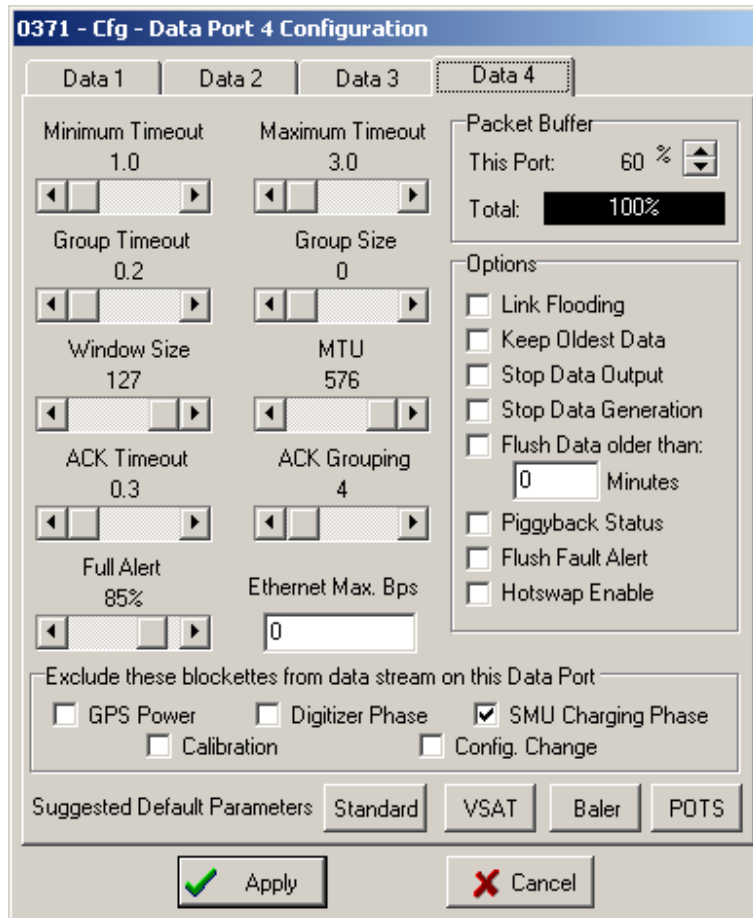


Figure 29: Data Port Configuration Panel.

For an Ethernet connection, a large window size, no grouping and quick ACK timeout is preferred since there is ample bandwidth and little penalty for resending data. A radio connection might increase the timeout and shorten the window size slightly. A VSAT connection typically employs groups to bunch up a number of small packets. The group is dispatched when the number of packets reaches the group size or after waiting until the group timeout is reached.

The Data Port 4 is, by default configured for the baler.

- In “Packet and Buffer” you can choose the percentage of buffer attributed to this Port. So you can display buffer, as you want between the different Ports. Of course it’s better to use 100% of the buffer.
- In “Options” more options are proposed.

### DP Token Editor

DP token store the “data recording” parameters and each logical port can use a different DP token, usually for a specific function. A token file contains all the data recording



parameters and each file can be loaded onto one or more data port. Any modification can be saved to a PC as a new token file.

Go to Configuration -> DP Token editor...

- Choose the data port you wish to configure.

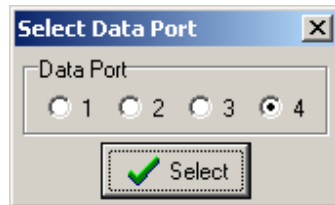


Figure 30: Selecting a data port

- Click on Select.



Figure 31: Loading and saving a DP Token file

In this menu you can add or delete the Channels you want to use.

- Click on Channels.
- Click on add or select the channel you want to delete and click on delete 3 Channels are used for Sensor A and 3 others for Sensor B. You can add as many channels as you want.

(add another screen shot where you can see the different channels -> figure 24??)

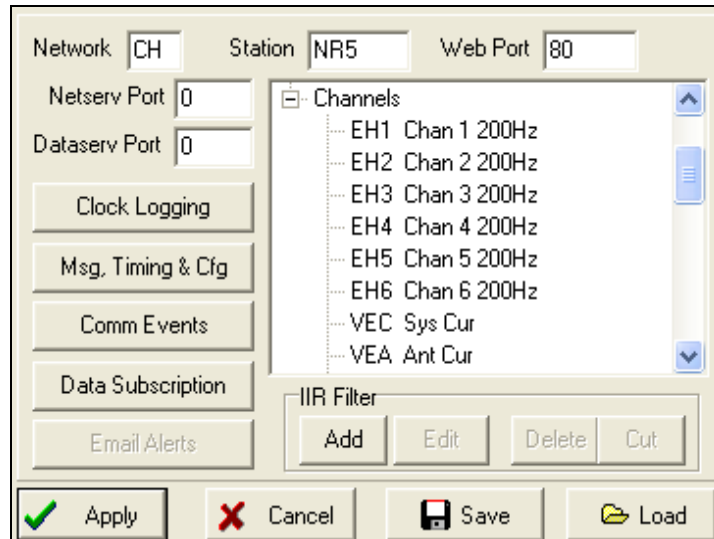


Figure 32: Configuration of each channel.

The time quality percentage in MSEED records is assigned according to whether a valid “external” time reference, such as GPS, has been or is being used, and if it is not currently being used, how much time has elapsed since such a reference was used. The percentage assignments are made according to parameters defined in the “DP token Editor, in the Clock logging menu. The defaults are whenever the GPS has time acquisition, the quality is considered at least 80%. If the PLL is tracking GPS, or is locked to GPS, the quality can raise to 90% or 100%. When GPS time acquisition is lost, such as when the GPS powers down, the quality immediately drops to 60%, and then degrades in 1% intervals every 10 minutes. This means that any quality above the minimum value of 10% indicates that GPS time was at least at some point in the past received. Quality over 60% indicates GPS time is being currently received.

## Global Setup

Configuration -> global setup...

A number of important parameters and actions are provided in this panel that content the global behaviour of the Q330.

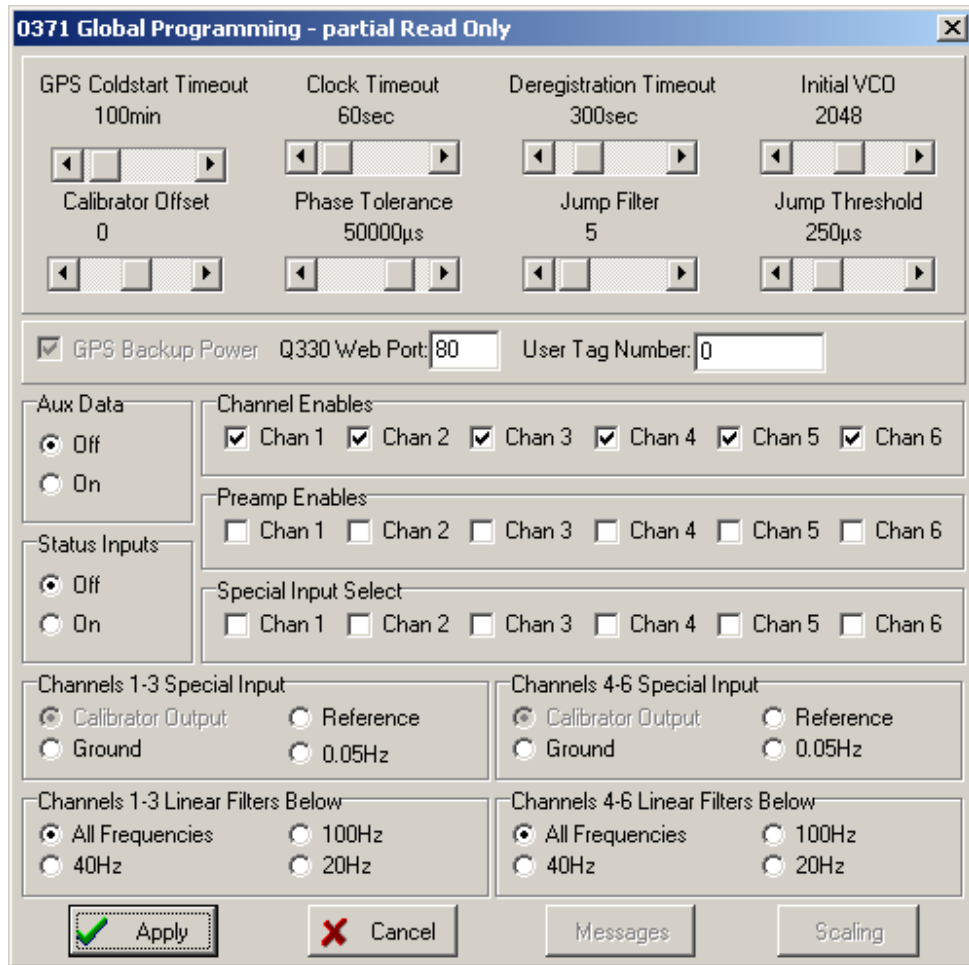


Figure 33: Global setup panel.

Below the sliders are a check box to leave the **GPS** engine **powered** during a reboot, preserving the almanac information and resulting in faster time to fix. The **Q330 web port** is by default port 80, the default for the most browser connections. Entering 0 turns off web access to the Q330. **User tag number** is best used, despite the name, as a version control reference for the User's configuration file loaded into the Q330. Typically a bunch of Q330's might be given the same configuration to operate in the same way (data recording parameters, including station code is part of the data token, which is a different file). If some modifications were needed, increment the user tag number. Polling for the Q330 returns the serial number, tag number, user tag and seed station code for each Data Port.

The middle section **enables channels** and **preamps** (gain x30). Each time the channels or preamps are changed you must reboot the Q330 to have this take effect. Disabling a channel means it will be unpowered and generate no data, no matter what the data recording parameters indicate. Quick view in the "Status" menu, will only display enabled channels.

**Special input** select applies the choice of input to the checked channels. The command takes effect immediately. The choice of input can be the calibration output signal (similar to the calibration menu's monitor channel, it records what the output signal is while the calibrated channels record the sensors response to the calibration signal). Also available as inputs to each selected channel are terminated to ground, connected to a reference voltage of 19.97Vdc. The 0.05 Hz signal is a 20 second period square wave that is synchronized in hardware to GPS minute mark. This particular input can be helpful for verifying time series manipulations well downstream of the digitizer. If the transition is not on a ten second boundary, something has mislabelled the sample time.

The last panel of radio buttons choose the sample rate **below** which the **FIR filters** will be **linear** phase filters. Above this sample rate, minimum phase filters are used.

## Interface

On Willard menu select Configuration-> Interfaces...

Physical interface are NOT part of a Q330 configuration file and must be set individually for each unit. The Base Port is common to all interfaces and should be set to 5330.

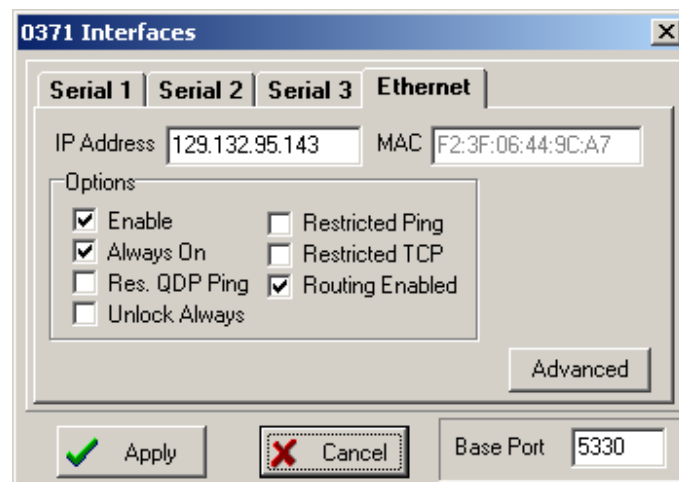
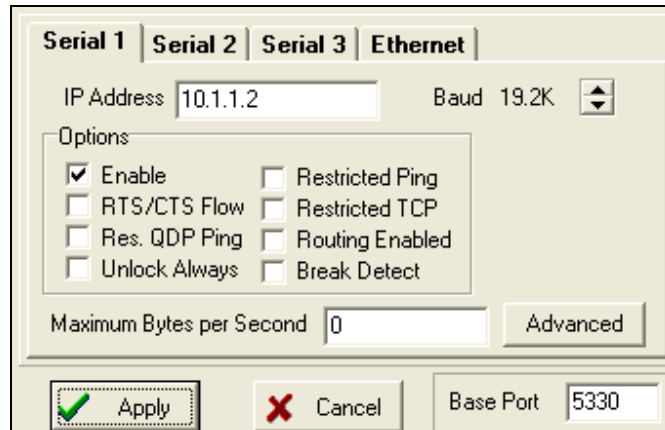


Figure 34: Interfaces panel (Ethernet).



*Figure 35: Interfaces panel (serial).*

- Set the serial IP address and Ethernet IP address you want the Q330 to use, enable the interface you want to use. If you change the IP address you need to return to the Willard manager panel and enter these IP addresses to be saved on the PC for subsequent connections.

Enable of the Ethernet interface allows an automatic powerdown of the interface if no carrier is detected, conserving power.

Always On, prevents the shutdown of the interface.

In this panel you also can configure the baler.

- Click on Advanced

Each physical interface can be configured to support Balers. This requires an association of a Baler not only to a physical interface but also to a Data Port. The Q330, upon receipt of a Baler broadcast announcement, will inform the Baler on which port it should register and what IP address it should use for its Ethernet and serial interface.

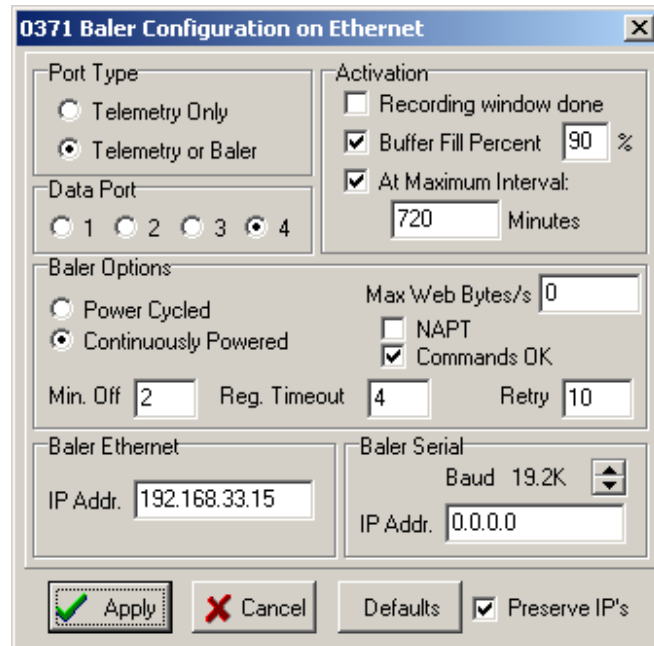


Figure 36: Interfaces advanced panel.

In **“Port type”** you can choose whether you want to associate a baler to this physical interface or not.

In **“Data Port”** you can choose which Data Port is used to control the Baler. Data port 4 is, by default, used for the Baler.

In **“Activation”**, you can set when the baler will be activated. For example in this case when the Buffer is at 90% full or every 720 minutes, whatever condition is met first.

In **“Baler option”** click on “NAPT” if you want that the Baler has the same IP address than the Q330. Click on “Command OK” if you want to be allow the Q330 to turn on the PB14 baler trough “Commands -> Turn on the baler”. Choose either if you want the Baler to be powered cycled or continuously powered with the radio buttons on the left. For the “Power Cycled” option you can configure the cycles with the “Min. Off”, “Reg.Timeout” and “Retry” options.

In **“Baler Ethernet”** choose de IP address of the Baler.

In **“Baler Serial”** you can control the band rate for a baler attached trough a serial port.

## Operational Limits

Configuration -> Operational limits...

Operational limits define the limits for which the Q330 will continue to function.

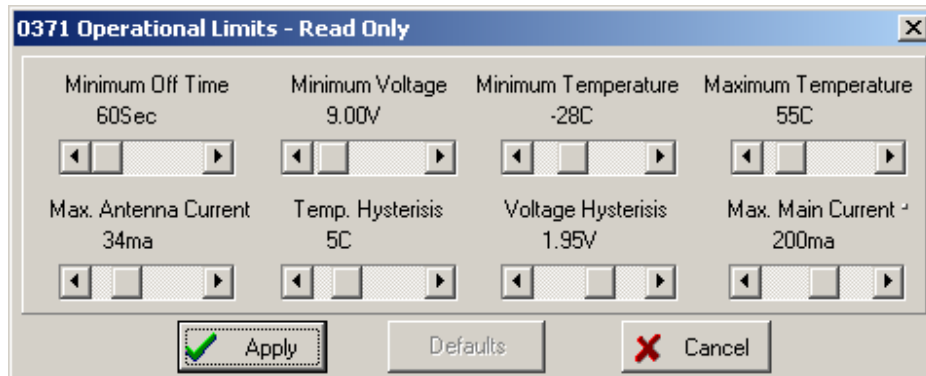


Figure 37: Operational limits panel.

Adjusting the low-voltage cut-off, for example may help to coordinate load shedding of the system component at a remote site. The hysteresis value means that the temperature or voltage must fall this much below the maximum before operation will resume (or rise that much above the minimum). The minimum off time is how long the Q330 will wait to start up for a clock reference before starting to sample based on its own internal time. For the first operational trials and most actual deployment none of these need adjustment.

## Sensor Control

Configuration -> sensor control...

In this panel, you can enable certain sensor control actions, such as ...

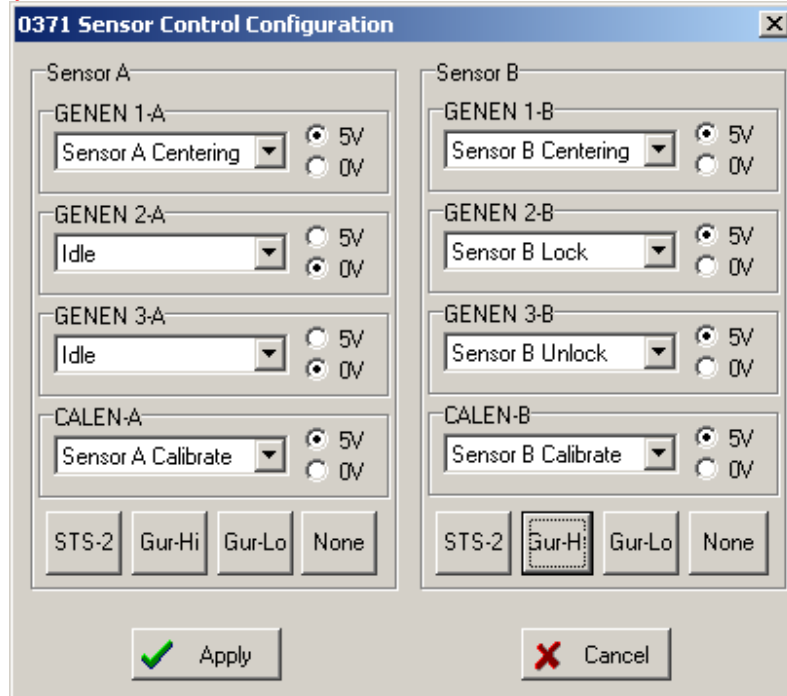


Figure 38: Sensor control panel.

“Idle” practically disables sensor control.

Presets are given for STS2 and Guralp sensors. If you are using a STS2, a Gur-Hi, or a Gur-Lo, just click on the corresponding button. In the example, sensor A is configured for a STS2 and Sensor B for a Gur-Hi.

## GPS

Configuration -> GPS

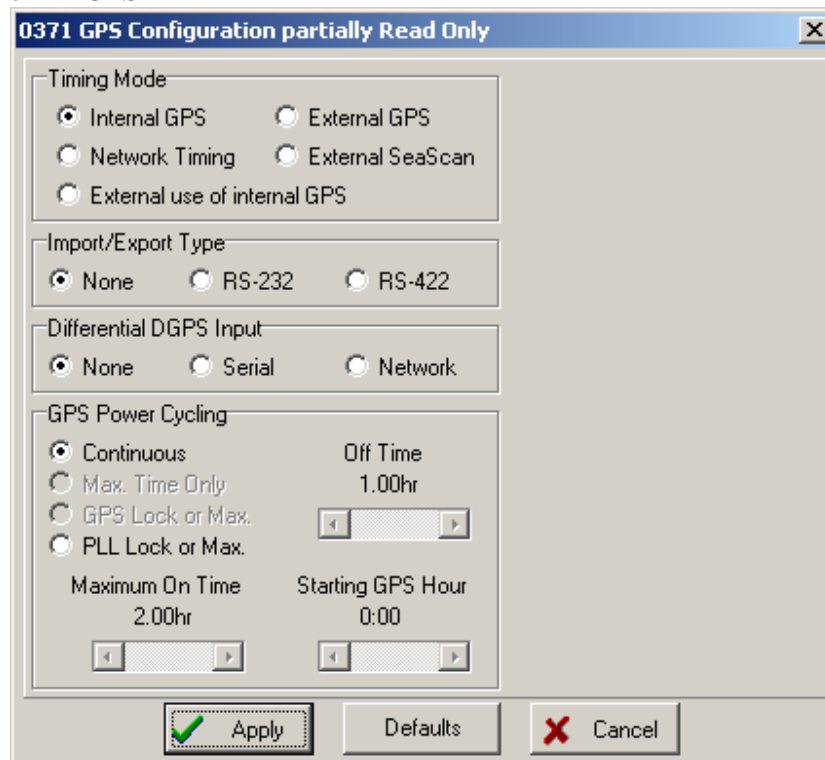


Figure 39: GPS configuration panel.

In the first box, you can select which **Timing Mode** you want to use. Selecting “External use of internal GPS” is used, for instance, to export the time signal of the internal GPS for use as a second Q330. This can be useful to troubleshoot a problem with one of the unit’s GPS engine or antenna.

In the “**Import or export Type**” box you can choose the format of the GPS time signal for import/export.

In the “**Differential DGPS Input**” box you choose the kind of differential GPS used:

- External (serial)
- Network provided

In the **GPS Power cycling** box the choices are:

**Continuous:** GPS is always powered.



**Max Time Only:** GPS is powered only for the maximum programmed “on time”. When that “on time” is reached, the GPS is powered down, whether reception has been received or not.

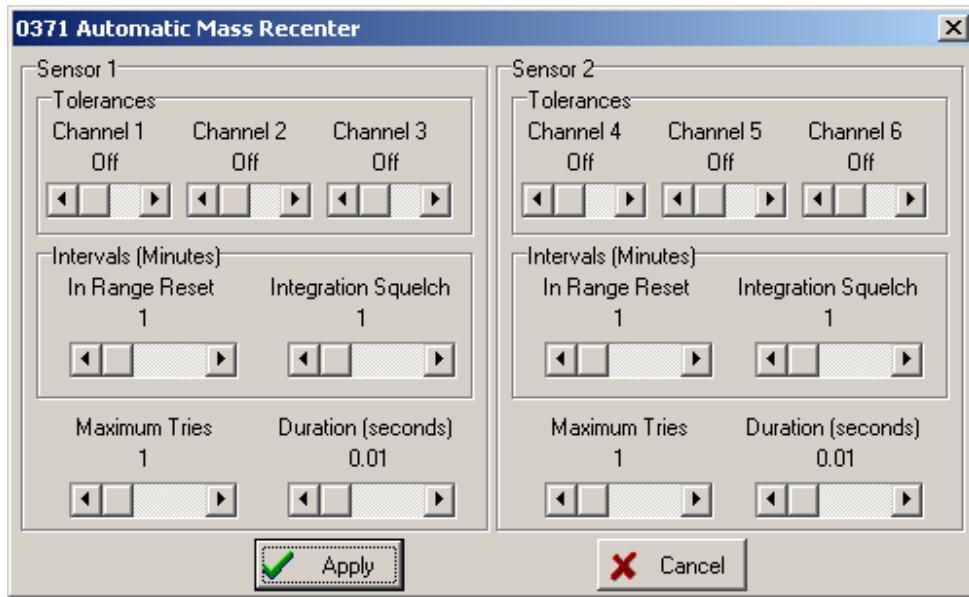
**GPS Lock or Max Time:** The GPS is powered down shortly after achieving a correct time solution, or after a safety “timeout”. This setting enables the absolute minimum power consumption, in that GPS “warm start” time acquisition after GPS power up usually only takes a few minutes. As soon as GPS time has been acquired, data records have a correct time stamp. The time base, however, generally does not have a chance to estimate the best internal oscillator frequency, and so the drift rate when the GPS receiver shuts down may not be well controlled.

**PLL Lock or Max Time:** This is similar to the previous option, except that the GPS remains powered while the internal PLL acquires lock to the GPS reference. When PLL lock is acquired, the timebase has an accurate estimate of the frequency required to hold drift at a minimum while GPS is powered down. During typical operation at fairly constant temperature, PLL lock may require an additional 10 minutes or so after GPS time acquisition. The PLL is considered as “locked” when the timebase is synchronous with GPS and the phase shift is 5 seconds or less. This is the recommended setting for power-cycled operation. The “starting hour” will cause the GPS engine to turn on at this time every day. It may turn on again that day based on the “Off-time” interval.

## **Automatic Mass Recenter**

Configuration -> Automatic Recenter

Automatic recentering features are intended for extended autonomous deployments where no operator or telemetry is present for long periods. Tolerances are specified in volts for each mass position, a length of time at which a retry of recentering will be attempted, but not more often than the maximum. Mass position values are ignored for a squelch interval after each centering attempt. Automatic mass recentering requires that sensors controls are configured correctly.



*Figure 40: Automatic mass recenter panel.*

### **Q330 Configuration**

In this panel configuration parameters can be saved to file or loaded from a file. See section 3.2.

### **Miscellaneous**

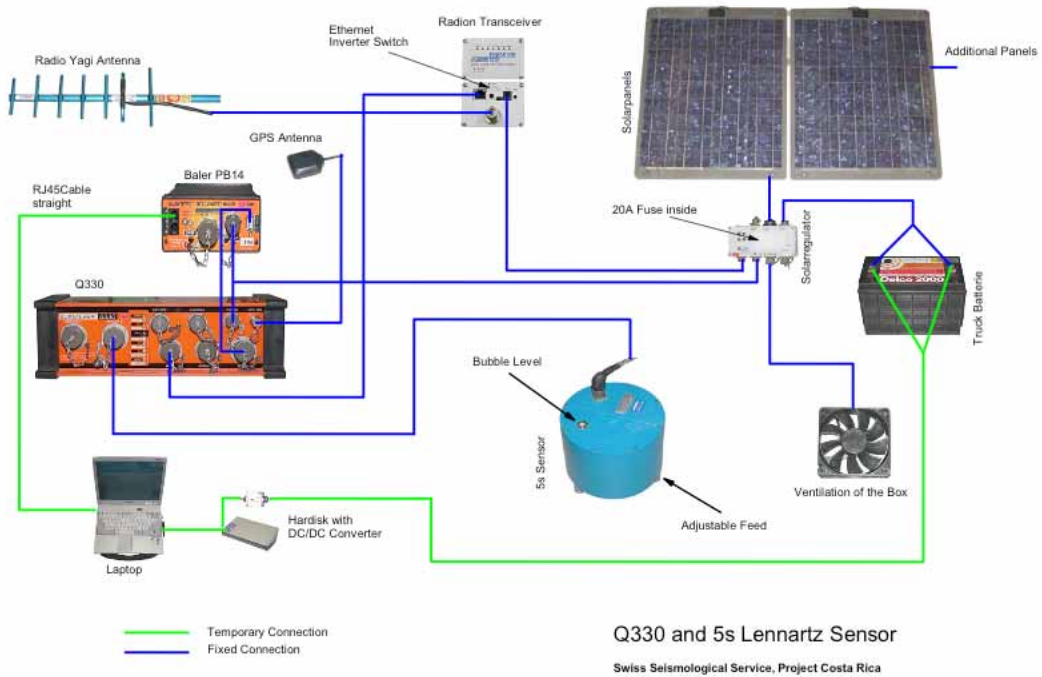


Figure 41: Example of connection to a Q330 to a LE3D-5s sensor with a radio link

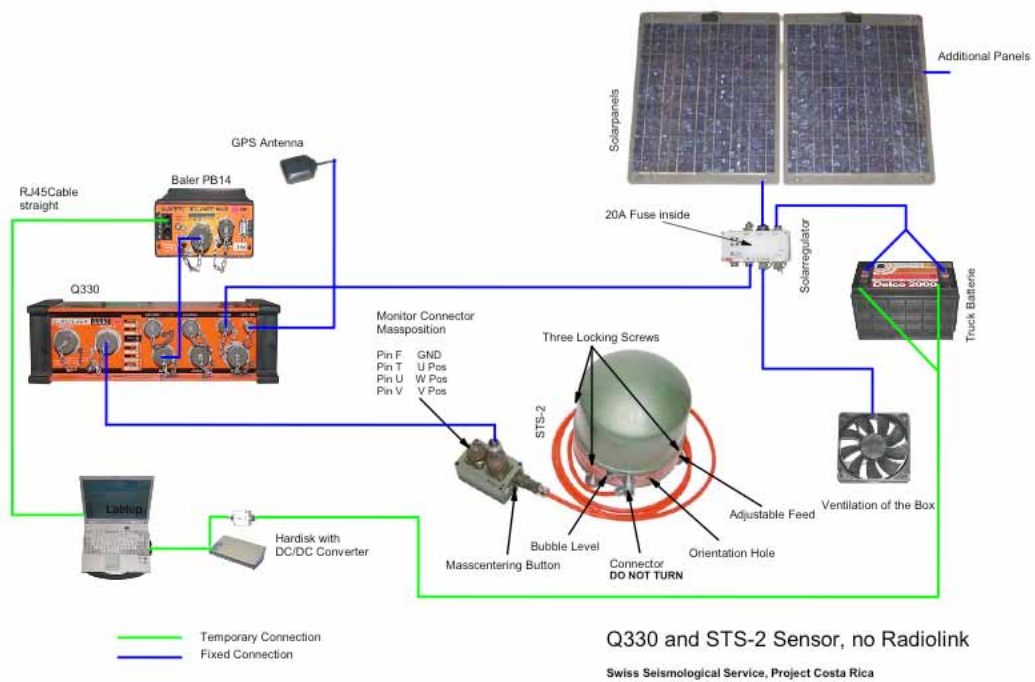


Figure 42: Example of connection of a Q330 to a STS-2 sensor without a radio link

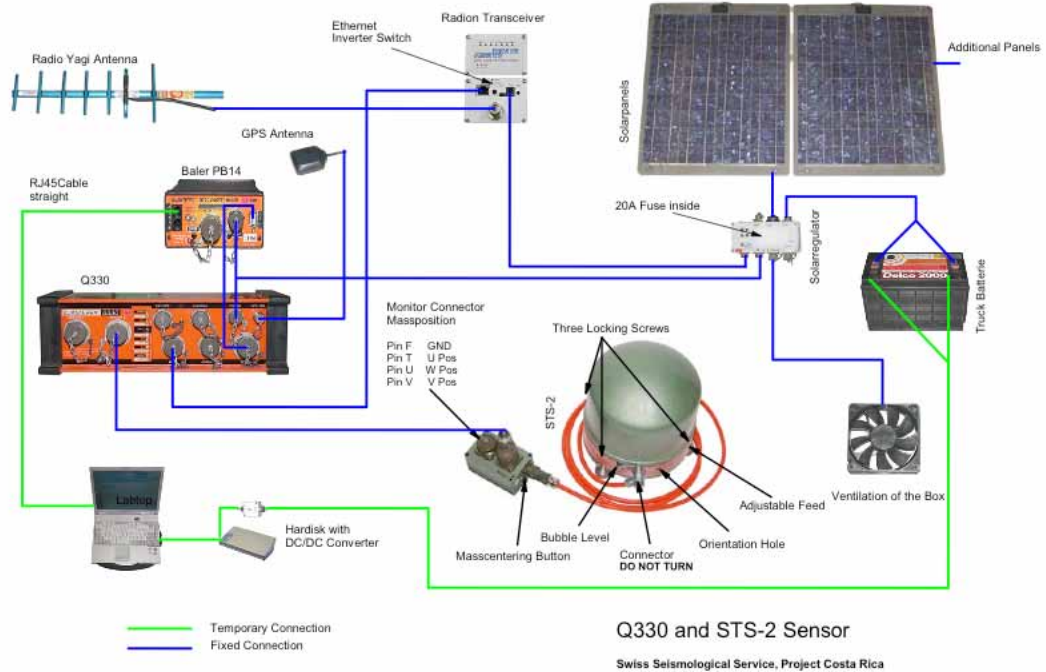


Figure 43: Example of connection of a Q330 to a STS-2 sensor with a radio link