

Q330 Operations Guide:

Q330HR/Q330 Operation Overview of Support Tools Baler Operation

Document 304808
Revision B

Q330HR/Q330 Operation and Overview of Support Tools and Baler Operation

Document Version 20070409

QUANTERRA, INC.

325 Ayer Rd.
Harvard, MA, 01451
TEL: 978-772-4774
FAX: 978-772-4645

Scope

This guide will cover operation of a Q330 or Q330HR in a simple test environment, in order initially to verify operation and acquire test data. It also includes the use of the Baler PB14F. The guide also contains technical reference, safety, operating environment, installation and maintenance information on the Q330 family of products.

Topics include:

- Review connection of multiple Q330's and Balers in an actual target station installation.
- Inventory of materials and initial steps connecting a Q330HR to power, GPS Antenna, and a PC for configuration setting.
- Using the Willard program to view status and issue commands, and load and save the Q330 configuration as an XML file.
- Review of steps required to prepare a Baler for connection to the Q330HR to be used in on-site recording, and retrieval of MSEED data from a Baler.
- Use of the "thin client" Mon330 program to demonstrate status monitoring of remote Q330's.
- Use of Cimarron graphic display tool to review MSEED data acquired by the Baler or by the Pecos PC program.
- Use of the Pecos program on a Windows PC for data acquisition and access to recorded data through HTTP and LISS service.
- Use of the BalerAdmin multi-platform tool for administration and collection of MSEED data from a group of Balers.
- Topical APPENDICES covering many common tasks and answers to frequent questions regarding Q330 operation.

The style of this document is conversational and topical, to introduce both detailed steps and familiarize users with an overview of common jobs, such as updating Baler firmware. Many prior documents and notes published on www.q330.com remain applicable and users should familiarize themselves with this information, however, this document will focus on new features in support tools such as Willard and Cimarron, and introduce new tools, with an emphasis on operation of the Q330HR. With the exception of specific hardware features included in the Q330HR, the methods and tools shown are fully applicable to all versions of the Q330. Thus the term Q330HR is used to describe both the Q330 and Q330HR for brevity.

IMPORTANT NOTE - CHECK www.q330.com FREQUENTLY FOR TOOLS & UPDATES

Note: The Q330HR is shipped from the factory with firmware and configuration that should not be overwritten with older Q330 configuration files, and the Q330HR should not be controlled using older versions of Willard that do not manage the Q330HR's new features. The tools and firmware shipped with the Q330HR, or later revisions downloaded from the www.q330.com website, should be used with the Q330HR. The www.q330.com website should be checked periodically for downloads. New www.q330.com downloads are backward compatible with Quanterra hardware.



EQUALLY IMPORTANT NOTE – USE THE TOOLS!

Even if you do not plan to operate in a Windows environment, take the time to walk through the jobs and applications here to learn how the equipment works. Take the time to scan application notes and even detailed protocol documents on the www.q330.com website. Use current revisions of Q330, Baler, and support tools software. If you don't like Windows, you're not alone, but if you don't learn to use the tools available, you're making a lot of work for yourself and your job will be harder. Many of the tools such as Willard, Pecos, and Cimarron run well under Windows emulating environments such as VirtualPC on MAC and WINE on Linux computers. Some applications, such as BalerAdmin, are designed to run natively on multiple platforms. If you have a question, please ask Quanterra or Kinometrics technical support.

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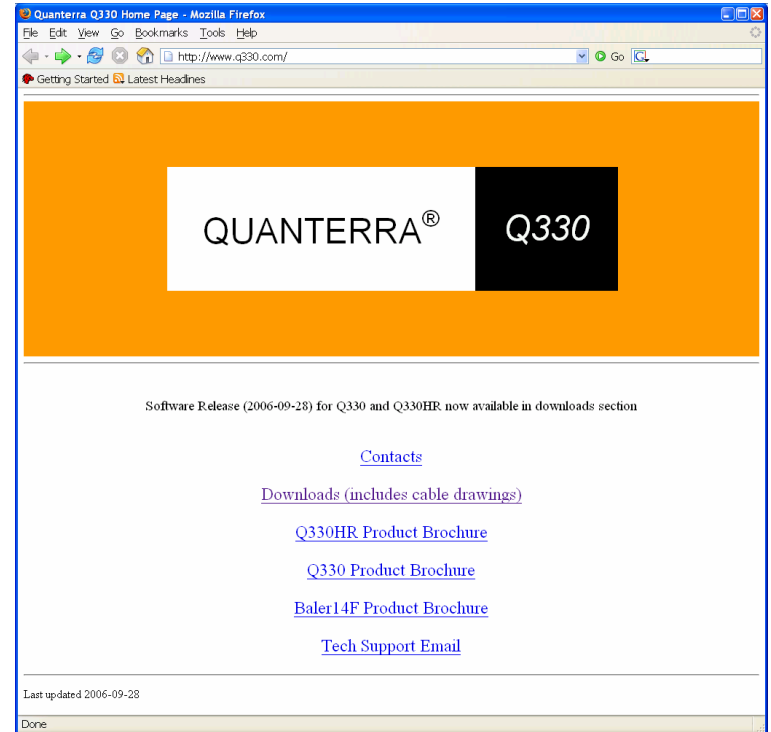
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Quanterra Inc., 325 Ayer Road, Harvard, MA 01451, USA

Phone: (978) 772-4774 Fax: (978) 772-4645

Website: www.q330.com

Kinometrics Technical Support: support@kmi.com



Declaration of Conformity

WE

KINEMATRICS, INC.

222 VISTA AVENUE
PASADENA, CA 91107
USA

hereby declare that the equipment specified conforms to the essential requirements of the following applicable European Directives and Standards and carries the CE mark accordingly:

Product Name: **Quanterra Q330**

Product Description: High Dynamic Range Digitizers

Model Number(s): Q330 (3 Channel), Q330 (6 Channel), Q330HR (Including all memory size options and Auxiliary Digitizer Boards) P/N 110900-(all versions), P/N 112300-(all versions)

Directives: Low Voltage Directive (72/23/EEC, amended by 93/68/EEC)
EMC Directive (89/336/EEC, amended by 93/68/EEC)

Standards: Safety: IEC 61010-1:2001/EN 61010-1:2001

EMC: IEC 61326-1:1997+A1:1998
EN 61326-1:1997+A1:1998
With Specific Tests and Limits Listed

Supplementary Information:

Pasadena, CA USA
13 October 2006



IAN M. STANDLEY
VICE PRESIDENT, ENGINEERING

Declaration of Conformity

WE

QUANTERRA, INC.

325 AYER ROAD
HARVARD, MA 01451
USA

hereby declare that the equipment specified conforms to the essential requirements of the following applicable European Directives and Standards and carries the CE mark accordingly:

Product Name:	Quanterra Baler 14F
Product Description:	Deep Data Buffer System
Model Number(s):	Packet Baler 14F
Directives:	Low Voltage Directive (72/23/EEC, amended by 93/68/EEC) EMC Directive (89/336/EEC, amended by 93/68/EEC)
Standards:	Safety: IEC 61010-1:2001/EN 61010-1:2001 EMC: IEC 61326-1:1997+A1:1998 EN 61326-1:1997+A1:1998 With Specific Tests and Limits Listed

Supplementary Information:

Harvard MA 01451
November 22, 2006



**JOSEPH M. STEIM
PRESIDENT**

Safety

Symbols & Terms

These symbols may appear on Quanterra equipment or in this manual:



When you see this symbol, *pay careful attention*. Refer to the similarly marked, relevant part of this manual before servicing the instrument.



This symbol means a *low-noise earth ground*. The noted item should be grounded to ensure low-noise operation, and to serve as a ground return for EMI/RFI and transients. Such a ground *does not work as a safety ground* for protection against electrical shock!



This symbol means an alternating current (AC) power line.



This symbol means a direct current (DC) power line derived from an AC power line.



This symbol indicates an electrostatic sensitive device (ESD), meaning that when handling the marked equipment you should observe all standard precautions for handling such devices.



This symbol indicates that a particular step/process or procedure is required to ensure the installation maintains conformity to European requirements.



This symbol indicates that this referenced equipment or material should be re-cycled and not thrown in the normal trash stream.



This symbol indicates that the step/process or equipment has an environmental consequence and steps such as recycling are required.

These safety-related terms appear in this manual:

Note: Statements identify information that you should consider before moving to the next instruction or choice.

Caution statements identify conditions or practices that could result in damage to the equipment, the software, or other property.

WARNING! statements identify conditions or practices that could result in personal injury or loss of life.

Specific Precautions

Follow the precautions below to ensure your personal safety and prevent damage to Q330HR/Baler. The unit is powered by an 8-18 VDC source, from external batteries or from a solar charging system.

Optional Power Supply Assembly

If you plan to power the Q330HR/Baler from the mains supply in an office environment, we recommend Quanterra/Kinometrics' Power Supply Assembly (PSA) (111120-PL) that supplies a nominal 14VDC to the unit. Plug the PSAs power cord into AC outlets that *will not apply* more than 250 Vrms between the supply conductors or between either supply conductor and ground. A protective ground connection (provided through the grounding conductor in the PSA and its power cord) is essential for safe operation. The PSA is designed for indoor use only; it must not be subject to immersion in water, high humidity, or temperatures above 70°C or below -20°C.

User-Supplied Batteries or Charging System

If you supply your own charging system, make sure the system provides the correct voltage and current required by the unit. If you derive power from the mains supply, make sure there is adequate grounding for all the equipment. If you supply your own batteries, follow the warnings below.

External Battery(s)

Follow the precautions in this manual when handling and replacing external batteries. Metallic instruments of any kind could short the battery terminals, resulting in fire or explosion. Do not drop the battery or attempt to disassemble it. When charging the battery, use a properly rated charger and do not overcharge the battery. For Quanterra/Kinometrics supplied charging systems the only correct replacement battery is a sealed lead-acid battery with relief vents and ratings comparable to the original battery. Never try to use a non-rechargeable battery with a battery charging system.

Grounding the Q330HR/Baler

When using the optional PSA to power the unit from the AC mains supply, remember that the unit is grounded through the PSA power cord. To avoid electric shock, plug the PSA cord into a properly wired receptacle where the protective earth ground has been verified. Do this verification *before* making any power connections to the unit.

Use the Proper Power Cord

Use the power cord and connector supplied with optional PSA, or an equivalent IEC-standard power cord. Be sure that it is in good condition.

Antenna, Phone, & LAN Cabling

Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) volts of DC and the ring signal at ninety (90) VAC can deliver a very uncomfortable shock. Power over Ethernet Cabling can carry DC voltages of up to 56VDC. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

Do Not Operate in Explosive Atmospheres

The unit and the optional PSA provide *no explosive protection* from static discharges or arcing components. *Do not* operate the equipment in an atmosphere of explosive gases.

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Unpacking & Inspecting the Unit

Before accepting the shipment the shipping carton should be examined for any obvious damage and this should be recorded by the freight carrier. The Q330HR ships in a custom designed carton. This carton can be used to return the unit or to ship it to other destinations. It should be carefully opened at the top so it can be re-used. The Q330HR is packed in custom foam inserts. Carefully pull the unit and the inserts from the box. The unit should have no signs of external damage. The unit is then ready for testing and installation.



When the packaging is no longer required please recycle the cardboard cartons and foam insert appropriately.

Operating Environment

The Q330HR and Baler need to be installed in a location that provides the following environmental conditions.

Operating Temperature

The Q330 is fully specified for accuracy over the -20° to $+50^{\circ}$ C temperature range, it will operate over the -40° to $+70^{\circ}$ C range and can be stored at temperatures from -40° to $+70^{\circ}$ C.

The Q330HR is fully specified for accuracy over the -10° to $+50^{\circ}$ C temperature range, it will operate over the -40° to $+70^{\circ}$ C range and can be stored at temperatures from -40° to $+70^{\circ}$ C.

The Baler PB14F will operate over the -40° to $+85^{\circ}$ C temperature range and can be stored at temperatures from -40° to $+85^{\circ}$ C when used with IDE Flash drives. When used with “low-temperature” rotating media option (standard since mid-2005) the operating temperature range is reduced to -20° to $+85^{\circ}$ C due to limitations of the media. These temperature ranges refer to operation in the standard “cycled” mode. The operational temperature range in “continuously-powered” mode is reduced to -20° to $+40^{\circ}$ C. All temperatures are ambient.

The units should not be placed where they are exposed to direct sunlight.

Operating Humidity

The cases of the unit are designed to meet the requirements of a NEMA 6P enclosure (equivalent to IP67). The units can operate in humidity levels of up to 100% and withstand occasional temporary immersion in water up to 2 meters in depth. The units should not be continuously immersed, as galvanic corrosion of the connectors will occur, potentially destroying the system. To ensure operation in high humidity, the desiccant packets must be fresh and the cases of the units should be carefully re-sealed if opened. The units should be protected from rain and snow and should not be allowed to stand in water for longer than one hour.

Operating Altitude

The Q330HR units can operate at altitudes from -300 to +10,000 meters. The PB14F Baler using rotating media can operate within the media-specified altitude range of -300 to +5000 meters. The PB14F Baler enclosure should NOT be opened at altitudes above +3000m in order to retain residual air pressure.

Electrical Ratings

The Q330HR requires a DC supply of 8-18 VDC, capable of supplying ~2.5W average power to a 6 Channel system, for a 3 Channel system the average power is <2W. This equates to an average current at 12VDC of ~200mA for a 6 channel system and ~166mA for a 3 Channel system.

The Q330 requires a DC supply of 8-18 VDC, capable of supplying ~0.8W average power to a 6 Channel system, for a 3 Channel system the average power is <0.6W. This equates to an average current at 12VDC of ~67mA for a 6 channel system and ~50mA for a 3 Channel system

The PB14-F requires a DC supply of 10-18 VDC, capable of supplying 6W of maximum power. The average power of the PB14-F when acting as a deep buffer for a Q330HR/Q330 is <0.06W when power controlled by the Q330HR/Q330.

The DC power supply does need to be sized for the total operating load and the initial inrush current. For example a 6 Channel Q330 may power a PB-14F, an STS-2, and an EpiSensor. In this case the current requirements of all these devices would need to be accounted for along with their requirements for initial inrush current, and additional current that may be required for certain operations such as sensor centering, calibration, and locking/unlocking. As a rule of thumb designing the power system to support a current of three times the steady state current for will provide an adequate reserve power. However, as noted in detail in the Appendix, the electronic loads presented by the Q330, Baler, and likely other equipment such as modems, radios, Ethernet devices, and so on, are complex and may have peak demands much higher than the 3 times the average for very short periods. Many electronic power supplies cannot operate with such a load unless a smoothing filter is used. The power requirements for the Q330, and other electronic systems, must be thoroughly understood in designing a power supply to provide power in your field installations. An incompatible power supply characteristic may result in frequent reboots, data loss, corruption of sensor outputs, and in some cases, damage. Read and thoroughly understand the power requirements of the Q330, and the supply you plan to use.

Equipment and supplies

For the first phase, concerning the Q330HR connected only to a Windows PC, you will need:

- A Q330HR
- An evaluation kit of connectors and cables, including;
- P/N 109476-M serial cable to connect PC to the console port of the Q330HR
- P/N 111058 4-pin TEE power adapter and P/N 111059 4-pin power connector
- P/N 111056 QNET cable with Cat 5 ethernet patch cable and 4-pin connector for power and control.
- A standard “patch” GPS antenna with 15’ cable, or preferably P/N 111095 “Bullet” antenna with 25m cable.
- PC Application binaries, supplied together in a ZIP file. Only Willard will be used initially. Some previews included to peek at ongoing developments.

Program	Minimum Version	Function
Willard	1.99 build 341	Primary configuration tool for Q330. Also provides status and control, and real-time data Quickview.
Cimarron	3.91 build 1240	MSEED waveform display tool. Displays MSEED files retrieved from a Baler, Pecos, or MSHEAR
Mon330	1.11	Real-time monitoring tool for concise status reporting from multiple Q330’s using only IP address.
BaleAddr	1.9	Baler IP Address assignment tool for use in Baler maintenance mode.
Reload	1.20	Utility for upload of firmware to a Baler.
MSeedScan	3.1	Utility for checking time and continuity integrity of MSEED data files
Pecos	1.40 build 414	MSEED data recording program for Windows PC, emulates Baler operation.
BalerAdmin	1.1.0.80	Tool for MSEED data retrieval and administration working simultaneously on a group of Balers.

- A 12V power supply (customer supplied)
- A multi-port 10/100Bt Ethernet hub or switch with RJ45 for connection of Q330HR, Baler, and PC via Ethernet.
- IP address allocations for the 330, PC, Baler. You should plan this in advance, particularly where multiple Q330’s and Balers may be networked simultaneously in a lab environment. The section below “IP Resource Planning” may help explain the various address and port requirements. The best approach is to create a private subnet, separated by a router from your office LAN, in order to minimize potential for conflicts and maximize efficiency.

For the second phase, including connection of the Q330HR to a baler, you will need:

- A PB14F Field Packet Baler.
- Either...
 - P/N 110401 Dual Serial Cable for Q330
 - P/N 110057 Baler (QNet to RJ45, DB9P Serial, & 4-Pin Baler Power/Control)
 - A 9-pin Male-Female Full Handshake Null Modem Serial adapter, P/N L-con DMA060MF or equivalent.
- ...or for new designs, the above 3 items (110401,111057,NULL) may be replaced by the preferred **P/N 503659-01** - Q330 Deployment Harness
- Baler firmware file “Baler14.exe” version **2.02** or later, delivered in a separate ZIP file.

Cable Drawings on www.q330.com

Drawings of all standard cables offered by Kinometrics and Quanterra are available on the support website. These drawings provide technical details of interconnections between the Q330 and Baler in typical environments. New cables are added frequently. Often there is more than one cable combination to achieve a particular interconnection requirement.

Complete fabrication-quality drawings are included on the web site for all cables. If you have a question regarding the connections made by the standard cables offered, download the drawings.

Q330 Drawings

Individual cable files are in PDF format, while drawing sets are in ZIP format
Cables for the Q330 and Q330HR are identical

Q330 Cables		
Revision	Name / Description	Size (KB)
20061026	Complete Set of Cable Drawings (available individually below)	3766

Q330 Communication & Power Cables

All QNet cables with RJ45 connectors are wired to connect to an Ethernet hub, except for p/n 111128 which is wired as a crossover cable. A RJ45 crossover connector (p/n 851836) is required to connect a 'hub' cable directly to a PC or laptop (p/n 111121 includes this crossover connector).

All cable sets with multiple part number components include one of each component unless otherwise noted.

P/N & Revision	Name / Description	Size (KB)
110902	Q330 Power Cable with Pigtail	61
110906D	QNET to RJ45 Hub with Power Pigtail	98
110907	Q330 Console Port Serial Cable - DB25	95
111125	Q330 Console Port Serial Cable - DB9	177
110949A	Q330 QNET to Baler14 QNET-80	114
110997	Q330 to PB14F (Ethernet, Serial, and Baler Power/Control) - this set consists of the following assemblies: 111056, 111057, & 111058	-
110999	PB14F (Ethernet, Serial, and Baler Power/Control) - this set consists of the following assemblies: 111057, 111058, & 111059	-
111056	Q330, PB14, or PB14F (QNet to RJ45 & 4-Pin Baler Power/Control)	207
111057	PB14F (QNet to RJ45, DB9P Serial, & 4-Pin Baler Power/Control)	285
111058	4-Pin Baler Power/Control Adapter 'T' (2 female, 1 male)	298
111059	4-Pin Socket Connector Kit for Baler Power Control	203
111060	Q330 to PB14 or PB14F (Ethernet and Baler Power/Control) - this set consists of the following assemblies: 111056 (2), 111058, & 111059	-
111061	Q330 to PB14F (Ethernet, Serial, Baler Power/Control, and extra connector) - this set consists of the following assemblies: 111056, 111057, 111058, & 111059	-
111105A	Q330 QNET to KMI FLEX	96
111120	Q330 Power Supply with Cable & Connector	78
111121A	Q330 QNET to RJ45	68
111128	Q330 QNET to RJ45 Crossover	167
111400	Q330 QNET to Baler14 QNET-80 with RJ45 Breakout	185
111401	Q330 to Dual Serial Port (2 DB9 Connectors)	406
503659A	Q330 Deployment Box Harness	154

Q330 Sensor Cables		
P/N & Revision	Name / Description	Size (KB)

For the final phase of installing the equipment in the field additional equipment and supplies will be required depending on the installation requirements. The following list of tools and supplied may be useful to you in the field (we assume that all infrastructure such as vaults, AC wiring, masts and grounding rods have already been installed):

To permanently mount the units:

- A drill capable of drilling into the attachment surface.
- Appropriate drill bits for the attachment surface.
- Suitable tools to install the screws/anchors into the attachment surface.
- Mounting hardware, screws, nuts, washers, concrete anchors studs etc (Dependent on selected mounting method)

To mount the GPS Antenna:

- Wrench or pliers to tighten the antenna connectors
- Tools for mounting the antenna to the pole
- Mounting Hardware

To make cables and grounding straps if required:

- A heat gun (electric or butane)
- Soldering iron (electric or butane)
- Small screwdriver
- Wire cutters
- Wire strippers
- Long-nose pliers
- Utility knife
- A drill (electric or battery powered)
- A crimping tool
- An extension cord or a small generator for AC power, if butane-powered soldering irons and battery-powered drills are not available
- Material to make grounding straps for the unit
- Solder with rosin-core flux
- An assortment of heat-shrink tubing, cable tie-wraps, and electrical tape

To configure the units and document the installation:

- A laptop computer running Windows, Linux, or other suitable operating System.
- Cables to connect equipment to configure it and those cables that will be part of the installation.
- A battery-powered digital volt meter (DVM) for system-checkout functions
- A portable printer, to print tests, configurations, and other commissioning data
- A camera, to photograph the completed installations

Safety & Cautions for Installation

During both the testing and field installation the following safety precautions and warnings should be observed to protect the equipment and user.

Grounding the Q330HR

All users should complete this procedure. You must provide the Q330HR with a good, low-impedance earth ground before operating it for the following reasons:



- To maintain the recorder as a highly sensitive, low-noise, seismic recorder.
- To shunt ESD transients, lightning-induced transients and EMI/RFI transients to ground.
- To meet the requirements of the European Community's EMI/RFI directives.

Determine what earth ground you will connect the Q330HR to. A good earth ground includes the following:



- a metal plumbing pipe that is eventually buried in the ground
- a copper ground rod staked in soil
- a well engineered electrical grounding system, or
- steel reinforcing rods that protrude from a concrete foundation.

Connect this conductor to the Q330HR's case grounding stud near the bottom left center of the Q330HR front panel. Then connect the other end of the conductor/grounding strap to the selected earth ground. This stud is marked with the ground symbol.

Note: If the Q330HR is powered by the optional PSA, the third pin (earth connection) of the PSA AC plug provides the safety ground. To ensure the unit's low noise performance, you must still connect the recorder's grounding stud to a good earth ground as described above.

Wiring & Cabling

Wiring and cabling should be carefully checked prior to installation to ensure correct wiring. We strongly recommend that you purchase completed cable assemblies whenever possible, if this is not possible you complete the cable in a laboratory environment, and only as a last resort complete cable construction in the field. All cables you have fabricated should be "buzzed out" to confirm they are electrically correct before connecting to equipment. When connecting telecom, LAN, WAN and antenna cables follow the cautions below.

WARNING! Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) volts of DC and the ring signal at ninety (90) VAC can deliver a very uncomfortable shock. Power over Ethernet Cabling can carry DC voltages of up to 56VDC. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

Connecting the optional Power Supply Assembly (PSA) (111120-PL)

If the Q330HR/Q330 includes the optional wide-input AC/DC power supply assembly (P/N 111120-PL), which connects to a standard AC outlet proceed as

follows.

Before plugging in the PSA:

- Make sure that the AC outlet is properly wired and is provided with a protective earth ground.
- Find out if the local AC power is subject to interruption, brownouts, or spikes. If it is, plug a suitable surge suppresser into the AC outlet. (Strongly recommended!)

Then do the following:

1. Push the 6-pin external power connector onto the Q330HR/Q330's EXT POWER connector and twist until it locks. (If you are powering a Q330HR and a Baler you will be using the 111059 plug connecting into the 111058 adapter and cable.)
2. Plug the PSA into the AC power outlet or surge suppressor. (Users outside the U.S. must use an adapter or an appropriate IEC line cord with the correct AC plug.)

Note: The PSA automatically adjusts for line voltages from 90 to 260 VAC (either 50 or 60Hz) without user intervention.

Proceed in a similar fashion if using your own power supply, ensuring that that the power supply can supply the power specified in the electrical rating section.

Caution: Using the wrong power supply unit with the unit can permanently damage its circuit boards. The units are provided with both reverse and over voltage protection, but continuous exposure to voltages >18V can damage the protective circuit elements.



WARNING! Potential electric shock hazard. The grounding stud is not a protective earth ground. If you connect the recorder to the mains supply, make sure that the protective earth ground is provided by the PSA as described in the Connecting the Power Supply section.

Caution: Potential equipment damage. All batteries and the PSA should be disconnected before you service the unit.

Connecting the Optional External Battery

The power supply system may include batteries to provide power backup for AC mains failure or as an energy reservoir for a solar charging system. In all cases please follow the following safety guidelines when working with batteries.



WARNING! Fire or explosion hazard. Do not install a non-rechargeable battery to be charged by a PSA or solar charging system. Only install the recommended battery ensuring all specifications are similar. For example Kinometrics charging systems normally utilize sealed lead acid batteries. Other types of Lead Acid battery should not be used as the temperature corrected charging voltage is set for SLA batteries only in Kinometrics equipment. On no account install alternative battery chemistry such as Lithium Ion or Nickel Metal Hydride when a SLA battery is specified!

For a Sealed Lead Acid (SLA) battery in storage, you should charge it every six to nine months to prevent permanent loss of capacity. You can float-charge the battery at 13.5-13.8V or cycle-charge the battery, with an appropriate current limit and a voltage of less than 14.7V.

When the voltage reaches 14.7V, the battery will be damaged unless you convert the cycle charging to float charging. Kinometrics ships batteries fully charged; make sure a battery is still fully charged before installing it.

Battery Installation

Follow the instructions provided with the power system to install a new external battery.



WARNING! Burn or explosion hazard. Never place metallic objects (such as a screwdriver or your wristwatch strap) across the terminals of a battery. The metal terminals can get very hot. Handle batteries with care, and do not drop them or attempt to take them apart. Recycle used batteries, or dispose of them in accordance with local regulations. Do not throw used batteries onto a fire.

Where is this all going?

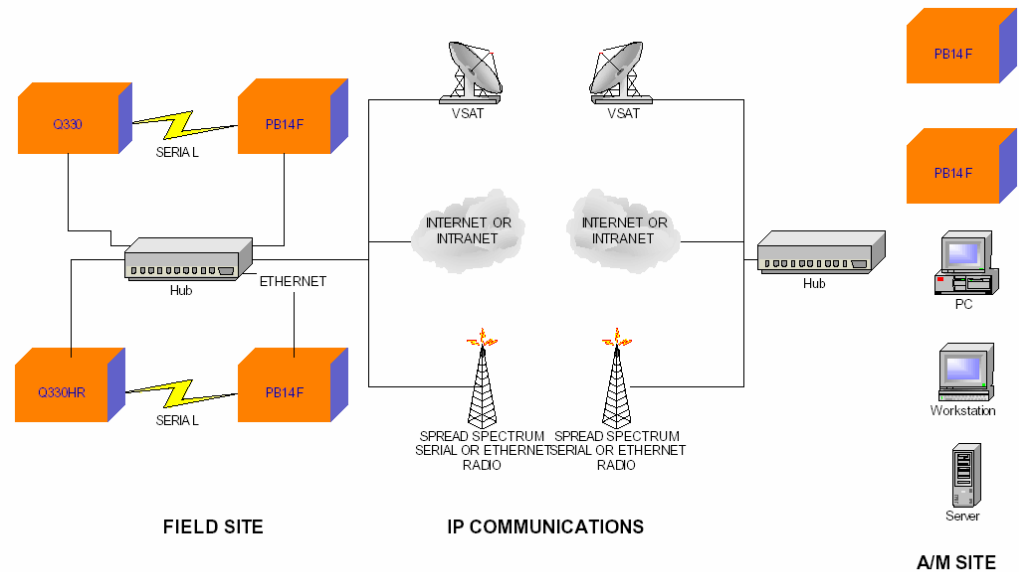
The Q330 family of products provides a high degree of flexibility in the use of communications interfaces. There are many ways to connect a Q330 to provide local acquisition and recording, and to allow remote access both to the real-time data stream and to data recorded on site. In addition, the Q330 may simultaneously support multiple connections of different types. Examples of devices that may be simultaneously connected include: Ethernet connection for real-time and recorded data, cellular telephone and dial modem connections to call in and/or call out, and serial spread-spectrum or Ethernet radios. In addition, data may be sent to up to 4 different receiving systems, including any combination of physical communications interfaces. So where do you begin?

Since the Q330HR was recently selected for deployment in Global Seismograph Network (GSN) sites, rather than treat the subject generally, this document will focus specifically on connecting and operating the Q330HR in a configuration suited for GSN sites. This configuration is generally applicable in many cases where it is desired to telemeter data simultaneously off-site, and to record it locally as well, and to be able to retrieve the recorded data through the communications interfaces. In order to achieve the desired total of 12 high-resolution A/D channels at GSN sites, the approach employs essentially two complete 6 channel subsystems: a Q330-6 and a Q330HR-6 at each field station. For redundancy, each Q330 will operate from its own GPS antenna, with its own internal GPS receiver and antenna mounted on a common mast.

Each Q330 will record locally on a PB14F connected by a serial interface. This approach allows a high degree of redundancy independent from the site Ethernet, and leaves the Ethernet interfaces on the Q330 and balers free to connect for direct off-site access. In this configuration, the Q330's will not "bind" with the Balers over the multiple-access Ethernet LAN, thus preventing any inadvertent "bindings" as may occur when a Q330/Baler are connected via Ethernet.

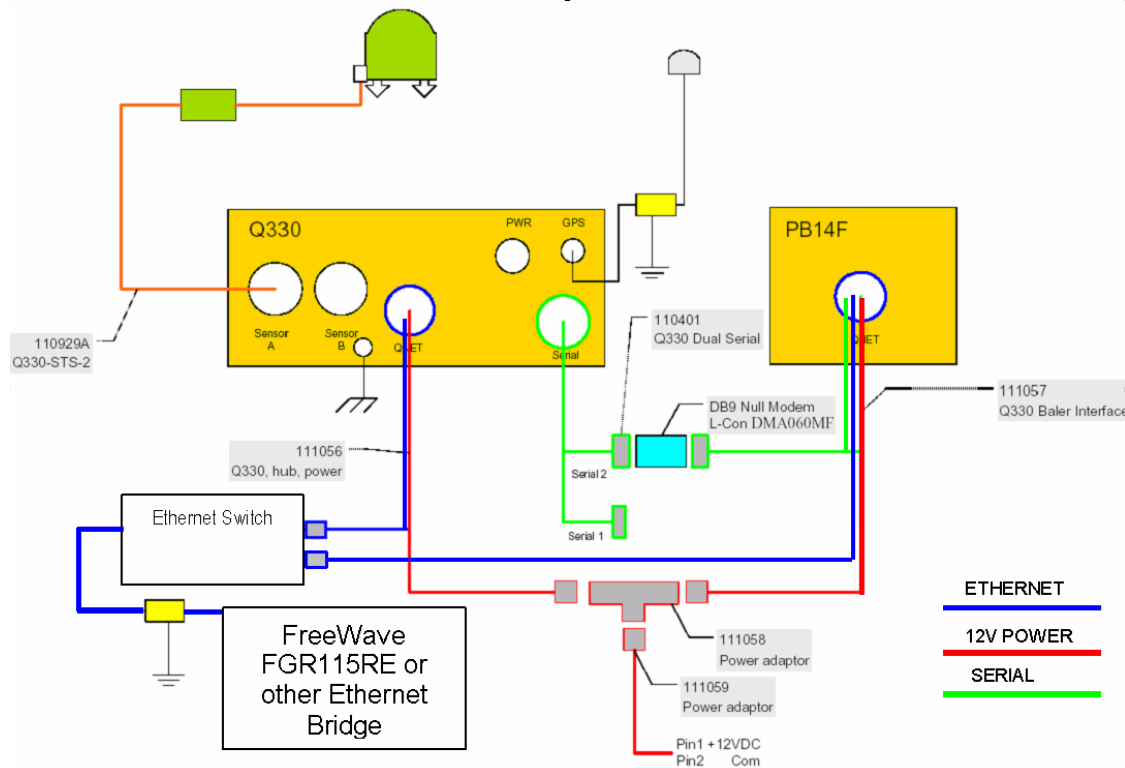
Off site telemetry and recording may be achieved in a variety of compatible approaches, using either dedicated rugged Baler14's, a PC running WXP and the Pecos program, or Linux or Solaris running Mountainair/datalog, or Solaris running Earthworm or the comprehensive Antelope package, as employed in USArray. Off-site telemetry and recording are completely redundant, and may be located physically near the field site, or at a network facility communicating across the internet. PB14 data is accessible remotely, and/or may be copied to local media by an operator. We will illustrate operation of off-site recording simultaneous with local Baler recording, using the Pecos program.

Bearing the overall objective in mind, we'll now proceed to review the detailed connection of one such Q330-Baler pair as actually configured for the field sites.



Connections between a Q330/Q330HR and a Baler at a Field Site

The detailed connections of a Q330 or Q330HR and Baler in an actual field installation are shown below. We'll set up this complete arrangement later in the procedure. For now, bear this in mind as the goal. Taking into account the overall direction, the next step is to plan IP network resource usage.



DETAIL OF DB9 NULL MODEM CONNECTION

CONNECT THESE WIRES TOGETHER!

IMPORTANT:

When connecting the 111401 and 111057 cables through the null modem, the flying **GROUND DRAIN** wires **MUST** be **CONNECTED TOGETHER!** Check for a **FIRM** connection and use an **OHMMETER** to verify continuity of the **GROUND** wires across the null modem. This is the ground connection for the baler in this arrangement. Erratic operation of the baler will occur without this **GROUND** connection.

NOTE:
The 110401 and 111057 cables and NULL MODEM may alternatively be replaced by the preferred 503659-01 *Q330DeploymentHarness* that combines the function of the 11040, 111057, and null modem. See the cable drawing on www.q330.com

Figure 1 CONNECTION OF ONE Q330/Q330HR AND BALER PAIR IN A FIELD STATION

IMPORTANT:

Observe GND and PWR connections in accord with safety recommendations, and to assure ground loop minimization. Use the **EARTH GND** screw on the Q330 panel. See the **APPENDIX**.

IP Resource Planning

Q330 family devices are exclusively IP devices and provide a number of distinct services. Each device, such as a Q330, Baler, and PC support software may require one or more IP addresses and TCP or UDP port numbers to support remote access to these services. Before beginning to use your Q330, you should be aware of the range of services available, and coordinate with your network administrator to make available the range of IP addresses and ports needed to make the most of the Q330. Some services require more than one TCP or UDP port. There must be unique port numbers assigned at each IP address in such cases.

Table of IP Resource Usage and default values

Service	IP Address	Default Port or Port Range	Where to set using Willard
Access to Q330 for control and real time data acquisition via Ethernet	The Q330 has 3 network interfaces, 2 serial and one Ethernet, each with a separate IP. Serials may use factory defaults. Ethernet interface IP address must be accessible on your LAN.	5330-5339 UDP	Q330 Configuration Interfaces Ethernet form.
Q330 HTTP Server.	The Q330’s HTTP (web) server appears at the specified TCP port on each of the Q330’s network interface IP addresses.	80 TCP . To discourage DOS attacks on non-private networks, use another port. 5380 TCP is suggested.	Q330 Configuration Global Setup
Baler HTTP Server and Command Port when normally connected to and acquiring data from a Q330. NOT when the Baler is operated in maintenance, i.e. “Vacuum”, mode.	A Baler may be contacted in two ways when connected to and acquiring data from a Q330. 1. Direct to IP address of Baler 2. NAPT access to Baler at IP address of Q330 , if NAPT is enabled in the Interfaces Advanced settings. In this case, the Q330 acts as a NAPT-capable router, handling traffic to/from the Baler. Only a single IP is required in this mode.	Direct Baler IP access: 5331 UDP 5380 TCP NAPT access to Q330’s IP: 5354 TCP 5344 UDP	DP Tokens for the Data Port on which Baler connects. Normally Q330 Data Port 4 Q330 Interfaces Advanced settings. When NAPT access is selected, the TCP port is automatically assigned 5350+DataPort, e.g. for the normal Data Port 4, 5354 TCP
Maintenance access to a Baler during preparation, when connected to a “ Data Vacuum ” application program, not a Q330.	IP address of Baler The IP address assigned by the Address Server is not related to the IP assigned to the Baler by a Q330. The IP address assigned by the Address Server must be reachable on the LAN where your Baler and PC operate	5331 UDP 80 TCP Assigned by the Address Server	IP address of Baler assigned when Baler boots up and connects to “Baler Address Server” on LAN, as in DHCP. A demo application that includes the Address Server function for a single Baler is “ BaleAddr ”. A more comprehensive multi-Baler application, BalerAdmin is fully released and preferred.

Baler NetServ service	IP address of Baler (not available NAT)	0 TCP – Default is disabled.	DP4 Token. Useful only continuous pwr mode
Pecos HTTP Server. Controls HTTP and Weblink Access.	IP address of PC running Pecos	80 TCP . The Pecos HTTP server must listen on a unique TCP port for each Pecos process running, i.e. for each station.	The Pecos HTTP port is set in the Pecos Manager . Possible recommendation: (Q330tagID*10)+(Data Port) , e.g. for Q330 tagID 1550, data port 1, assign 15501 TCP
Pecos NetServ Server, provides connection service to LISS client.	IP address of PC running Pecos Note: Each Pecos may permit multiple simultaneous LISS connections, each at a unique port number, occupying a contiguous port range starting at an assigned base port.	0 TCP – Default is disabled. As in the case of the Pecos HTTP server, the Pecos NetServ server must listen on a unique TCP port for each Pecos process running, i.e. for each station.	The Pecos NetServ base port and range is set in the Pecos Manager . With one LISS connection, a simple formula to assign a unique port number for LISS service is: (Q330tagID*10)+(Data Port+5). E.g. for Q330 tagID 1550, data port 1, use 15506 TCP. Multiple LISS client connections per Pecos permitted, this formula may lead to conflicts between Pecos’s used to collect data from the Q330’s separate data ports.
ConfigServer serves centralized cfg info.	IP address of computer running ConfigServer	8133 TCP	Doesn’t use Willard. Set in ConfigServer.cfg file.

“Do’s” and “Don’ts” concerning Windows and Windows Networking, Q330’s, and Balers!

Certain security measures, particularly in Windows XP, may prevent proper operation of the heavily IP-service dependent application programs unless configured to permit the range of ports and services required. It is recommended to operate the Windows PC initially in accordance with the guidelines below, with security features disabled, then once the requirements are understood, security features may be re-enabled individually and tested for effect.



- DISABLE WINDOWS FIREWALL
- DISABLE 3RD PARTY FIREWALLS (MCAFEE, SYMANTEC...ETC), ANTI-SPYWARE, ANTI-VIRUS PROGRAMS
- DISABLE ENERGY CONSERVATION SETTINGS THAT MAY SHUT DOWN THE HARD DISK OR DISPLAY
- DON’T USE NETWORK DRIVES FOR DATA STORAGE. THESE MAY GO OFFLINE UNPREDICTABLY RESULTING IN DATA LOSS.
- In your initial work outlined in this document, DISCONNECT your LAN from any other LAN on which Q330’s possibly running older firmware may be present, to prevent inadvertent confusion of which Q330 you are talking to. Later, when all Q330’s are updated, they may coexist on the same LAN.

Initial Connection between a Q330/Q330HR and a PC with Willard

For the first phase, we'll concentrate on a subset of the actual connections used in a field station. This will connect your Windows PC to the Q330 via the serial console port and Ethernet, and will provide power for the Q330 through the same cabling arrangement used in the field station. We're using the same cabling used in the field station to connect to the Q330, but there is no Baler yet. We've also made a connection to the CONSOLE port of the Q330 to the PC.

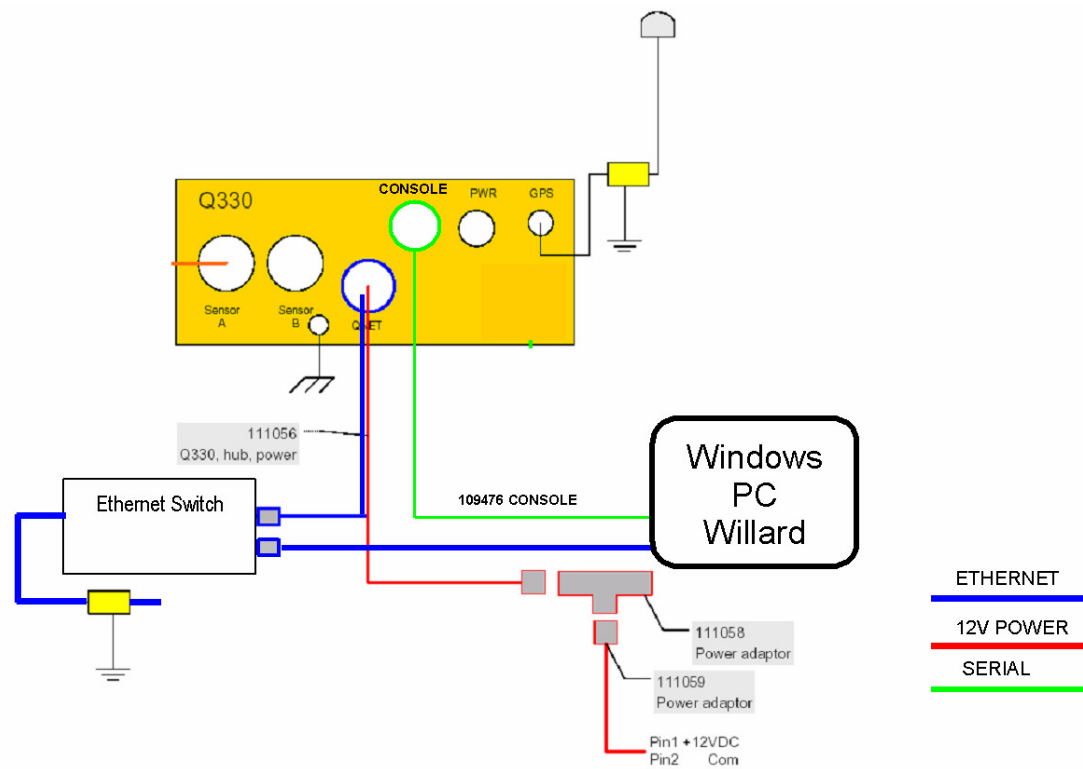


Figure 2 CONNECTION TO A PC OF ONE Q330/Q330HR FOR INITIAL SETUP

Connect and Power Up

Locate the Q330 so that the RJ45 connector on the QNET cable P/N 111056 can reach the power supply and hub. Locate the GPS antenna outside or in a window.

- Connect the GPS antenna to the Q330.
- Connect the P/N 111056 QNET cable to the Q330 QNET port, and connect an available connector on the 111058 TEE adaptor. This will leave a power connection for the Baler later.
- Connect the P/N 109476-M serial cable from a PC COM port to the console port of the Q330. No null modem is required but a 25 to 9 pin adaptor may be required for the PC serial port.
- Fabricate a P/N 111059 power plug, connecting the pin 1 (+) and pin 2 (-) wires. Plug this into the 111058 TEE adaptor, and connect your +,- power cable to a high-quality, linear-regulated 12VDC power supply. The voltage should be set 13.5-14.5V. It is recommended to limit the length of wires from the power supply to the Q330 to less than 2m. Excessive length and power source impedance may cause the Q330's power monitor to shut down the Q330 during load transients.

When power is applied to the Q330, there will be a sequence of flashing LED's during the boot procedure indicating various waypoints. After 20s, no RED FAULT indicators should be present. The RED SYSTEM STATUS indicator should begin blinking within 90s after power up, and will turn GRN when GPS time is acquired. After power up, initial acquisition of GPS time may require an hour or more. The following steps do not require acquisition of GPS time.

While the Q330 runs and the GPS receiver begins to acquire time, the PC applications can be set up.

Introduction to and installation of PC support applications

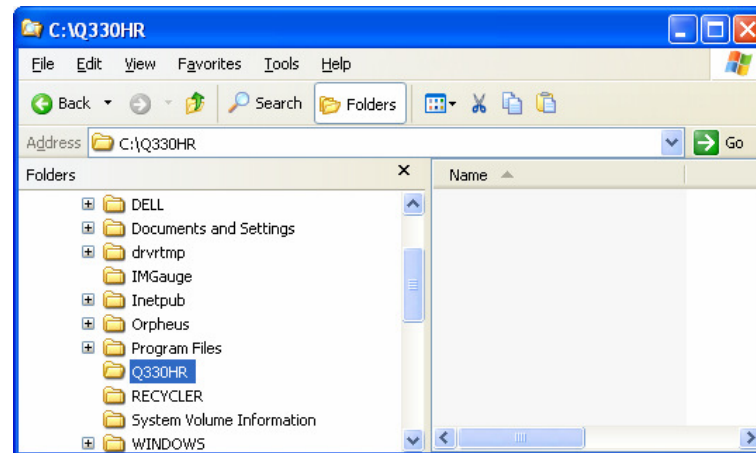
The Quanterra supplied applications Willard, Pecos, and Cimarron are compatible with Microsoft Windows operating system including Windows 98, Windows ME, Windows 2000 and Windows XP.

Create a directory on your PC for the Q330HR support tools. The Q330HR tools are backward compatible with previous Q330 tools, and may be installed within an existing directory structure. There are some backward compatibility issues, so for illustration purposes, however, the present examples will show stand-alone installation of tools in a new directory and configuration explicitly for evaluation of the Q330HR. You may have elsewhere on your system the Q330 standard software support tools that include utilities for Q330 and Baler administration. Those procedures and tools remain unchanged, and are needed for these tasks which are not specific to the new features pertaining to the Q330HR.

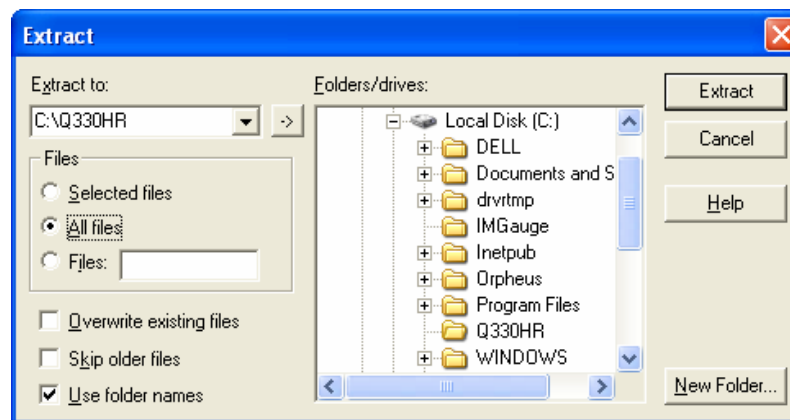
We will use C:\Q330HR as the new home directory explicitly used for the Q330HR. If you use Pecos, the location of the applications can be separated from the data collected from a station by specifying a different directory for the station data recorded by Pecos when the individual station directories are created. When updates to the Willard or Pecos applications are installed, it is sufficient to extract the new Willard Zip archive in this directory, the new application distribution does not disturb customer station configurations.

Create a directory C:\Q330HR, and unzip the contents of the file Q330-support-20050809.zip (or later) on the CD into the Q330HR directory. These tools will be all that is necessary to communicate with, record, and access MSEED data from the Q330HR and are backward compatible with previous Q330 hardware and

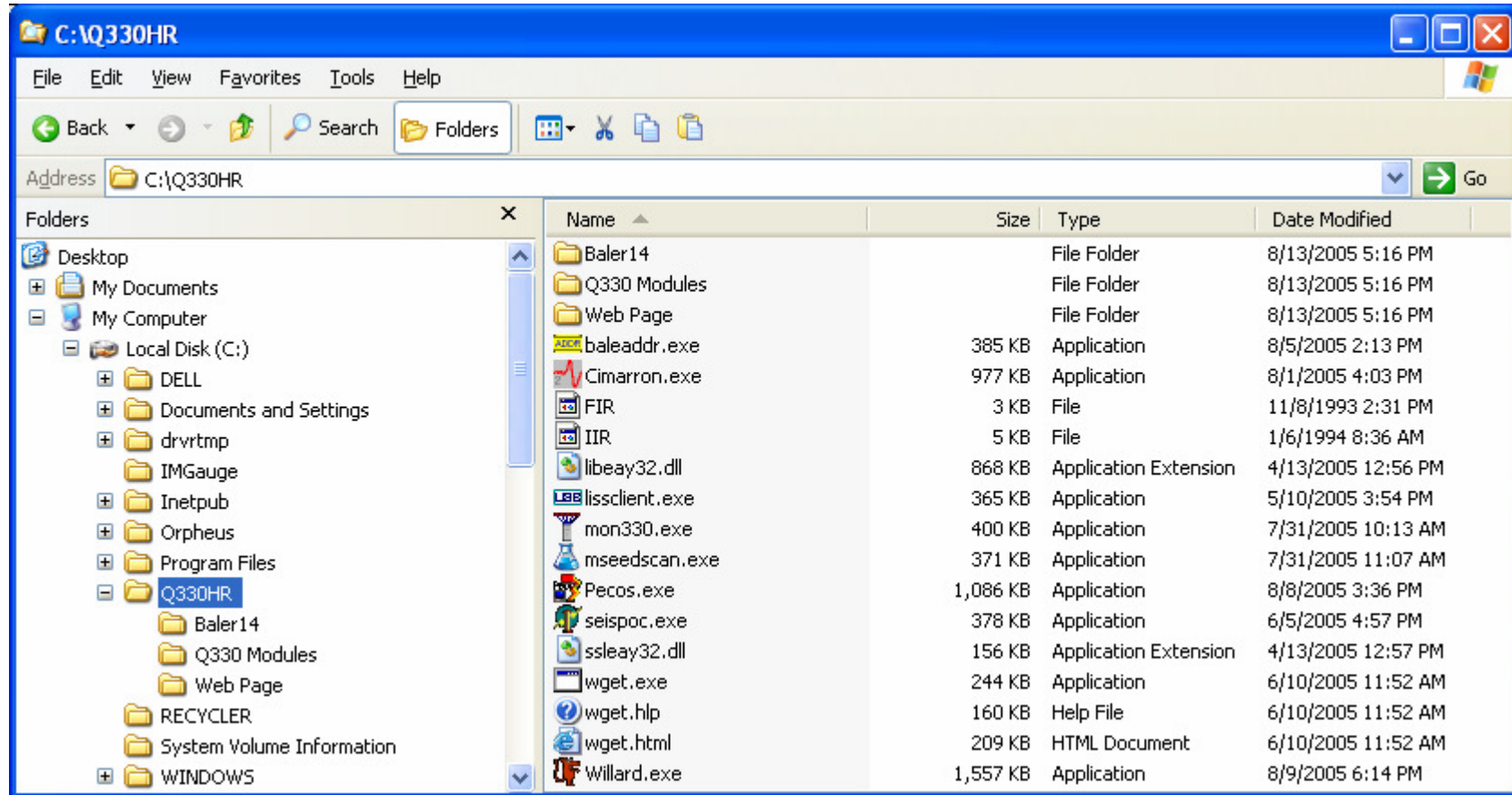
firmware versions.



Be sure to select the WinZip options as specified below to create the proper directory structure.

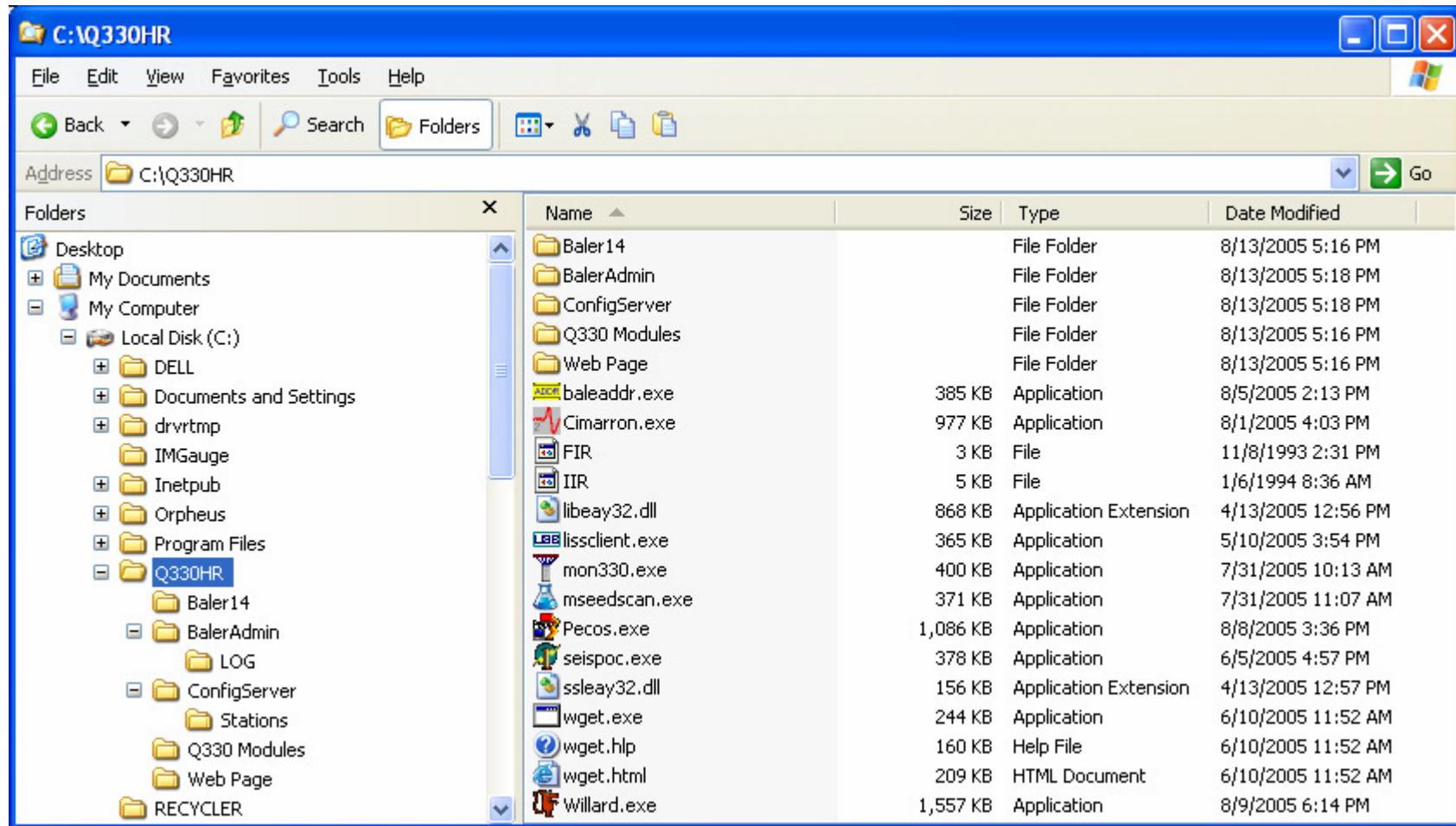


After the files have been extracted, your Q330HR directory should look something like below. The Q330 Modules directory contains Q330 firmware current at the time of shipment.



It's convenient to create shortcuts to all the applications (.exe's) on your desktop or quick-launch bar. Note that the reload.exe is located in the BALER14 subdirectory.

Although we won't use these programs immediately, it's worthwhile to extract the file BalerAdmin-20050809.zip (or later) as well into your new Q330HR directory. Again, be sure to use the WinZip extract options as above. BalerAdmin and ConfigServer are located in their own subdirectories.



Notes on the directory structure used by the PC applications Willard, Pecos, and Cimarron

The directory in which the application binaries are located is called the Willard home directory, C:\Q330HR in the figure above. Within this directory, a file called *stations.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 stations.ini* file is part of the *manager* function of each application.

A separate directory is maintained for each Q330 you communicate with using the PC applications Willard and Pecos. You can name the directories with any name (up to five characters) but typically the directory name is either the SEED station code or the 4-digit Q330 Tag Id. For example, BOBS or 0114 might be used for the station directory name of Q330 tag id 0114 deployed at station code BOBS. Pecos is a Data Processor program (it writes SEED data on the PC). Since each Q330 can support up to four independent Data Processors, or DP's, the directory structure for Pecos requires the Data Port number appended to the name, for example BOBS_1 to store data from Data Port 1. On startup, the applications Willard, Pecos, and Cimarron will prompt you to choose a station from the list in *stations.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 the Willard, Pecos, and Cimarron applications contain a built-in manager function to edit connection information and to manage the station directories so that reconnection is simple. The ".ini" files should not be manually edited.

Typically, Pecos may be used for initial experiments of recording some data in the lab and for diagnostic testing. As such, the required PC disk space is typically small and no special disk partitions are necessary. Most users will be primarily concerned with Willard to issue commands and configurations to a number of Q330s. Hence the majority of station directories on any PC will be Willard directories. If you are planning to use a PC for continuous long-term recording from a number of Q330's, locating station directories on a separate local disk partition is useful. Pecos provides an acquisition function identical to that of the Baler, including identically generated log files and http access to on-disk data. Cimarron allows live plotting of MSEED data recorded by Pecos while the Pecos application is running, via a distributed TCP mechanism called "Weblink". Cimarron may also be used to plot MSEED data records extracted from Pecos or a Baler, in identical procedures. You may think of Pecos as a "virtual Baler" program.

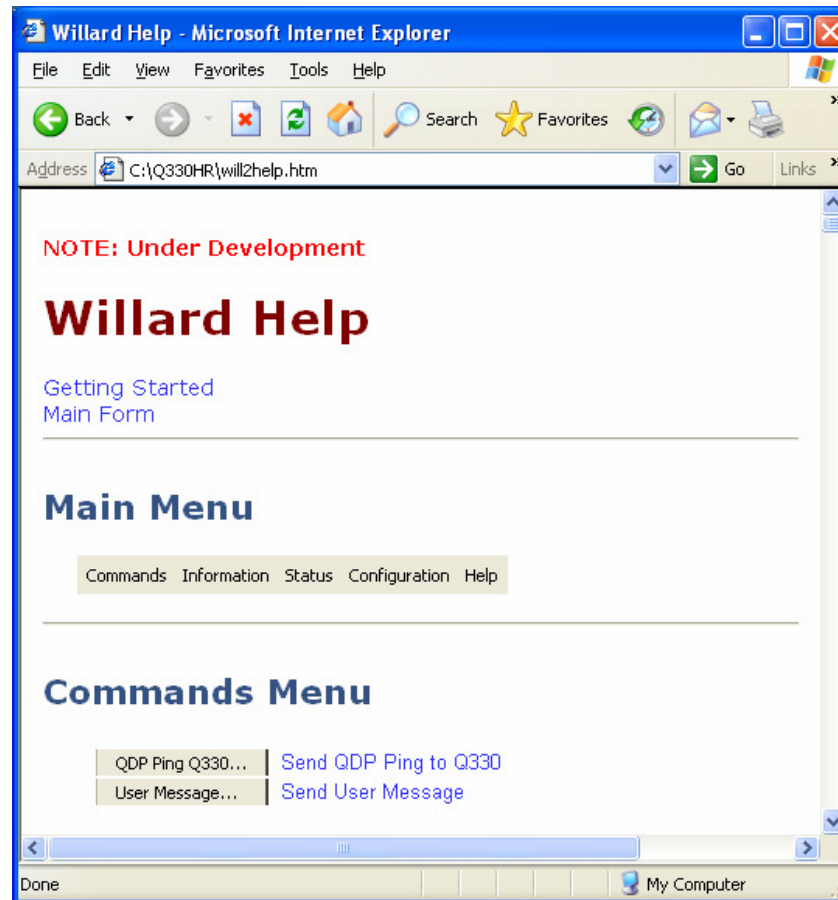
Now we will talk to the Q330. Once the Willard home directory is installed on your PC, a configuration for each new Q330 or Q330HR with which you wish to communicate can be built there using the manager mode of each application. To communicate with a new Q330 or Q330HR using Willard, the procedure is to first connect using the Q330's console interface, set the Q330's IP address, then connect using the Ethernet network for future communications. The console may be used at any time, but is not necessary for Q330 administration. Acquisition of data by a DP cannot be performed through the console interface.

Creating a Willard station for the Q330 and assign an IP address - Using CONSOLE registration to build Willard applications settings.

The Willard application is used to create a "Willard Station". A "Willard Station" is the directory structure on the PC necessary to store the station specific connection parameters in a *station.ini* file within the "Willard Station" directory. The application Willard uses the *station.ini* file, once it's setup, to connect to a Q330. The *station.ini* file does *not* set any parameters in the Q330. These connections parameters are settings only for the Willard application.

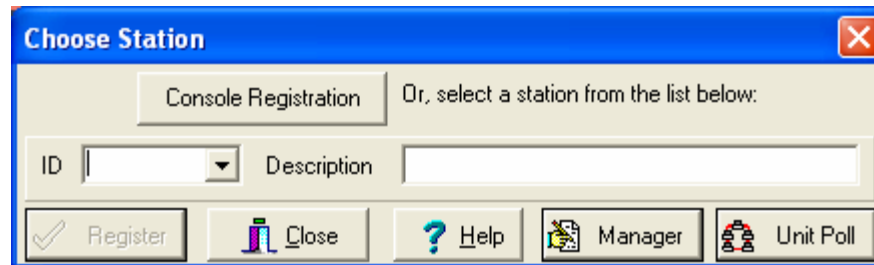
- Make sure the 109476 cable is connected to the console from the Q330 to your PC COM port
- Make sure power is applied to the Q330
- Start Willard. The first time you run a new version of Willard, it will bring up a browser window with the Willard help system. You should review the help system, then close the browser when you're ready to proceed. You can recall the help system from Willard's help menu any time. The next time you run Willard, the browser window will not appear – only when Willard is updated and it detects a version upgrade.

Willard's initial html help file:



Registering with the Q330 on the CONSOLE Port.

We have installed Willard on a computer with no previous Willard installation. Therefore after you close the browser window, in its new empty home directory, Willard will present the “Choose Station” box, with no available “choices”:



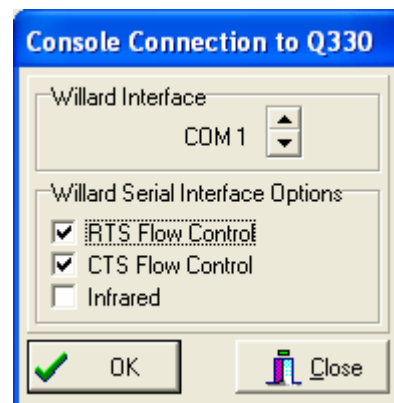
We’ll now create and save Willard settings to be able to choose our 330.

We are first going to use the Console Registration. The Console method, using the Console cable, allows us to circumvent security requirements that are necessary on a LAN. Using the Console connection, Willard can inquire from the Q330 the information necessary to connect automatically.

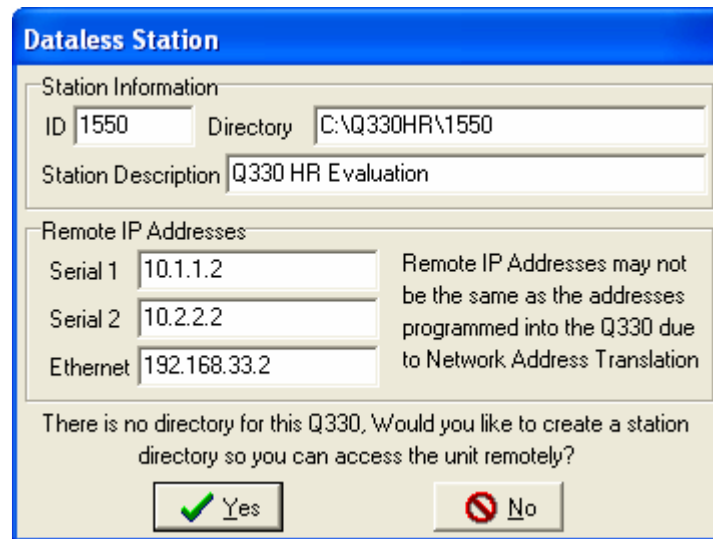
Select the Console Registration Box.

Next, Select the COM interface on your PC that is connected to the Console Connector of the Q330.

Usually flow control is not required. The Infrared support assumes you have a serial IrDA device attached to your PC and you are using this protocol to communicate to the Q330. While many PCs have a built-in IrDA interface, it is usually hard to aim it at the Q330. Quanterra can supply an IrDA device that connects to a serial port and then aimed conveniently if such operation is desired. Normally you will leave this box NOT checked.



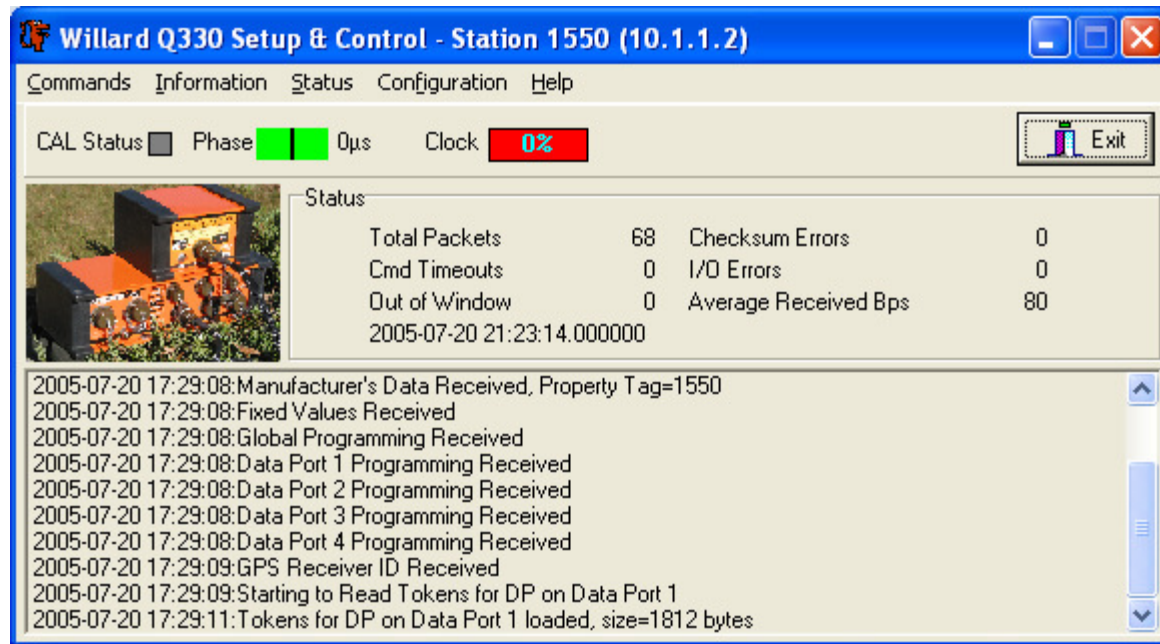
Willard will automatically connect to the Q330 and display information read from the Q330 (using special Console privileges) that will allow Willard to connect to the Q330 in future sessions. In this first encounter with a Q330 that Willard has not seen before, Willard will offer to save the information read. The information can be changed, in which case you will need to make corresponding changes to the Q330 configuration to match your settings, or you can save Willard's suggestion. In the future when communicating with this Q330 using a "remote" connection, i.e. one of the Q330 interfaces other than the special Console, the IP address and connection information saved by Willard must match that stored in the Q330. We'll see the normal "remote" method in a few pages.



- Enter the station ID of your choice (up to 5 characters). The ID presented is the Q330 tag ID, by default. The Willard station ID is NOT used to name data from this Q330, only to match Willard's applications settings to reconnect to a remote 330. If the station ID does not match the station name in the data recording parameters, the application will issue a warning as communication begins.
- By default, a subdirectory for each station's application settings is created below the directory containing the Willard application.
- Enter a description of this connection into the "Description Box". This is used in a presentation menu when selecting a connection. A station code is often included in the description.
- Enter an IP address for each 330 interface you intend to reach from this PC. Most of the time this is the Ethernet interface and you set it to a number issued by the network administrator for a new host on your network in accordance with your IP Resource Planning. This information is used by the PC 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 Willard application on the PC. Setting the address in the Q330 is done in a later step.

When finished entering these application settings on the PC for later reconnections, click the Yes box. You may elect to simply accept the values presented without any alterations if you do not intend to connect via Ethernet anytime soon. In any case, you can edit any of the entries later with the Manager function of Willard. Note that the 192.168.33.2 Ethernet address is the default set in the Q330 at the time of shipment.

When you have clicked Yes above, Willard will create a directory to save its application settings and will register on the console port with the Q330. If successful, the familiar Willard main form will appear, and the message area will look something like that below.

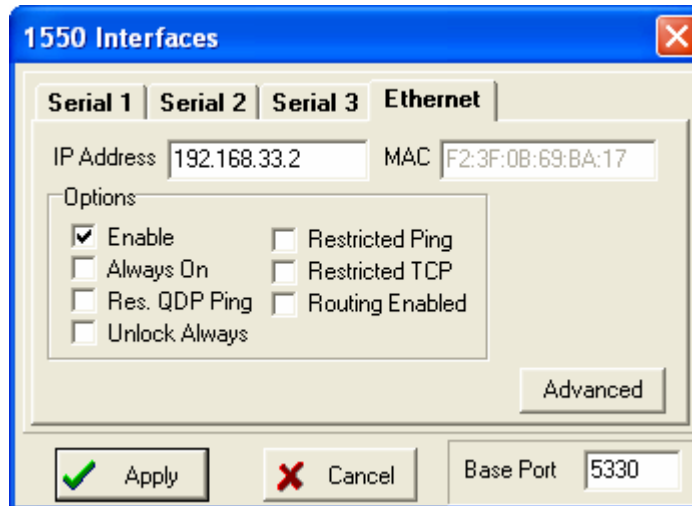


If no connection, check that the cables are correct. See that no other program is using the COM port on your PC that you selected. A conflict for usage of the PC's COM port could result from infrequently used applications such as a Palm HotSync application.

Configuring the Q330 for an IP address. This step actually changes the IP address in the Q330.

Once registered, in the Willard main menu, select “Configuration | Interfaces ...”

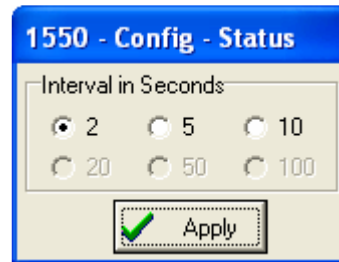
Set the Serial IP address and Ethernet IP address you want the Q330 to use and enable the interfaces you want to use. You can return to the Willard manager panel and enter these IP addresses to be saved on the PC for subsequent connections. The addresses entered for each interface will be the address of the Q330 on the network for that interface. Typically the serial interfaces can be left at the default, but the Ethernet must be set to an address on your LAN. In the example below, the address is the default at time of shipment. Change this as appropriate for your network.



Select Apply

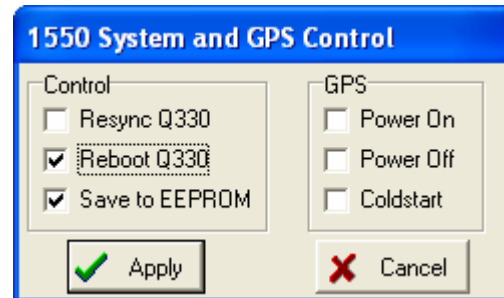
On the Willard menu select “Status | Status Interval...”

Select 2 seconds for the status update interval and Apply. You need do this only once following creation of a new Willard station, to set the screen update interval.



On the Willard menu select “Commands | System and GPSControl ...”

Select “Save to EEPROM” and “Reboot”.

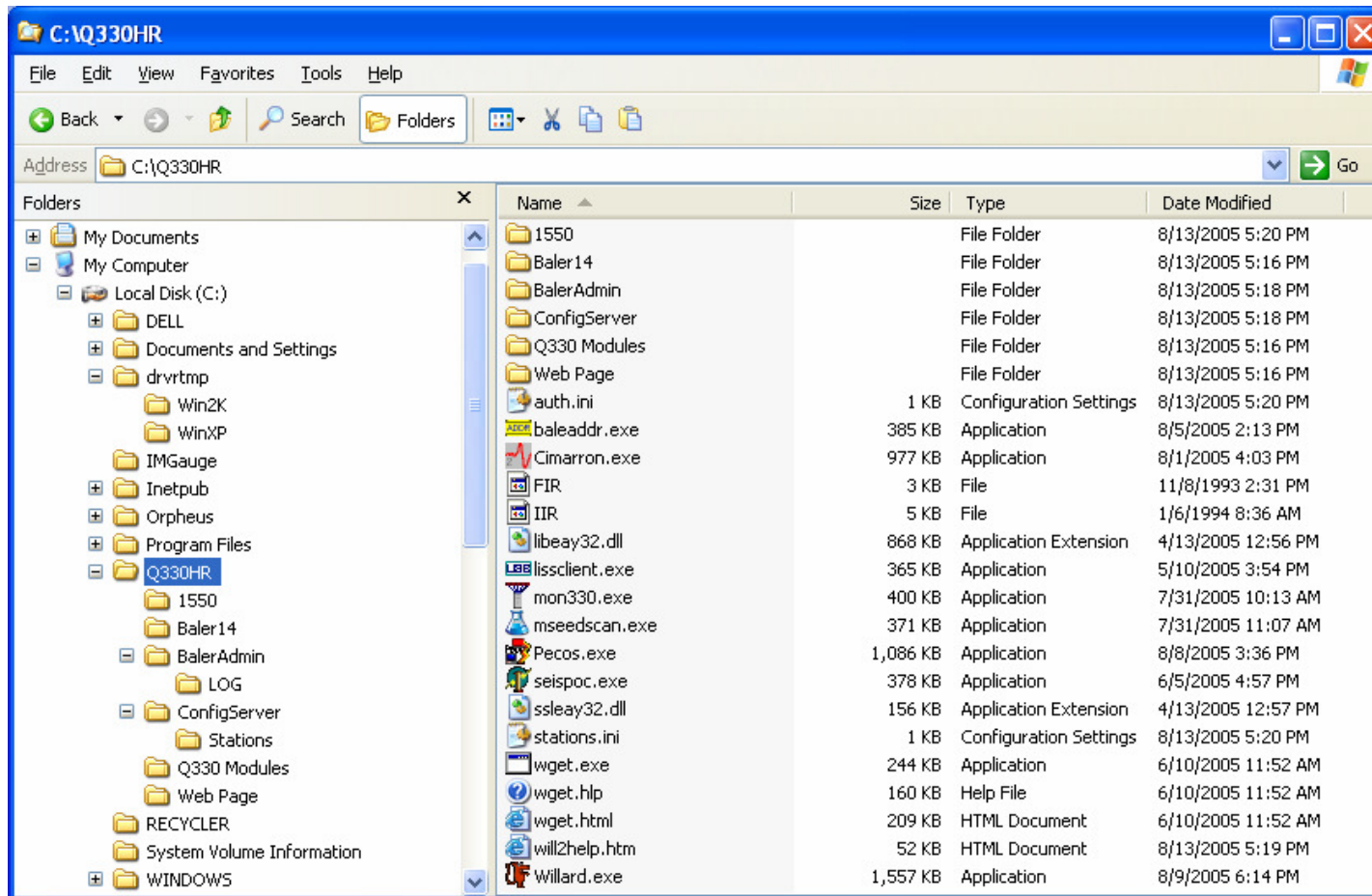


Exit Willard using the ‘Exit’ button.

The Q330 will now reboot, and when it comes up will have the new Ethernet address settings. GPS time is not lost during a reboot if power is not removed.

Note that interface address settings do not take effect until Q330 reboot. Most other parameter settings in the Q330 take effect immediately. Interface settings do not take effect until reboot in order to permit you to continue working until ready to enact the change. Otherwise after applying the interface setting with a new address, communications would be lost.

Your will now see that some new files and a directory matching the Q330 “Station ID” you supplied has been created in the Willard home directory:

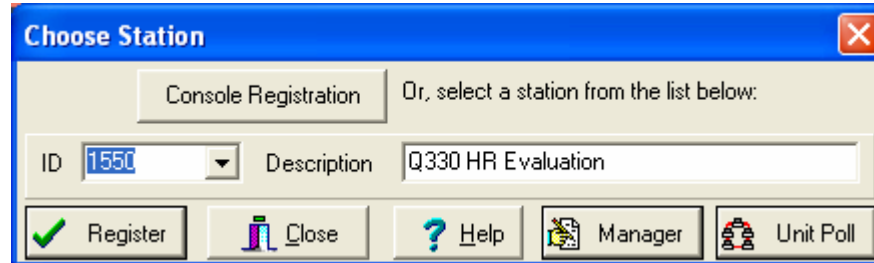


You can see how Willard has populated the connection information, creating a new directory, “1550” in this case to store Willard application settings for Q330 TAGID 1550, and has created the root “stations.ini” list.

You have now built a directory on your PC containing the Willard application settings for the Q330.

Exit the Willard application completely. We will now start it again, which will be the normal way in which it will be started since you've already built at least one directory containing settings.

Start Willard. You will be prompted to choose an ID, now at least the one built above being available.

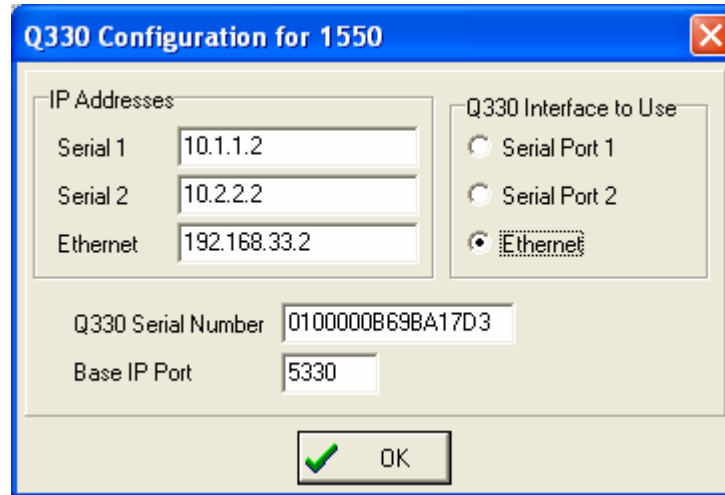


We'll now review the application settings, and see how Willard automatically configured its application settings for this Q330.

Select Manager

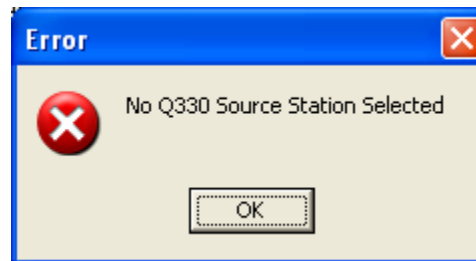


Select Q330 to see the settings pertaining to this Q330.



During the console connection, Willard automatically read the Q330's unique 16-digit electronic serial number which is necessary for communication with the Q330 on all interfaces except the console, and Willard read from the Q330 the IP address of its Ethernet interface. Willard has populated its application settings with this information.

Say OK, and close the forms through which you drilled to arrive here. Willard will abort with



Now that you have seen the method for using the console port to build a new Willard station automatically, it is possible to review a more advanced method that can be used entirely over the Ethernet network, even when the IP address of the Q330 is configured to an address not on your LAN.

Alternate means of building a Willard station directory using Ethernet polling, without the console

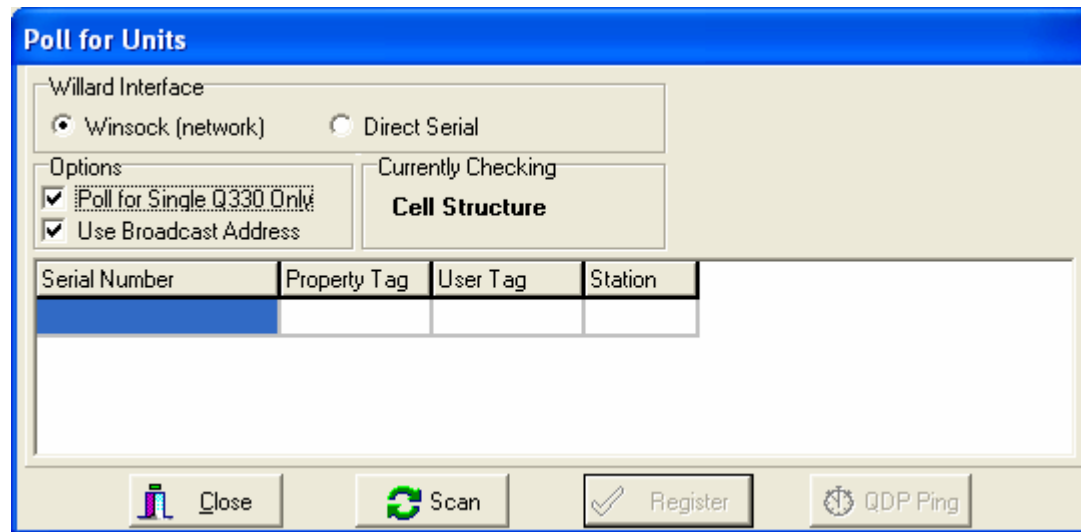
You should review this section for future reference, but may skip over it for now if you wish to “Configuring the Q330 for Operation”

The purpose of this method is also to build a new directory to contain Willard’s settings, however, this method does not require use of the console port. In most cases, as you become proficient in the use of Willard, when you encounter a new Q330 on your LAN and wish to build a new settings directory, this alternate method will be preferred. There are some cases where it will not work, for example, if the unit has been programmed to disable its Ethernet interface, or to deny access to the “polling” function we will use, but in most cases, this method is quicker and simpler, not requiring special cables. This method will only work on a LAN segment where you have IP broadcast capability to reach the Q330, i.e. you cannot poll the entire Internet for Q330’s! For Q330’s on the open Internet, i.e. that are not reachable by IP broadcast from your computer, you need to know the IP address, electronic S/N, and authorization code to be able to register.

But on a LAN where IP broadcast is available, to use the “polling” method to build a new directory to contain Willard’s settings for a new Q330.....read on.

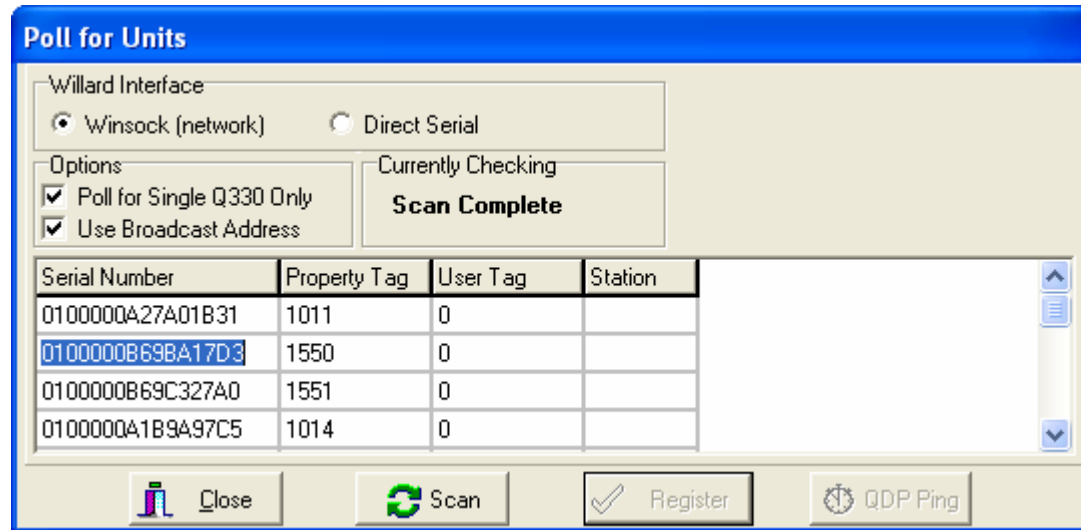
Make sure the 111056, or 110906 Ethernet cable is connected to the Q330, and the Q330 is plugged into your LAN.

Start Willard. Do not choose a station. In the initial selection dialog, select “Unit Poll” instead. A dialog is presented:

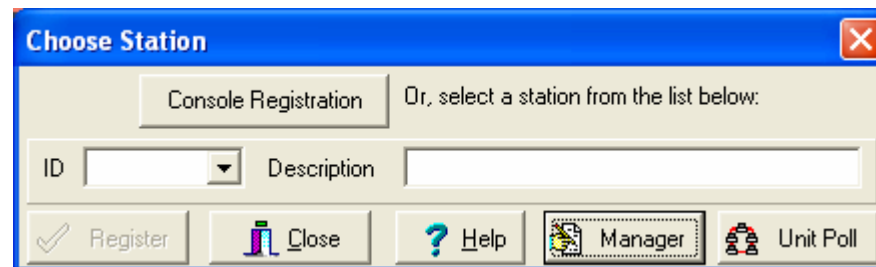


Check “Poll for Single Q330 Only” and press “Scan”.

Willard will produce a list of all the Q330's on your LAN and show their electronic serial numbers and TAGID. The list is scrollable. You may find Q330's that you didn't know were there! If so, you should isolate them from your LAN for the following procedures, until we have completely configured your Q330 and Baler, since one of these Q330's may be programmed to allow binding to your Baler.



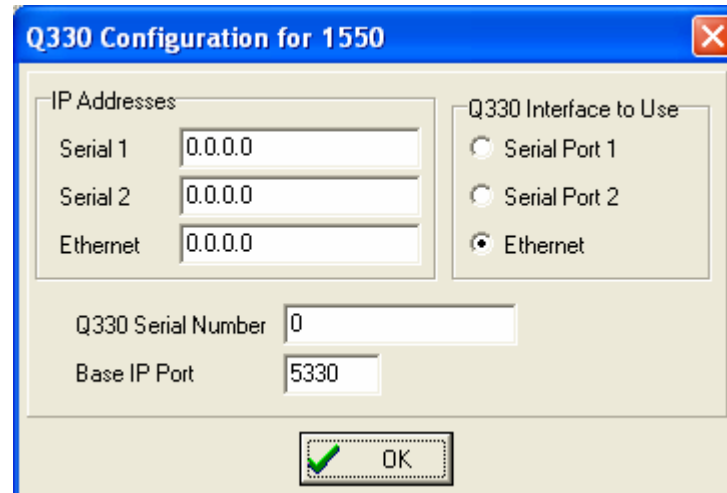
Using the mouse, highlight the S/N of the new unit for which you are building a Willard Station and type Ctrl-C or right-click and “Copy” to copy the S/N to the clipboard. We are using the clipboard to remember this S/N for the next step to be able to paste it into a form where needed. Close the form and select Manager



Enter the 4-digit ID you would like to use, typically the TAGID or SEED station name, and a brief description:



Click Create



In the blank Q330 Serial Number space, highlight the “0” to replace it, and paste the electronic serial number you saved in the polling step above. In the case of building an application settings directory for a remote station to which you do not have LAN IP broadcast capability, you will need to manually type in the electronic S/N in the box.

Enter also the actual IP address on the LAN that Willard will use to communicate with the Q330. Note that the serial number must not have any leading or trailing spaces or other characters present, and must use upper case.

Q330 Configuration for 1550

IP Addresses

Serial 1 0.0.0.0

Serial 2 0.0.0.0

Ethernet 192.168.33.2

Q330 Interface to Use

Serial Port 1

Serial Port 2

Ethernet

Q330 Serial Number 0100000B69BA17D3

Base IP Port 5330

OK

Click OK when done.

Click OK on the next form. This establishes Willard's initial application settings for connection to this Q330. If any of these need to be changed, they are accessible from the "Willard" button in the Manager.

Willard Configuration for 1550

Current Interface

Winsock (network) Direct Serial Modem

Serial Interface Options

RTS CTS Infrared CTSTime 0 19200

General Options

Serial IP 10.172.53.5 Default DP Command Timeout

IP addr of PC's COM port Port 1 6 Min. 10 Max.

Time and Date Formatting

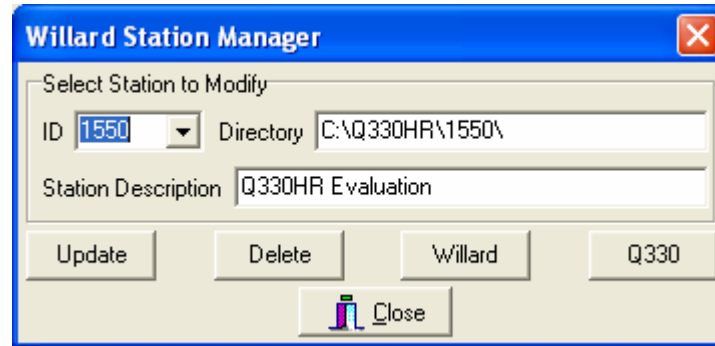
Date yyyy-mm-dd Time hh:nn:ss

Configuration and Token File Format

Optimized XML Verbose XML Old Style CFG/TOK

OK

When you clicked OK above, the Manager form will appear



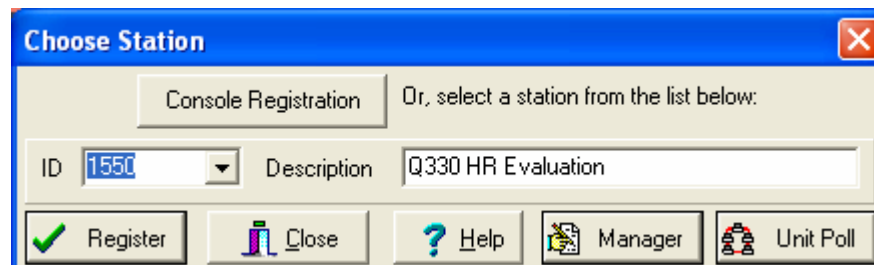
Click Update and Close the Manager

Now you may Register with the station just built. Note, however, that if you used this polling method to communicate with a Q330 with which you have not previously done so, the Q330 interface IP addresses will not have been set in the Q330.

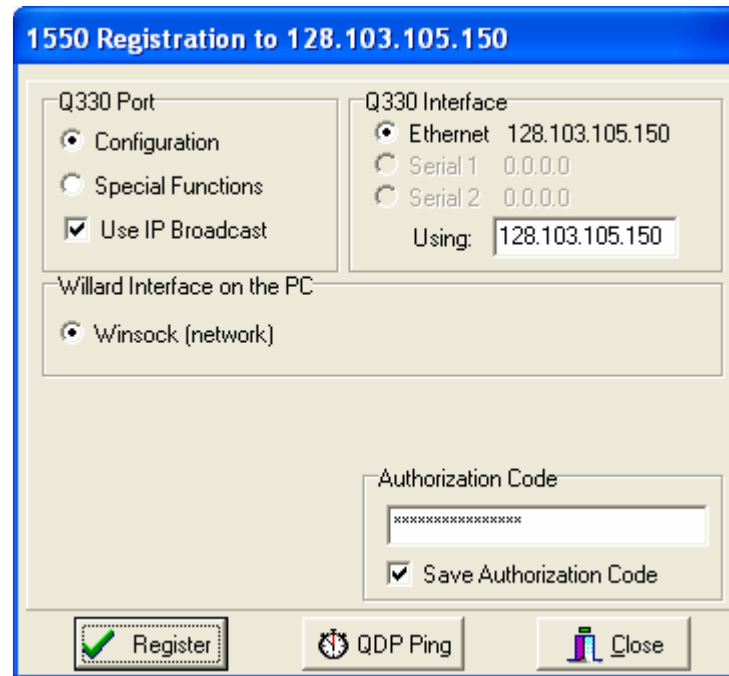
Setting Q330's Ethernet Interface Address using Broadcast mode

To set the Q330's Ethernet interface address when you are connected via Ethernet, you cannot use exactly the procedure above, because when you encounter a new Q330, its address may not actually be on your LAN, reachable from your PC. For this case, there is a means to communicate with an unknown 330 using "broadcast" mode.

In the Choose Station dialog, select the station ID you've built, and Register. Because the IP address of the Q330 has not yet necessarily been set for you LAN, you must use Broadcast mode to communicate with the Q330.



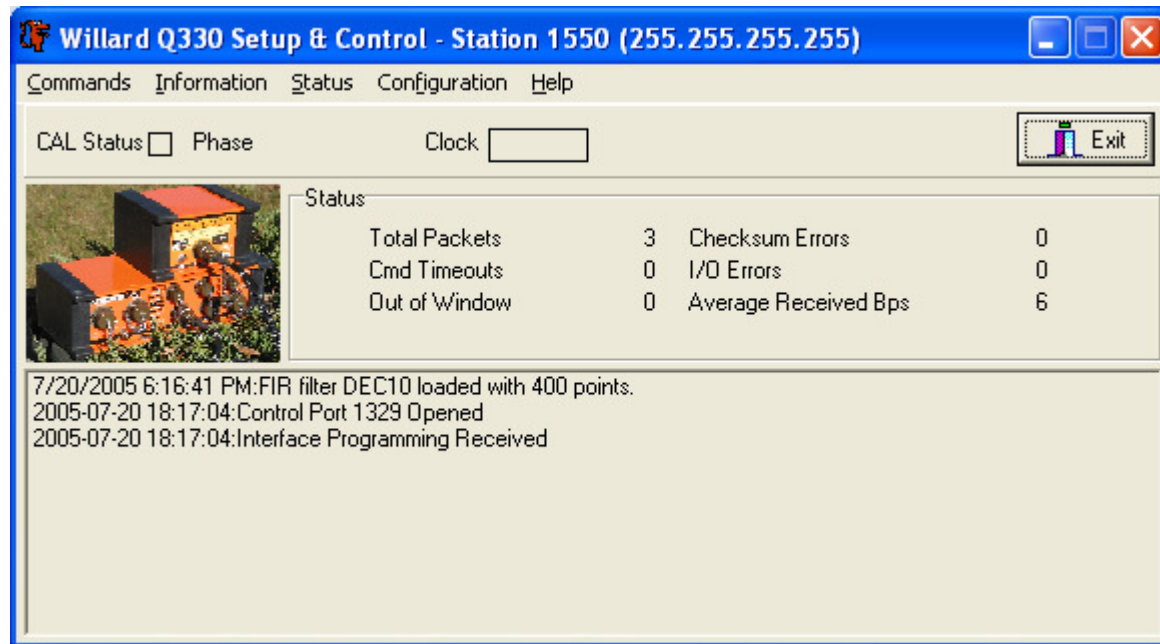
When the Registration form is presented, check the "Use IP Broadcast" box.



Enter 0 for the Authorization code, and check “Save”.

Press “Register”

If you've successfully registered, Willard will show a registration, but only a small subset of the commands will be accessible. Broadcast mode is used only to set interfaces on a Q330 having an unknown IP address. Therefore when you register only the message "Interface Programming Received", will be displayed.



Select Configuration\Interfaces, set the IP addresses of the Q330's interfaces as above.

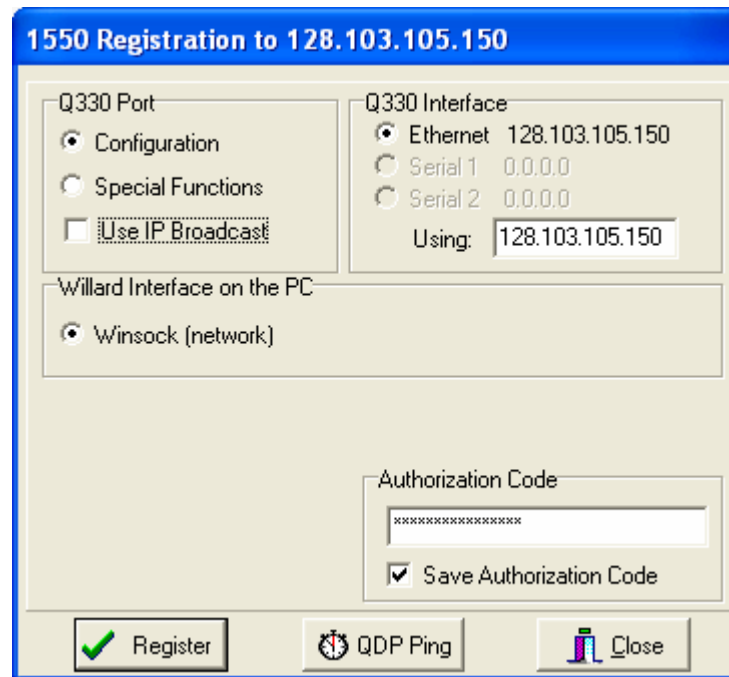
Select Command/Save and Reboot as above.

The Q330 has now been configured for communications and a Willard station built entirely over the Ethernet network without use of the console cable.

Browsing and Saving the Q330 Operating Configuration

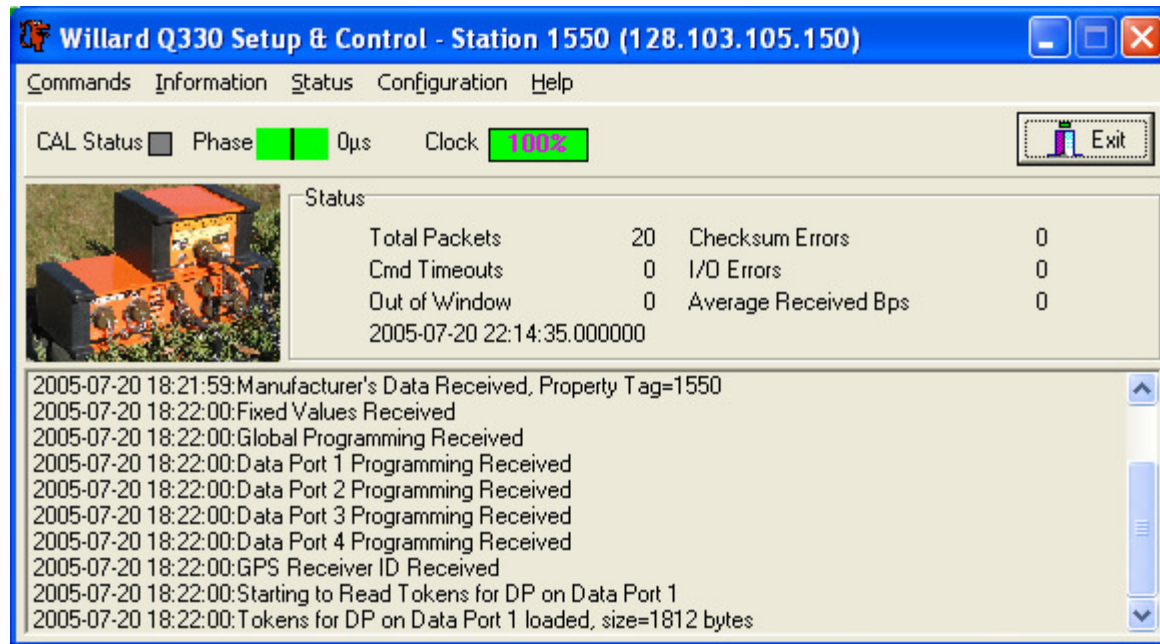
Let's get back to normal operations. Start Willard, choose the station ID you want to talk to, and Register on the Ethernet in non-Broadcast mode. To do this you must uncheck the "Use IP Broadcast" box.

Note that Willard has remembered your application settings from last time.

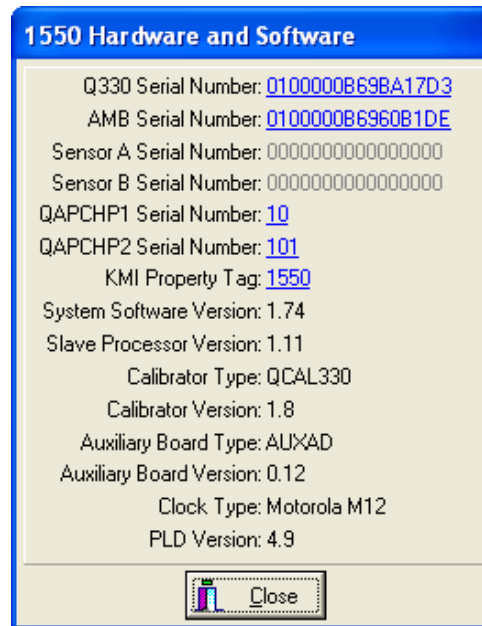


The form below shows a successful connection.

Note that in this example the Q330HR has been connected to a GPS antenna and powered sufficiently long to acquire GPS time, evidenced by Clock 100%.

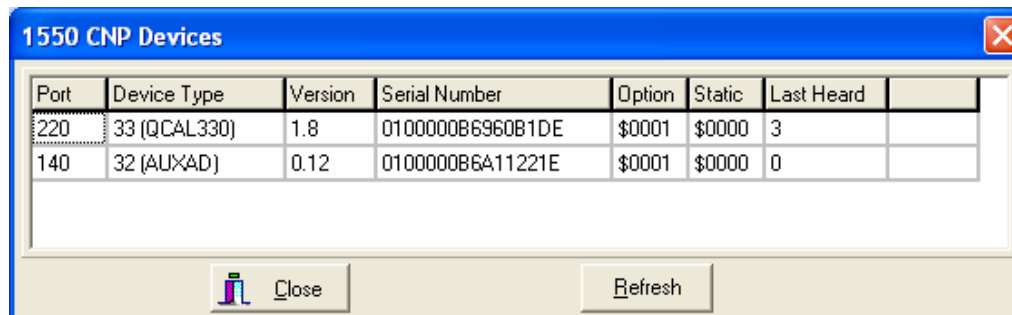


Now let's browse some Q330HR status forms. Check the Q330 hardware and firmware versions under Information\Hardware and Software

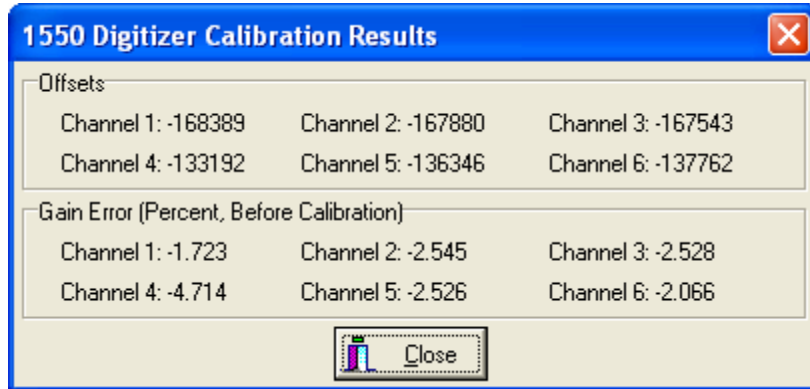


If it is necessary to update Q330 firmware, the APPENDIX describes the procedure.

Note that the Q330HR contains the AUXAD Auxiliary 16-bit A/D, indicated above. Check Information\CNP Devices to check on operation of the AUXAD

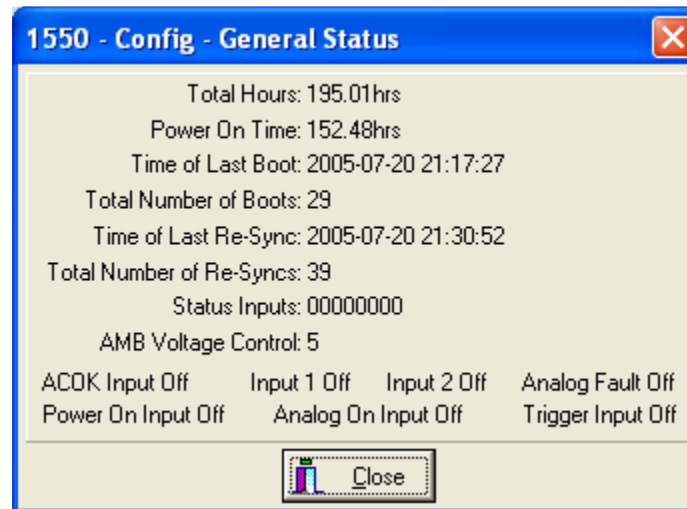


Check Information\Digitizer Calibration to report the self-calibration's adjustments to gain and offset of the main A/D

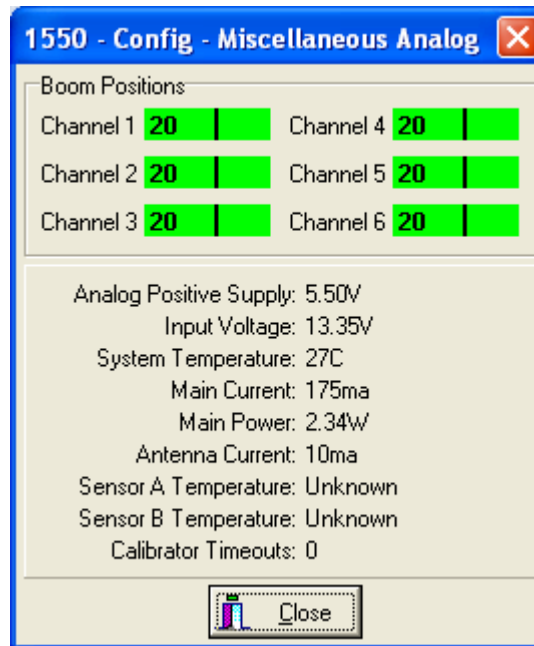


Typical values for a Q330HR. A standard Q330 offset is ~-150000

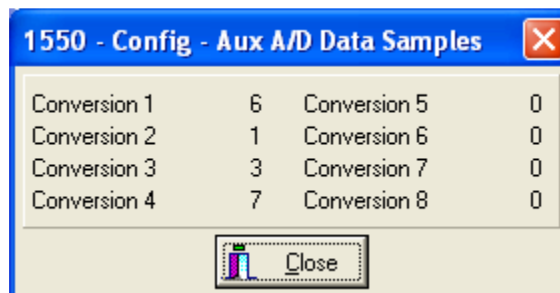
Select Status\General Status to see total hours on the unit



...and Status\Miscellaneous Analog to check on environmental state. Boom positions are shown normal (+20) with no sensor connected. Range is -128,+127



Select Aux A/D Status. The Aux A/D form will show offset values typically in the range of +/-20 counts, changing by one or two counts every second. The factory configuration is 4 differential channels, so the conversions 5-8 report a value 0. The gain setting of the AUXAD is +/- 12.59V differential corresponds to +/- 32767 counts, or 2602 counts/volt



Check the Configuration\Restricted\Manufacturer's Area to see the board population. Channels 1-3 are HR (type 2) and Channel 4-6 are Standard (type 3). The HR channels are configured for 26-bit output, i.e. sensitivity of the 26-bit HR channels is 2^{26} counts/40Vp-p or 1.67Mct/V or 596 nV/count. The sensitivity of the standard channels is the usual 2^{24} counts/40V or 2.38 μ V/count. The setting for 26-bit output can be made only by Quanterra or Kinometrics by connecting the Q330HR to a network-routable address.

1550 Manufacturer's Area

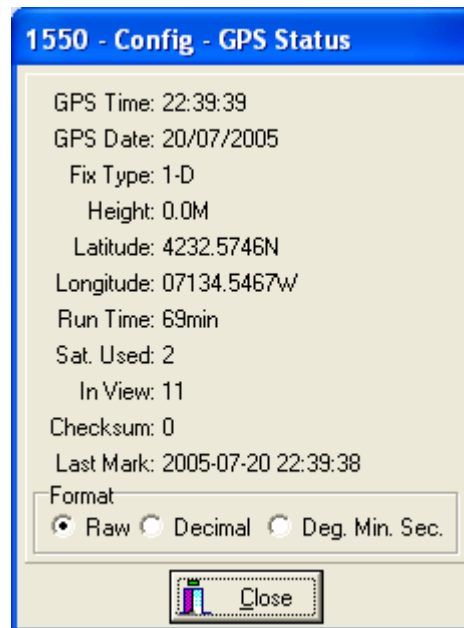
QAPCHP 1
 Type Version 26 Bits
 Serial Number
 Channel 1 Ref. Counts
 Channel 2 Ref. Counts
 Channel 3 Ref. Counts
 Defaults for Type:

QAPCHP 2
 Type Version 26 Bits
 Serial Number
 Channel 4 Ref. Counts
 Channel 5 Ref. Counts
 Channel 6 Ref. Counts
 Defaults for Type:

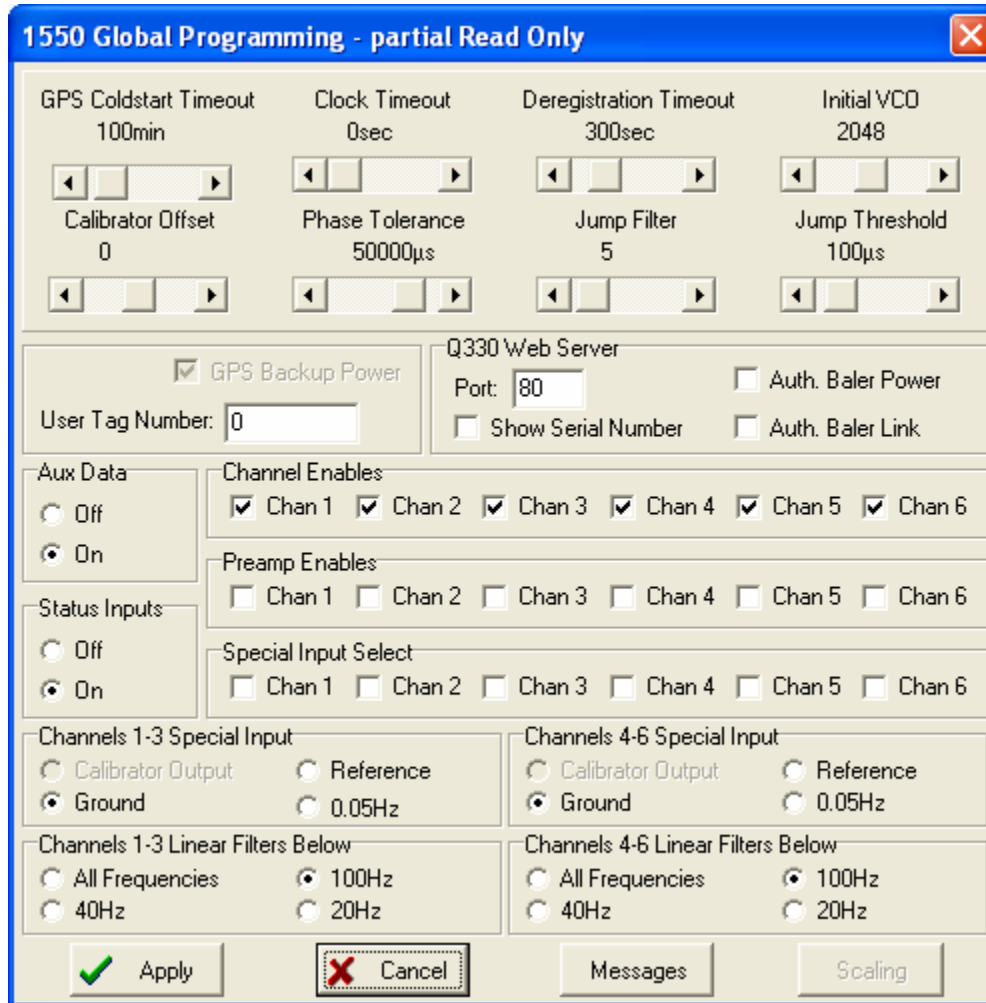
All Channels
 Clock Model System Model Calibrator Offset AMB Voltage Setpoint
 Packet Memory Password
 Clear Counters Reset "Born on Time" 2005-07-07 07:19:08
 KMI Property Tag Number

Check the Status\GPS Status.

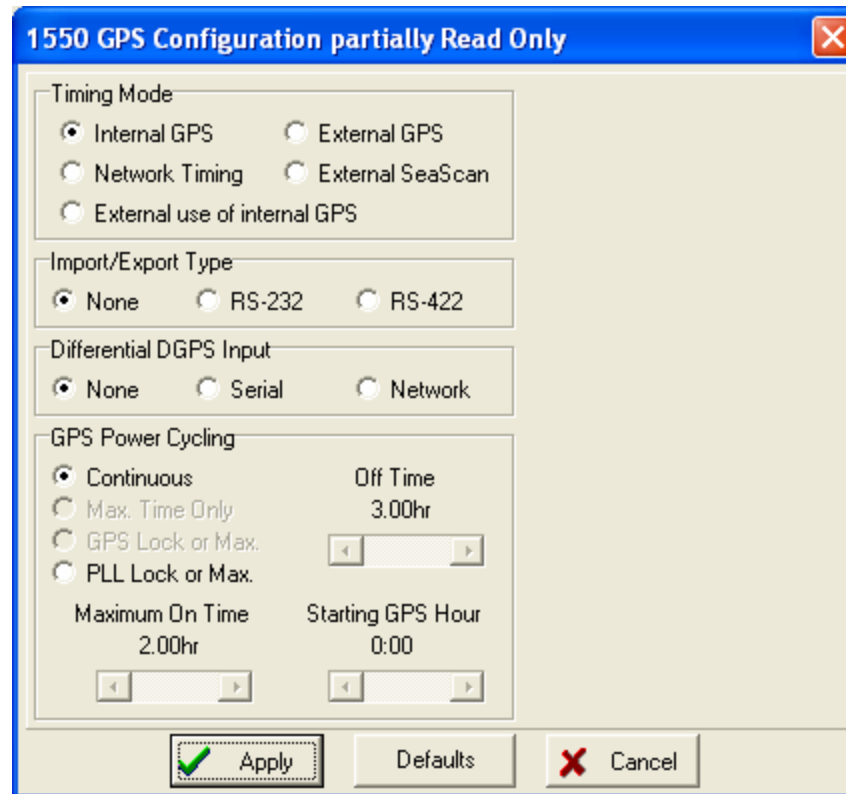
A “1-D”, “2-D”, or “3-D” fix is sufficient for timing information. A 3-D fix must be acquired initially following power up of the Q330 to establish location and altitude. This initial 3-D fix following a Q330 power up may require up to an hour. If power is not removed from the Q330, the GPS will retain the location information, and acquire time with less than a 3-D fix. When the Q330 is commanded to reboot, power is retained to the GPS receiver, so that acquisition of time following a commanded reboot is fast, usually within less than 1 minute.



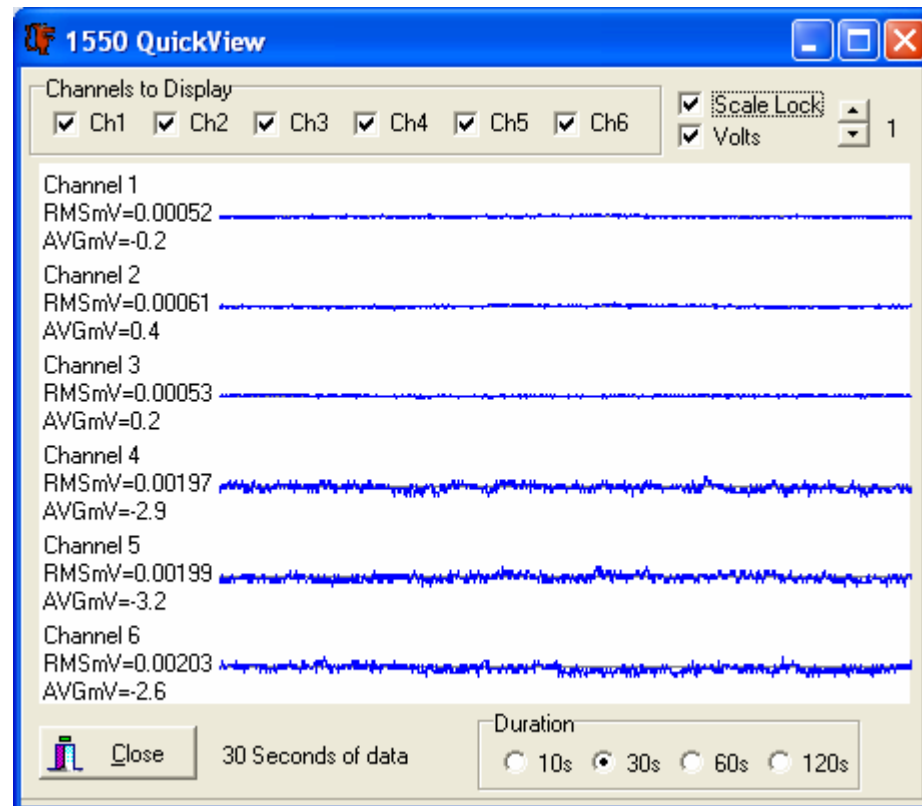
Check on the Configuration\Global Setup to see the FIR filter types and Q330 HTTP root server TCP port number. These are default settings at the time of shipment.



Check the GPS Operating Mode. For HR operation with the AUXAD, the highest performance is obtained with continuous GPS operation. Continuous GPS operation requires approximately 250-300mW of power. If cycled operation is desired, the default parameters off 3 hrs and on 2 hrs maximum are correct.

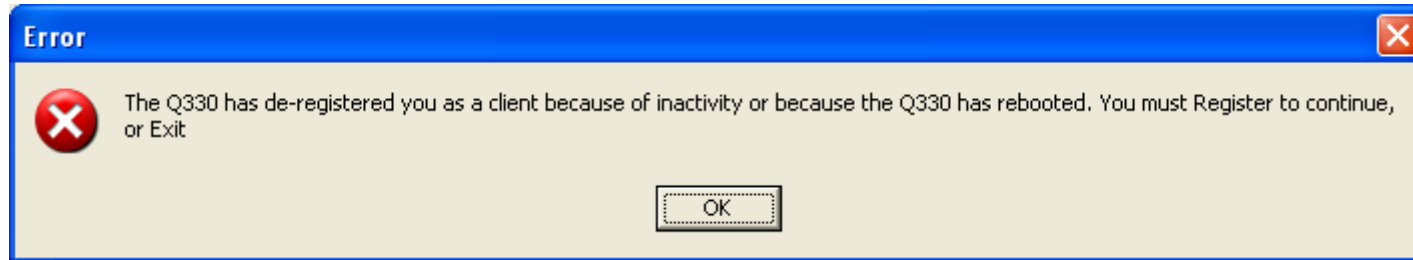


You can browse the main A/D data in real time using the Status|QuickView function. To see the performance of the Q330HR A/D referred to input, select all 6 channels, and Scale Lock, Volts. With no input, the Q330HR's channels 1-3 show as virtually a flat line with roughly 500-700nV rms noise. The standard channels 4-6 show a typical roughly 2uV rms.



Re-Registering if the Q330 logs you off.

Note that if you do not enter any command input to Willard for more than 10 minutes, Willard will show that the Q330 has de-registered you because of inactivity



If this occurs, click OK and Re-Register

Saving the complete Q330 state in XML – Configuration Cloning

At this point, basic Q330HR operation is verified and the configuration of the Q330 should be saved for reference on your PC. Willard will save the entire internal state in a single XML file. This must be done before making any changes to the reference configuration. It is recommended that the reference configuration be used initially verbatim, except for IP interface settings, to verify operation in the configuration used for factory testing. Once verified, adjustments may be made as required.

To save the entire Q330 state, select Configuration\Configuration Cloning. Check “Include Dialout Password”, and Save. The text strings shown are descriptive names that you can use to explain the type of configuration loaded in your Q330 for the “base” configuration, i.e. defining filter sets and, for example, which channels have preamps enabled, GPS settings...etc, and for the Data Port (DP) specific “tokens” that describe what MSEED channels are generated in, for example, a Baler, or Mountainair software. In the form below, these are the names in your factory configuration. If you make changes, you can save these changes with indicators here, such as a short description or revision date. These strings can be read at any time in the Q330’s web page.

1550 Configuration Cloning

Save to File

Configuration Base Tag


DP1 Token Set


DP2 Token Set


DP3 Token Set

DP4 Token Set

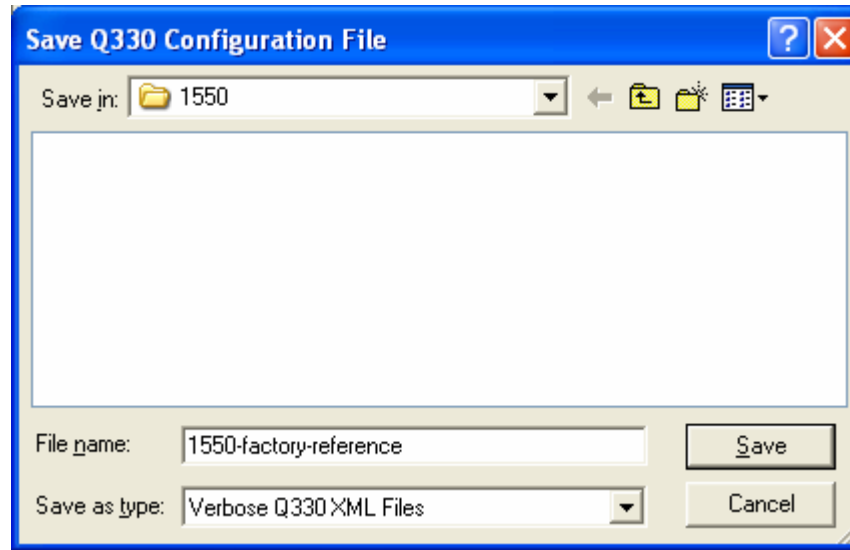
Include DialOut Password

 Save

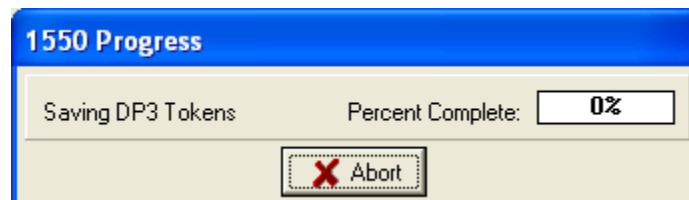
 Close

 Load from File

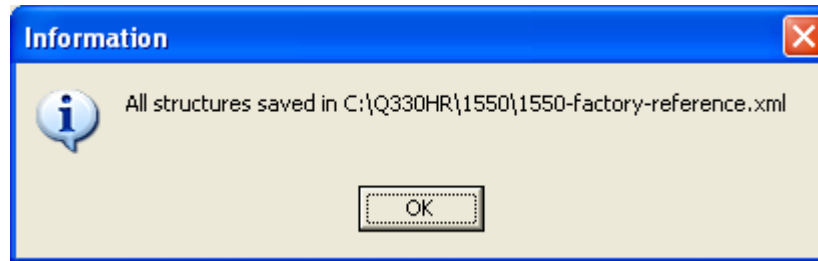
A file dialog will come up. By default, Willard names the XML file as the station ID. Select a name for this initial save, however, to reflect that this is a reference configuration, such as <ID>-factory-reference.xml. You should not use the default name of tag ID alone, since Willard will update the XML file of this name any time you save a configuration change.



The entire state will be saved in a sequence of several operations, for example, as below, for each set of tokens, and the internal web page...



Finally the message confirming the save in your designated xml file will appear after all Q330 settings have been read from the Q330 by Willard and written to XML. Using the Configuration Cloning Save dialog, you should keep a permanent record of each reference configuration.



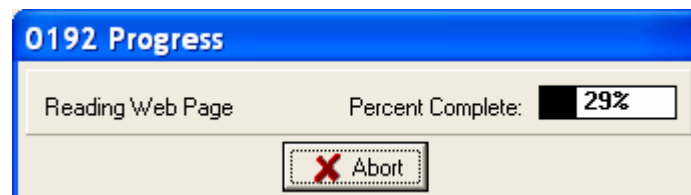
The file just saved can be loaded back into the 330 at any time using the Cloning dialog. The Cloning dialog may also be used to load this file into another Q330, making only relevant small changes such as the IP interface addresses and station names in the Cloning form.

You may be interested in some of the content and structure of the XML file. A detailed document describes all the parameters and the file structure. The APPENDIX shows the basic outline and selected parameters.

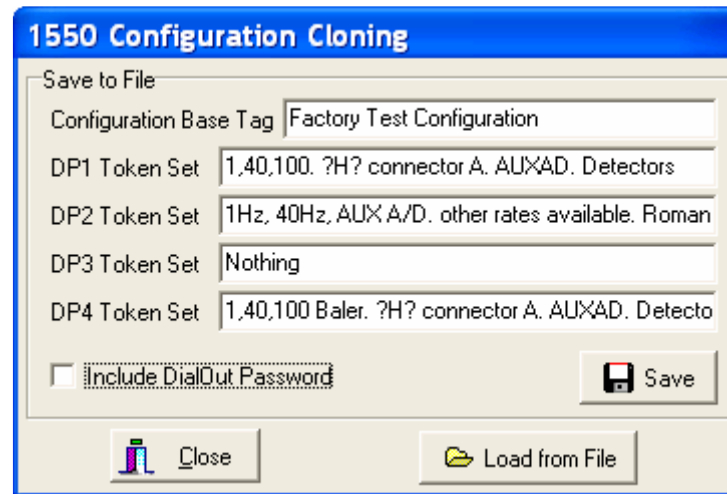
Cloning XML configuration load

Let's say, for example, we want to load into our present Q330, tag number 1550, a tested and verified configuration that we previously saved from tag number 0377 into a file called "0377-baseline.xml".

Select the "Configuration Cloning" dialog from Willard's "Configuration" menu. When you do this, Willard will read the names of the configuration and token set stored in the Q330's web page. Therefore, you will first see a progress bar as below while Willard refreshes this information.



When Willard has completely loaded the information from the 330, a form something like that below will appear, summarizing the names of the configuration and token set. At this point, you may load or save the entire configuration. In this exercise, we are going to load the previously-saved configuration into the Q330.



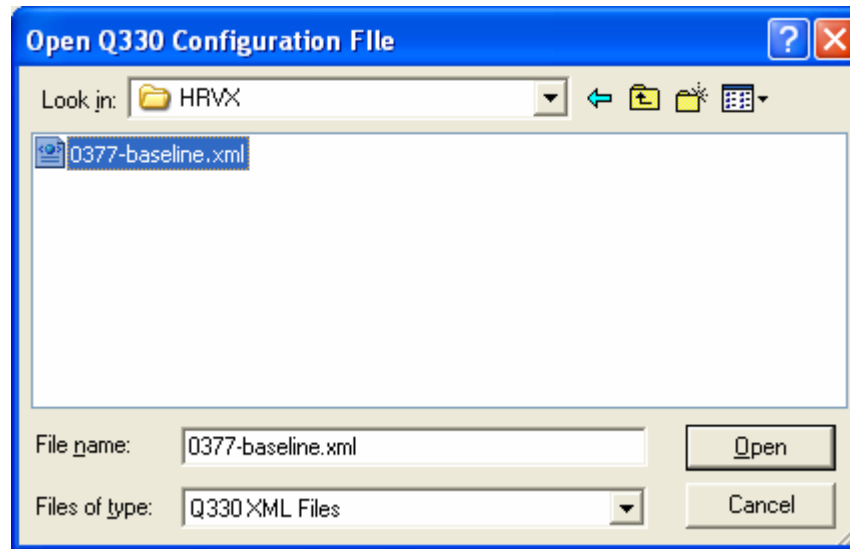
The image shows a software dialog box titled "1550 Configuration Cloning". It contains several text input fields for configuration details, a checkbox for "Include DialOut Password", and buttons for "Save", "Close", and "Load from File".

Save to File	
Configuration Base Tag	Factory Test Configuration
DP1 Token Set	1,40,100. ?H? connector A. AUXAD. Detectors
DP2 Token Set	1Hz, 40Hz, AUX A/D. other rates available. Roman
DP3 Token Set	Nothing
DP4 Token Set	1,40,100 Baler. ?H? connector A. AUXAD. Detecto

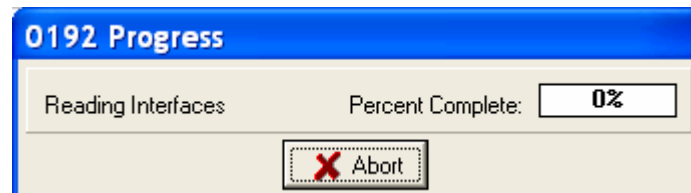
Include DialOut Password

Buttons: Save, Close, Load from File

Select “Load” and browse to the file you want to load. Then “Open”.



As the present configuration in the 330 is read, a progress bar is displayed:



A new, blank “spreadsheet” form will be presented. This spreadsheet provides a means to merge selectively the configuration information existing in the Q330 with the configuration information contained within the XML file you are loading. It is frequently necessary to retain certain information specific to a particular installation, such as interface IP addresses, while loading other information from the XML file.

The main cloning tab “Edit & Load” presents a summary form, into which we’ll select the parts of the configuration either from that already resident in the Q330, or from the file we’re loading. If there are no “Announcements” configured in either the Q330 or the XML file from which you are loading, the “Edit & Load” tab will initially appear as below. In most configurations, Announcements will not be specified.

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | **Edit & Load** | Section Selection and CRC's

DPs Set Stations to TAG ID and Networks to:

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name

Interface

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password

Global

Base Port	Web Port	User Tag	Configuration Base Tag

What, by the way, are “Announcements”? These are also referred to as “Point of Contact”, or POC, messages that are sent automatically from the Q330 to user-specified IP addresses to signal that the Q330 wants a connection to be established. Such POC messages are sometimes necessary, if, for example, the Q330 appears on a public IP address that is dynamically assigned by a router. In this case, the transmission of a POC message, containing the address of the Q330, may be the only means for a receiver to discover the IP address of the Q330.

If there are no “Announcements”, select the “DP Specific” tab and skip the discussion on the next page. While you won’t usually need the “DP Specific” when you become proficient in the cloning operation, we’ll use it now to better understand the underlying actions We’ll return to “Edit & Load” in a few steps.

If, however, there are Announcements configured in either the Q330 or the XML file from which you are loading, the “Edit & Load” tab will initially appear as below with a reminder that you must configure the Announcements from the Announcements tab. Announcements are configured under their own tab.

NOTE: THE “Announcements Require Configuration” REMINDER WILL APPEAR UNTIL YOU SELECT THE Announcements TAB. WILLARD CONSIDERS THE ANNOUNCEMENTS TO BE “CONFIGURED” AFTER YOU HAVE LOOKED AT THE PRESENT SETTINGS IN THE Announcements TAB, EVEN IF YOU DO NOT ACTUALLY SET THEM. THEREFORE, IT IS YOUR RESPONSIBILITY TO SET THE ANNOUNCEMENTS AS REQUIRED IF YOUR APPLICATION REQUIRES THEM.

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | **Edit & Load** | Section Selection and CRC's

DPs Set Stations to TAG ID and Networks to:

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
	<input checked="" type="checkbox"/>					

Interface

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
	<input checked="" type="checkbox"/>						

Global

Base Port	Web Port	User Tag	Configuration Base Tag
<input checked="" type="checkbox"/>			

Announcements Require Configuration

See the section below describing configuring of the Announcements under the Announcements tab.

The DP Specific tab shows the names and relevant IP port settings of the information contained presently in the Q330 and in the file being loaded. The presentation may be familiar to users of software version control “merge” operations, which permit selection of specific features from one source or another into a final merged result. Note the MSEED station names and Network Codes.

When you configure the “DP Specific” tab, you are actually instructing the clone operation from where to load DP tokens for each of the 4 data ports. For example, if you want only to load tokens from the configuration contained in port 3 in your XML file, select only the “DP3” tab under “In File”. You will see the tokens for DP3 in the “New Values” area (the information that will be loaded into the Q330) copied from the “In File” area.

To copy all of the tokens from the XML file into your Q330, press the “Copy All” button under the “In File” area.

NOTE: AFTER COPYING TOKENS FROM AN XML FILE, THE STATION CODE MUST BE SET FOR EACH DATA PORT IN ORDER TO PROPERLY IDENTIFY RECORDED MSEED DATA. YOU WILL DO THIS UNDER THE “EDIT & LOAD” TAB

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | Edit & Load | Section Selection and CRC's

Currently in Q330

Copy All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
	MA	1550	65535	0	0	1,40,100. ?H? connector A. AUXAD. Detectors
	MA	1550	65535	0	0	1Hz, 40Hz, AUX A/D. other rates available. Roman Rates.
	MA	1550	65535	0	0	Nothing
	MA	1550	5380	0	0	1,40,100 Baler. ?H? connector A. AUXAD. Detectors

In File

Copy All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
	QT	0377	65535	0	0	6-channel 100,20,1 detected only H,B
	QT	0377	65535	0	0	6-channel 100 (off), 20
	QT	0377	65535	0	0	6-channel 1 sps only
	QT	0377	80	0	0	6-channel 100,20 continuous to baler w/ detectors

New Values

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name

Similarly, the interface IP address settings currently in the Q330 and in the file are displayed. Typically when loading a reference configuration into a new Q330, only the IP addresses and MSEED station names are the only changes required.

NOTE: OFTEN WHEN LOADING A MASTER CONFIGURATION FROM AN XML FILE INTO AN EXISTING Q330 INSTALLATION, YOU WILL RETAIN THE IP ADDRESSES WITHIN THE Q330. A COMMON PROCEDURE, THEREFORE, IS TO SELECT “COPY ALL” FROM THE “In File” AREA, THEN PRESS THE “IP Address”, “Baler IP/POC”, “Baler Alt/DialIn” BUTTONS TO SET INTERFACE SETTINGS PER THE FILE FOLLOWED BY RESTORING THE ACTUAL ADDRESSES FROM THE Q330.

Q330 Configuration Load

DP Specific | **Interfaces** | Globals | Announcements | Edit & Load | Section Selection and CRC's

Currently in Q330

Copy All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
Serial 1	10.1.1.2	10.1.1.14	0.0.0.0	0			
Serial 2	10.2.2.2	10.2.2.14	192.168.33.14	0			
Ethernet	128.103.105.107	192.168.33.14	0.0.0.0	0			

In File

Copy All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
Serial 1	10.1.1.2	0.0.0.0	0.0.0.0	0			
Serial 2	10.2.2.2	10.2.2.14	192.168.33.14	0			
Ethernet	131.142.176.122	192.168.33.14	0.0.0.0	0			

New Values

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
Serial 1							
Serial 2							
Ethernet							

Note that the “spreadsheet” format always allows you to see what will be loaded into the Q330 in the event there is any ambiguity. You may copy information from the “Currently in Q330” or “In File” areas and make adjustments as many times as required until you like what you see.

And lastly, the “Global” configuration can be retained as presently in the Q330, or accepted from the file. Here, the “Configuration Base Tag” may be edited if you are saving a new XML configuration.

Q330 Configuration Load

DP Specific | Interfaces | **Globals** | Announcements | Edit & Load | Section Selection and CRC's

Currently in Q330

Copy All	Base Port	Web Port	User Tag	Configuration Base Tag
	5330	80	0	Factory Test Configuration

In File

Copy All	Base Port	Web Port	User Tag	Configuration Base Tag
	5330	5380	0	HRVX

New Values

Clear All	Base Port	Web Port	User Tag	Configuration Base Tag

After browsing the other tabs, let's return to the "Edit & Load" tab, from which you'll be able to do all the setting changes needed in a typical cloning operation. If for example, you want to load all the tokens from the file, under the "DP's" area, press "Copy from File". If you select copy from Q330, the values will toggle to the present settings. In addition you can select only a specific data port, for example, by pressing the "DP4" button. Typically, you will "copy from file" for the tokens and "Global", and "Copy from Q330" for the Interface settings to retain the IP addresses in the Q330 for which it is currently set. All of the interface addresses can be quickly and conveniently set from this form. Any cell on the spreadsheet can be edited, and saved into the Q330.

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | **Edit & Load** | Section Selection and CRC's

DPs Set Stations to TAG ID and Networks to:

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
	QT	0377	65535	0	0	6-channel 100,20,1 detected only H,B
	QT	0377	65535	0	0	6-channel 100 (off), 20
	QT	0377	65535	0	0	6-channel 1 sps only
	QT	0377	80	0	0	6-channel 100,20 continuous to baler w/ detectors

Interface

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
	10.1.1.2	10.1.1.14	0.0.0.0	0			
	10.2.2.2	10.2.2.14	192.168.33.14	0			
	128.103.105.107	192.168.33.14	0.0.0.0	0			

Global

Base Port	Web Port	User Tag	Configuration Base Tag
5330	5380	0	HRVX

When loading the tokens from the file, typically the station names for each Data Port will need to be set appropriately for the Q330 into which the tokens are loaded, since these will differ from the file. There is a short-hand means to automatically set the station names to the unit's 4-digit tag ID, and to define the MSEED network code as well. Enter the desired network code into the box, and press "Set". In the example below, we have set the MSEED station codes to the unit's tag-ID, and we're ready now to apply the new configuration to the Q330, with a new "Configuration Base Tag" descriptive string to remind us of where it came from.

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | Edit & Load | Section Selection and CRC's

DPs Set Stations to TAG ID and Networks to:

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
DP1	IU	1550	65535	0	0	6-channel 100,20,1 detected only H,B
DP2	IU	1550	65535	0	0	6-channel 100 (off), 20
DP3	IU	1550	65535	0	0	6-channel 1 sps only
DP4	IU	1550	80	0	0	6-channel 100,20 continuous to baler w/ detectors

Interface

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
Serial 1	10.1.1.2	10.1.1.14	0.0.0.0	0			
Serial 2	10.2.2.2	10.2.2.14	192.168.33.14	0			
Ethernet	128.103.105.107	192.168.33.14	0.0.0.0	0			

Global

Base Port	Web Port	User Tag	Configuration Base Tag
5330	5380	0	Hybrid Configuration Based on HRVX

If you want to proceed with loading the Q330, press Apply. You can Cancel at any time prior to Applying to abort changing the configuration in the Q330.

Fine-tuning XML configuration load using Section Selection

You may at times want to load only certain “sections” of a master XML file into a Q330, or load almost an entire file, but omit certain sections to retain hand-built configuration settings in your Q330. It is possible under the “Section Selection and CRC’s” tab to select individually which sections of the master XML file are loaded during cloning. By default, all sections are selected, but you may de-select those you do not want.

Q330 Configuration Load						
DP Specific		Interfaces	Globals	Announcements	Edit & Load	Section Selection and CRC's
Load	Section	CRC in XML File		Load	Section	CRC in XML File
<input checked="" type="checkbox"/>	Data Port 1	40678CE0		<input checked="" type="checkbox"/>	Tokens 1	68F4F3A0
<input checked="" type="checkbox"/>	Data Port 2	D0324D9A		<input checked="" type="checkbox"/>	Tokens 2	4084F255
<input checked="" type="checkbox"/>	Data Port 3	A0E1D48A		<input checked="" type="checkbox"/>	Tokens 3	C048E2E1
<input checked="" type="checkbox"/>	Data Port 4	18A51436		<input checked="" type="checkbox"/>	Tokens 4	4823E055
<input checked="" type="checkbox"/>	Global Prog.	783D98A2		<input checked="" type="checkbox"/>	Web Page	5076CA4C
<input checked="" type="checkbox"/>	Sensor Control	50EF5C6A				
<input checked="" type="checkbox"/>	Operating Limits	70FC2654				
<input checked="" type="checkbox"/>	Auto Re-centering	8876C07A				
<input checked="" type="checkbox"/>	Adv. Serial 1	78288F2A				
<input checked="" type="checkbox"/>	Adv. Serial 2	E023306D				
<input checked="" type="checkbox"/>	Adv. Ethernet	A850E51F				
<input checked="" type="checkbox"/>	GPS Parameters	40548B3D				
<input checked="" type="checkbox"/>	PLL Parameters	A0776776				
<input checked="" type="checkbox"/>	Interfaces	48AF1E64				
<input checked="" type="checkbox"/>	Announcements	00000000				

When the XML file is first read by Willard, it is checked for integrity by comparing the CRC values stored in the file with values calculated based on all the settings in the file. If any of these CRC's do not match, a warning "There are CRC Errors" will display on the Edit & Load tab, and the offending sections of the file will be shown in red on the "Section Selection and CRC's" tab. This should signal you that the XML file you are attempting to load has been corrupted, and, unless you are an expert user and understand the implications, this file should not be loaded onto your Q330.

Q330 Configuration Load

DP Specific | Interfaces | Globals | Announcements | **Edit & Load** | Section Selection and CRC's

DPs Set Stations to TAG ID and Networks to:

Clear All	Net	Station	Web Port	Net Port	DSS Port	Token Set Name
	DP1					
	DP2					
	DP3					
	DP4					

Interface

Clear All	IP Address	Baler IP/POC	Baler Alt/DialIn	POC Port	ISP Phone Number	ISP User Name	ISP Password
	Serial 1						
	Serial 2						
	Ethernet						

Global

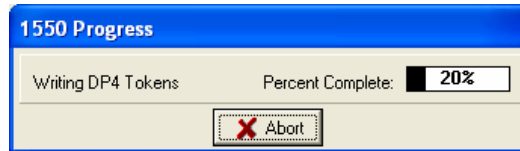
Base Port	Web Port	User Tag	Configuration Base Tag

There are CRC Errors

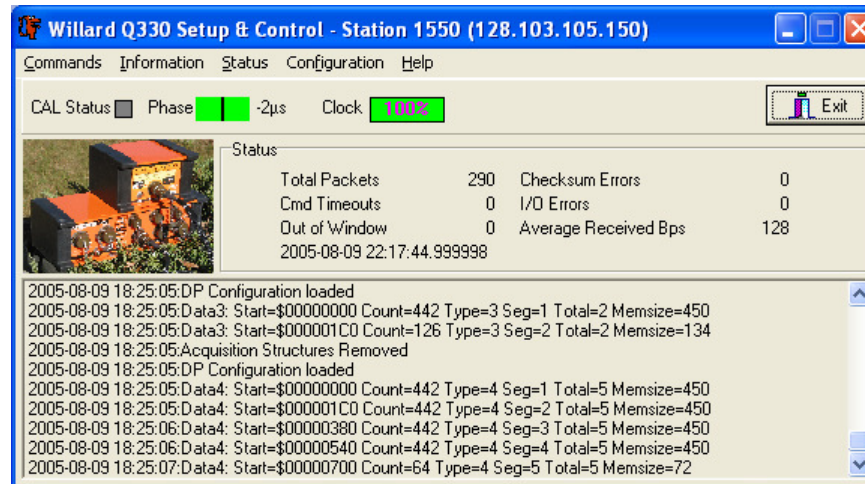
Q330 Configuration Load						
DP Specific		Interfaces	Globals	Announcements	Edit & Load	Section Selection and CRC's
Load	Section	CRC in XML File		Load	Section	CRC in XML File
<input checked="" type="checkbox"/>	Data Port 1	40678CE0		<input checked="" type="checkbox"/>	Tokens 1	68F4F3A0
<input checked="" type="checkbox"/>	Data Port 2	D0324D9A		<input checked="" type="checkbox"/>	Tokens 2	4084F255
<input checked="" type="checkbox"/>	Data Port 3	A0E1D48A		<input checked="" type="checkbox"/>	Tokens 3	C048E2E1
<input checked="" type="checkbox"/>	Data Port 4	18A51436		<input checked="" type="checkbox"/>	Tokens 4	4823E055
<input checked="" type="checkbox"/>	Global Prog.	C880AC1A		<input checked="" type="checkbox"/>	Web Page	F01B47C6
<input checked="" type="checkbox"/>	Sensor Control	50EF5C6A				
<input checked="" type="checkbox"/>	Operating Limits	70FC2654				
<input checked="" type="checkbox"/>	Auto Re-centering	8876C07A				
<input checked="" type="checkbox"/>	Adv. Serial 1	78288F2A				
<input checked="" type="checkbox"/>	Adv. Serial 2	E023306D				
<input checked="" type="checkbox"/>	Adv. Ethernet	A850E51F				
<input checked="" type="checkbox"/>	GPS Parameters	40548B3D				
<input checked="" type="checkbox"/>	PLL Parameters	A0776776				
<input checked="" type="checkbox"/>	Interfaces	48AF1E64				
<input checked="" type="checkbox"/>	Announcements	00000000				

...continuing the Cloning Load

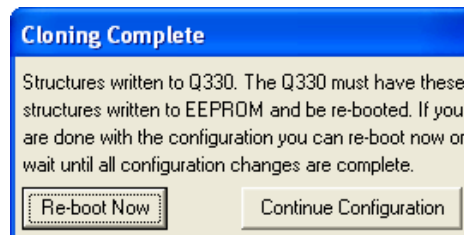
As the apply operation progresses, each token set and web page is written to the Q330.



The main Willard message area tracks the progress.



Finally, when complete, you are reminded that the new configuration loaded into the Q330 must be saved in the Q330's EEPROM. You would normally select Reboot now, and save to EEPROM and reboot. Or you may make further adjustments to the configuration, but you must save and reboot before power down.

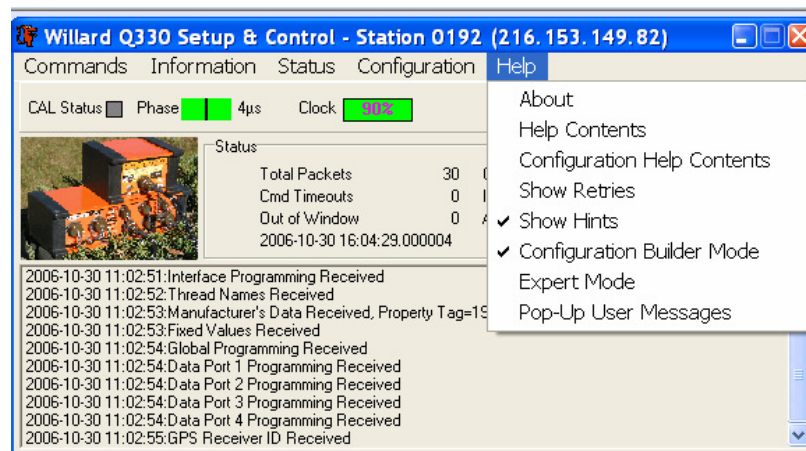


Using Cloning to Migrate from older versions of Willard and Q330 firmware and Importing the Q330 Web page template

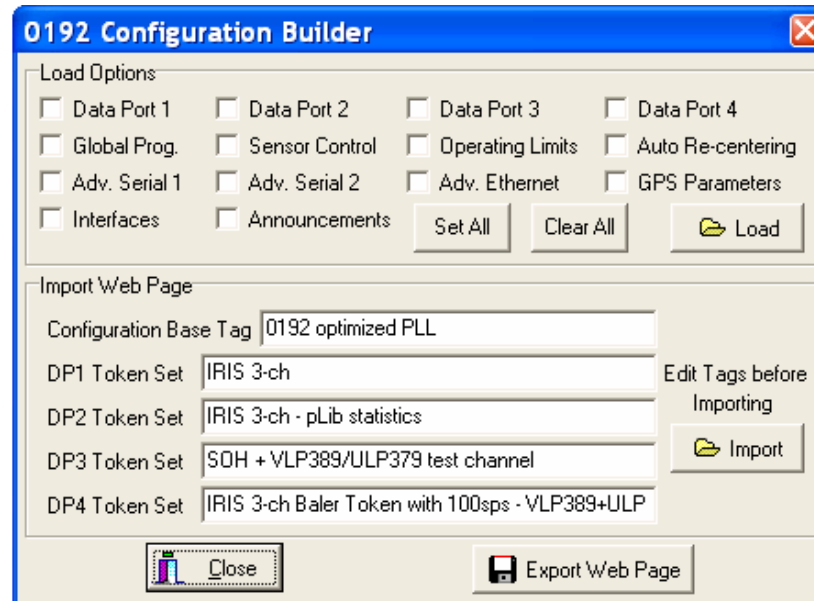
The new features and operations described in this document, while discussed in the context of Q330HR introduction, pertain as well to low-power Q330's. In order to take full advantage of these tools, the Q330 must be upgraded to current software, and have its root web page installed. The root web page is necessary to support the new configuration and token text tags, and the ability to turn on the Baler via the web interface. Once a unit has migrated to this new system, future upgrades will take place simply by virtue of loading the XML configuration into Willard, since the new XML system includes the entire Q330 configuration state, including its root web page. If you do not follow the migration procedure, or run an old or corrupt root web page, it is possible to crash the Q330 when its web port is accessed.

This procedure will migrate to new software and root web page, and save the present configuration as XML. The specific migration order necessary:

1. Install latest Q330-support package on your computer, including Willard.
2. Using the new Willard, update the Q330 Modules. The Q330 must be running the new firmware during the migration process.
3. Reboot Q330 using the new modules
4. Reregister with Willard. Double check after registering in the Information\Hardware&Software that the Q330 modules have been updated.
5. Enable Configuration Builder mode (enable this by checking the selection in Willard's HELP menu)



6. Select Configuration Builder in Willard's Configuration menu. You'll be presented with a form as below in which you can enter the text names you would like to use initially to describe your system configuration. Type in the text tags that you want to use to identify the configuration. These can be changed at any time later. Recall that the tags are a new feature, and were not previously available in prior software versions.



7. Press Import to drill to the new baseline root web page in the Q330HR\Web Page directory. When you import the web page the test tags will be written into it. They are actually stored in the Q330 in its web page, and extracted and inserted on the fly when loading or saving the configuration.
8. Disable Configuration Builder Mode.
9. Make any further adjustments to the configuration you want.
10. From the Willard Commands\System and GPS Control, select “Save to EEPROM” and “Reboot”
11. When the Q330 has rebooted, Re-register
12. Use Configuration Cloning to Save the present state of the Q330 into a file, called say “<tagid>-baseline.xml”.

The XML file “<tagid>-baseline.xml” now contains a valid unified XML file representing the entire configuration at the time of upgrade, including the new embedded root web page. The Q330 is now prepared so save and load in their entirety such unified XML files to simplify configuration loading using one file.

Concept of XML Configuration “Authoring”

Where does the “one file” mentioned above come from? Willard has an extensive, and what might appear as a bewildering, array of parameters that may be set. No one would ever be able to operate a uniform set of instruments in a defined configuration if each unit had to be individually programmed in detail to define what data were acquired. The idea instead is for an expert user, under configuration control, to build a set of reference XML files appropriate for certain classes of applications. For example, a configuration can be built for minimum power consumption using cycled GPS and a power cycled Baler – these elements are part of the non-DP-specific or token information, and might define a particular set of MSEED channels to be recorded on a Baler. These channel configurations are part of the DP-specific, or token, information. Whereas it was previously possible to manage these separate pieces of information saved in separate files, the new Willard allows the entire, self-consistent Q330 state to be saved and loaded, with small changes such as interface addresses, in a single file. It’s the expert user’s job to develop, or “author” such reference configurations; field users need mostly deal with simple “cloning” load and save operations of authored XML’s.

Willard signs sections of the XML file with a 32-bit CRC value. Willard automatically updates these CRC values whenever the configuration is saved. Whenever Willard attempts to load an XML configuration, the CRC is validated, and the user is warned if an invalid CRC is found. In this manner, the integrity and traceability of a particular XML configuration can be identified and maintained through any distribution chain. Because CRC’s are localized by section, differences can be relatively quickly located. Information outside the CRC but within the section, such as in this case, interface addresses, can be altered without affecting the validity of the CRC. It is therefore possible for template XML’s to be uniquely modified outside Willard to set station names and IP addresses without affecting verification integrity.

Editing the XML Configuration File – Beware!

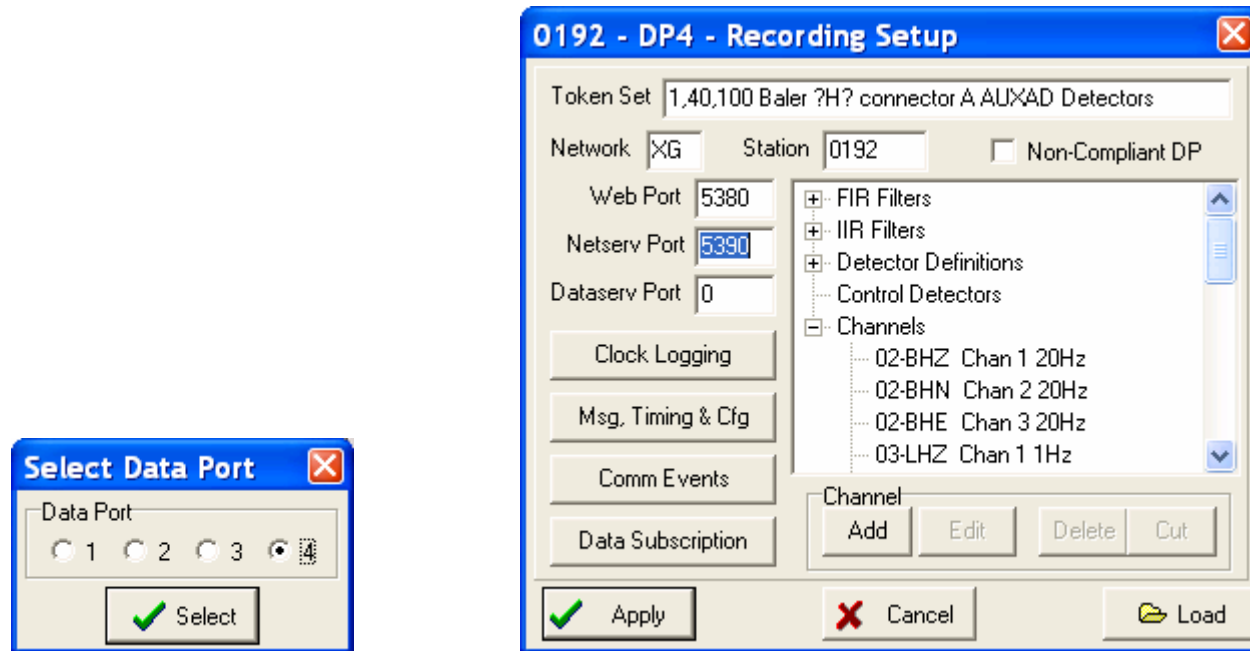
When creating a new configuration for a Q330, it is tempting for some to read a saved XML file into a text editor, and make changes there. This is not a recommended procedure. Many parameters are inter-related and changing one somewhere without changes others may result in the Q330 being unbootable. The CRC’s are calculated over specific regions of the XML file, and specific regions of the XML file are explicitly omitted from the CRC. It is generally safe to make changes to the parameters outside the CRC areas. That is the intent in an automated cloning system based on XML files. Information pertaining to specific unique stations, such as the MSEED station code, IP addresses,...etc, are not included in the CRC, and may be edited, or generated by an automatic sort/merge process based on a template. In short, the CRC’s are in the file for a reason, to guarantee that the parameter set is intact. Don’t change what’s inside the CRC regions unless you are an expert user, intimately acquainted with internal details of the Q330.

```

<?xml version="1.0" encoding="iso-8859-1" ?>
<Q330_Configuration>
<writer>
<proto_ver>"1"</proto_ver>
<name>"Willard"</name>
<soft_ver>"1.95 Build 333"</soft_ver>
<created>"Wed, 25 Oct 2006 13:52:24 GMT"</created>
<updated>"Wed, 25 Oct 2006 13:52:26 GMT"</updated>
</writer>
<global>
<interfaces>
<ser1_baud>19200</ser1_baud>
<ser1_enable>1</ser1_enable>
<ser1_hard>0</ser1_hard>
<ser1_break>0</ser1_break>
<ser1_rping>0</ser1_rping>
<ser1_rtcp>0</ser1_rtcp>
<ser1_route>0</ser1_route>
<ser1_rqping>0</ser1_rqping>
<ser1_bootp>0</ser1_bootp>
<ser1_unlock>0</ser1_unlock>
<ser2_baud>38400</ser2_baud>
<ser2_enable>1</ser2_enable>
<ser2_hard>0</ser2_hard>
<ser2_break>0</ser2_break>
<ser2_rping>0</ser2_rping>
<ser2_rtcp>0</ser2_rtcp>
<ser2_route>0</ser2_route>
<ser2_rqping>0</ser2_rqping>
<ser2_bootp>0</ser2_bootp>
<ser2_unlock>0</ser2_unlock>
<ser3_enable>0</ser3_enable>
<ser3_route>0</ser3_route>
<eth_enable>1</eth_enable>
<eth_always>0</eth_always>
<eth_rping>0</eth_rping>
<eth_rtcp>0</eth_rtcp>
<eth_route>1</eth_route>
<eth_rqping>0</eth_rqping>
<eth_bootp>0</eth_bootp>
<eth_unlock>0</eth_unlock>
<crc>58736831</crc>
<ser1_ip>10.1.1.2</ser1_ip>
<ser2_ip>10.2.2.2</ser2_ip>
<eth_ip>128.103.105.134</eth_ip>
<base_port>5330</base_port>
</interfaces>
<data1>
<lport>0</lport>
    
```

CRC calculated over region starting at the section tag to the <CRC> tag

DP Token Editor



As in prior versions, Willard provides a “DP Token Editor” to create and modify detailed SEED Channel sets, where items like channel names, SEED location codes, event detectors etc, are defined. This would normally be utilized during “authoring” only. The Token Editor can be used to modify a configuration loaded in from a file, and can also be used, as it could be used in prior versions of Willard, for example to load a particular token set saved in a reference file into a particular data port on a Q330. Note, as in the DP Token Editor menu at right, that when not in Configuration Builder mode, there is no “Load Token” button. That’s because unless you’re authoring a new XML baseline, you would normally do only a complete Cloning load.

The DP Token Editor itself remains as in prior versions of Willard, and is discussed in other documents. The new feature is really that, unless you’re the author, you don’t need it anymore to load tokens into a Q330 – that’s all done transparently in the unified XML load!

Configuration Builder Mode

When in Configuration Builder mode, the more advanced operations, like loading and swapping individual token sets, can still be done. This type of operation is illustrated below, where, for example, a token stored in an XML file for DP4 may be loaded into DP1 in the Q330. One might use such an operation during “authoring” of a new standard configuration. This type of more advanced operation is available in Willard’s Configuration Builder Mode, selected under Willard’s HELP menu. If you’re not the XML “author” you won’t need this type of operation. The “collapsed” forms of the XML files are shown.

```
<?xml version="1.0" encoding="iso-8859-1" ?>
- <Q330_Configuration>
+ <writer>
+ <global>
+ <interfaces>
+ <data1>
+ <data2>
+ <data3>
+ <data4>
+ <sensctrl>
+ <slave>
+ <advser1>
+ <advser2>
+ <advether>
+ <gps>
+ <pll>
+ <automass>
+ <announce>
+ <tokens1>
+ <tokens2>
+ <tokens3>
+ <tokens4>
+ <web_page>
</Q330_Configuration>
```

FILE

```
<?xml version="1.0" encoding="iso-8859-1" ?>
- <Q330_Configuration>
+ <writer>
+ <global>
+ <interfaces>
+ <data1>
+ <data2>
+ <data3>
+ <data4>
+ <sensctrl>
+ <slave>
+ <advser1>
+ <advser2>
+ <advether>
+ <gps>
+ <pll>
+ <automass>
+ <announce>
+ <tokens1>
+ <tokens2>
+ <tokens3>
+ <tokens4>
+ <web_page>
</Q330_Configuration>
```

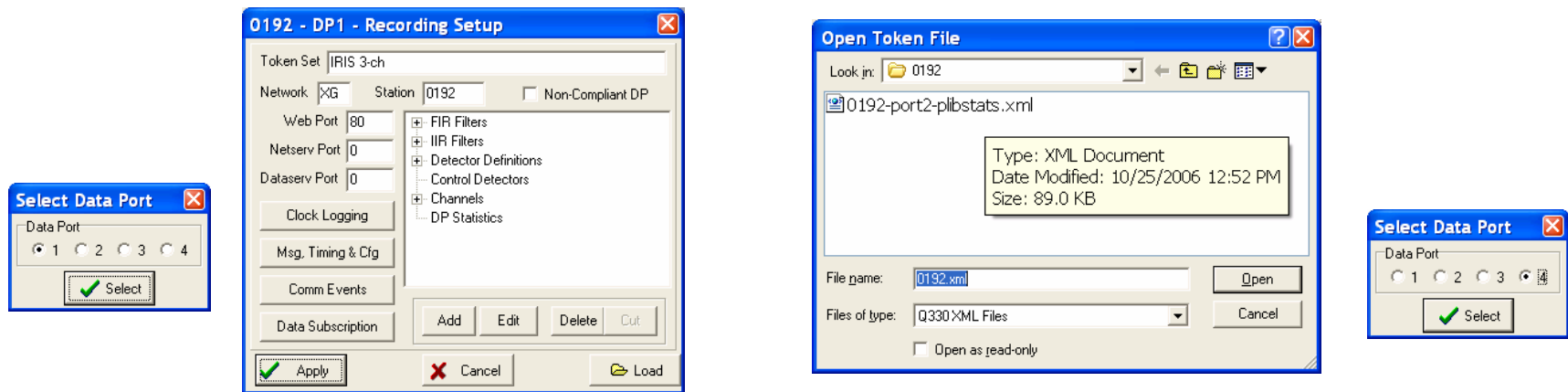
Q330

A simple example moving the tokens from Data Port 4 in a source XML file to the target Data Port 1 in a Q330 is illustrated. See below for the details.



Loading Tokens from one Data Port to another using Configuration Builder Mode

The operation to copy tokens from one Data Port to another discussed above is illustrated below. With Configuration Builder mode enabled, select Configuration\DP Token Editor on the target Data Port into which you want to load tokens. Let's say in this case, we are editing Data Port 1, and we want to copy the tokens from Data Port 4. Notice in the DP Token Editor form, when in Configuration Builder Mode a "Load" button appears in the lower right corner of the Token Editor ("Recording Setup"). When you select "Load", you will be prompted for the name of the XML configuration file from which the tokens will be loaded. After selecting the file, you will be prompted for the Data Port number from which the tokens will be loaded. The tokens will be immediately loaded into the target Data Port, in this case Data Port 1.



After the new tokens are loaded into the target Data Port, we recommend turning off Configuration Builder mode, and then proceed to Configuration\Configuration Cloning and save your new configuration in a new XML file. Now you will have authored a new master configuration.

The Data Recording Configuration – the Data Port Concept and DP Tokens

A crucial and powerful feature is the Data Port concept employed in the 330.

- There are four Data Ports. Each Data Port is an independent buffered group of channels and sample rates. Each Data Port may be acquired by an independent receiver.
- Three physical IP network Interfaces (Ethernet & 2 serial) are available. The Q330 automatically provides IP routing between its interfaces.
- Each Data Port can use its own SEED channel names or Station Code
- Connection to a Data Port is by IP socket. Multiple Data Ports can use the same network interface. Simultaneous communication with any group of Data Ports may take place over any interface.

The Data Port concept allows user selected sets of data to be transmitted independently to multiple receivers, local or remote. Local recording, for example, may record data from Data Port 4 on a Baler, while off-site telemetry uses another, independent set of data configured on Data Port 1. Each receiving client is independent from the others.

The generation of MSEED data in a DP is done according to specifications in Tokens loaded into each data port in the Q330. The Tokens essentially encode in a structured form the information necessary to construct MSEED channels from the raw A/D channels (1-6) in the Q330. The tokens define what SEED channels are created by a DP connected to the Q330, particularly a Baler. The tokens are stored in the Q330, rather than in the DP, so that a Baler, which may be exchanged, need not contain any configuration information – it's all within the Q330.

Normally the task of configuring the Q330 comprises mainly loading entire XML configuration sets that have been previously qualified. The XML cloning feature in Willard makes this a one-step operation. Willard does include a means for editing of Tokens, to make individual adjustments; however, routine operation does not require individual adjustments with the Token editor. It is intended that the Token editor be used only as an “authoring” tool to create new master configurations, and that routine operations deals only with these authored configurations.

In the actual station configuration, Data Port 4 is used by a Baler. We will proceed to prepare and connect a Baler. Further acquisition on other Data Ports using other software tools is optional in the context of initial setup. We will first concentrate on Baler operations, then proceed to the optional procedures. The Q330HR at time of shipment has been configured with DP tokens for three DP's. Data Port 3 has no token loaded by default. The Data Port communications parameters have been configured for local network connections.

DP 1 Continuous acquisition at sample rates of 1,40,100 sps. Channel naming appropriate for seismological application, with ?H? channels on the HR digitizer at connector A, channels 1-3 and standard channels as ?L? on connector B. The AUXAD channels are recorded as AX0-3. Murdock-Hutt Event detectors are active on the HHZ,BHZ,LHZ channels. The ?H? channels are configured for continuous LISS output (netserv). The netserv TCP port needs to be defined to enable LISS access. Telemetry operation with Pecos, Pecos2, or any lib330-compatible application is targeted.

DP 2 Continuous acquisition at sample rates of 1Hz, 40sps. Channel naming for engineering purposes using Roman numeral representation of sample rates, e.g. XL1 for 40sps, channel 1. Other sample rates, including 20,100, and 200 are preconfigured in the DP tokens, but have their output switched off.

DP 3 No DP Tokens loaded

DP 4 Same as DP1. DP4 is the default Baler data port. A Baler connected to data port 4 will therefore record the same data as the DP on 1 with the default configuration.

Sensor A or B connections on Q330 vs. Q330HR, and tokens in default XML files.

Sensor A/B Assignments

By long-standing convention, Q330 parameter files place FBA sensor settings on channels 1-3 (sensor A), and seismological settings on channels 4-6 (sensor B). The Q330HR's fixed hardware configuration places the 26-bit QAPCHP on sensor A, with the 24-bit QAPCHP on sensor B. Consequently, Q330HR parameter files contain settings opposite those of Q330 settings: seismological settings on sensor A, and FBA settings on sensor B. These differences occur primarily in the token sections of the XML parameter files.

XML Parameter File Names

The first field of the file name described the instrument type, Q330 or Q330HR. The second is the dash number of the instrument part number, where x denotes the packet memory available (0 = 8MB, 1 = 32MB). The third is the number of channels. 3-channel units have an additional field for the sensor type each one supports, while the 'default' designation indicates the FBA settings are the factory default settings used for 3-channel units when they are configured at the factory. The version number is in the last field; the same value will be displayed in the configuration base tag field in Willard (Configuration | Configuration Cloning).

Typical XML parameter file names:

- Q330-x4-6ch-v01.xml
- Q330-x3-3ch-FBA-default-v01.xml
- Q330-x3-3ch-seis-v01.xml
- HR-x2-6ch-v01.xml

FIR Filters

Beginning with recent software releases (Willard v1.81 & Baler v1.87), we introduced a new filter system that permits samples at all sample rates to be aligned on UTC boundaries. These require a different setting in the tokens for V?? and U?? data that are derived from other channels, e.g. VHZ. The new filter is "VLP389" for V?? data, and ULP379 for U?? data. These are the preferred filters if the user is running code versions the same or later than the versions mentioned above..

The XML parameter file default remains DEC10 because if someone is running an old Baler, it won't understand the token with the new filter specified.

What's a Baler anyway, and what's it good for?

The Quanterra Packet Baler is a Q330 data processing (DP) system implemented in an extremely low power (100mW cycled mode), rugged field package. The Baler receives data packets from a Q330 data port and processes the data into V2.4-compliant MSeED data files, and includes event detection and multiple means of high-level TCP/IP access to the recorded data. The model PB14F operates over a wide temperature range and in IP68 environments. Most importantly, the MSeED data recorded by the Baler is in an immediately useful form without post processing while requiring virtually zero power at a remote station site. There is no competing equivalent.

For autonomous stations, (as pictured at right), i.e. those recording without any telemetry connection, the Baler is used as a means to store data until an operator can visit the station. The operator can transfer data from the Baler on-site or simply swap the Baler and then offload Balers later at a regional depot or even overnight in a hotel to a laptop.

For stations with real-time telemetry, the Baler provides a deep on-site reservoir of data that can be accessed via a standard HTTP interface in order to recover a complete data set. The Q330's data port packet buffers will span telemetry outages on the order of hours, for example due to bursts of RF interference, router reboots or IP route discovery, however, the Baler's much deeper buffer is required during extended communications outages, such as caused by disruptions in communications that may be caused by a major earthquake.

The Baler, however, does more than simply write a streaming file or telemetry packets. The Baler converts Q330 packets into files by MSeED channels and may perform event detection. The Baler supports a HTTP server that will deliver data requested by *file* or by *time* and *channel*. The same data access method is used for both autonomous and telemetry backup applications. As a telemetry backup for a long outage, the first priority may be to patch long-period time-series. The Baler has already sorted these few important packets from the mass of high sample rate data. The Baler can also deliver selected time segments of high rate data immediately. Thus the bandwidth used for patching data (while still receiving the current real-time feed) is used more efficiently. For autonomous stations, the Baler provides quick data access to spot check a few events to see that the station operated properly. This is possible while the operator is still onsite and able to make any necessary improvements. The BalerAdmin program (described later) automates remote or local retrieval from many Balers.

The Baler operates in two basic modes; *Acquisition* mode and *Server* mode. Deployed with a Q330 it is normally operated in *Acquisition* mode in which the power cycling, data recording and IP addressing is controlled by the Q330. Willard is used to configure a Q330 with Baler settings, notably the DP token for data recording, the Baler's IP address, and the information to control how and when a power-cycled Baler is powered up..

For data offload of a swapped Baler, the Baler can also operate in *Server* mode. In this case the Baler is not attached to a Q330 but listens for a *Vacuum* application on the network to assign the Baler an IP address, collect data, re-allocate data files on the Baler for deployment, etc. BalerAdmin is one such *Vacuum* application. The Baler behaves slightly differently in Server Mode, disabling features for power cycling and data throughput throttling that are necessary at a remote station.

What's a Baler good for? It provides inexpensive, highly uniform and complete on-site storage and easy access to the most valuable station product – a complete, unambiguous data set. Used in conjunction with real-time telemetry, accurate data return approaching 100% is routinely possible.



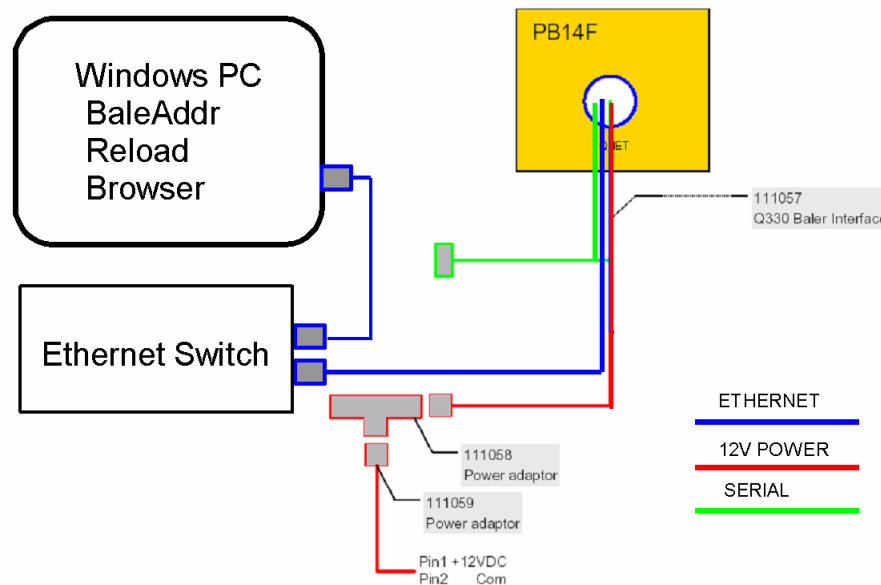
Preparing a Baler for Connection to a Q330HR – Baler Firmware Update and “Cleaning”

We’ll now prepare a Baler for operation with the Q330HR. Disconnect the P/N 109476-M serial cable to PC COM port to the console port of the Q330. You will no longer need the console cable.

We will first use a manual procedure using the very basic “BaleAddr” tool to demonstrate the principles. We’ll then use a preview version of the more sophisticated tool designed for management of multiple Balers.

IMPORTANT! When preparing the Baler, disconnect your network segment comprising the windows PC and Baler from your facility LAN and from your Q330. Your network should appear as in the simple diagram below. This is to prevent any inadvertent bonding of the Baler under preparation to any Q330 that might be connected to your LAN. Note that if your Windows PC needs a DHCP address assignment, your should instead give the PC a fixed IP address for this step.

Connect the Baler to your PC using the 111057 cable to supply Ethernet and Power to the Baler. The Baler “Status” LED will begin to blink GRN every 5s to indicate it is in IDLE mode.

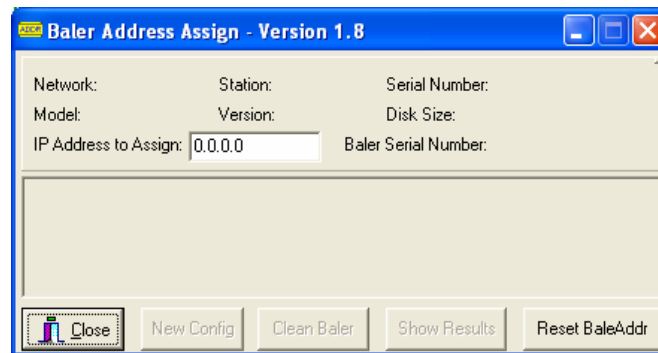


**PC – BALER CONNECTIONS FOR BALER PREPARATION.
BE SURE THE SWITCH IS DISCONNECTED FROM YOUR LAN AT THIS STAGE!**

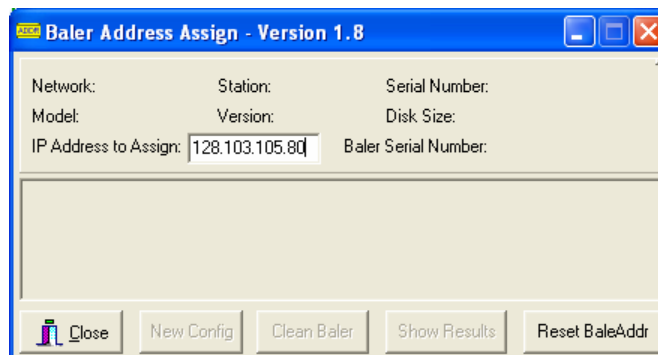
IMPORTANT NOTE: THE STEPS IN THIS PREPARATION WILL ERASE ANY DATA PREVIOUSLY RECORDED ON THIS BALER. YOU SHOULD RECOVER ANY DESIRED DATA BEFORE PROCEEDING.

REMEMBER! DISCONNECT THE NETWORK COMPRISING YOUR BALER AND LAPTOP FROM YOUR OFFICE LAN BEFORE BALER PREP TO ISOLATE YOUR LAN FROM ANY OTHER BALERS OR Q330'S THAT MAY OTHERWISE BE FOUND.

Start BaleAddr. The first time the program is run, the IP address entry will show 0.0.0.0.



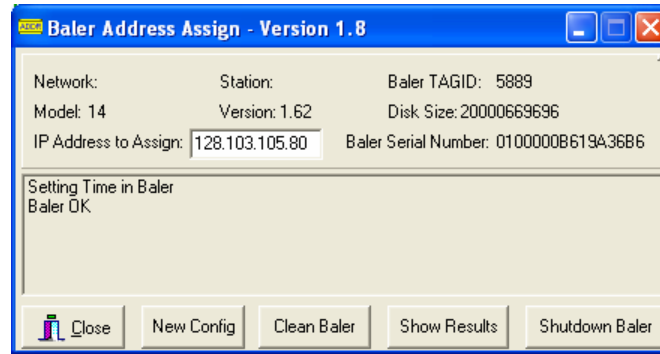
Enter an IP reachable from your laptop. This example shows one in our office. BaleAddr is now listening for a Baler to announce itself so that the Baler can be served with this IP address.



Press the ATTN button on Baler for about 1s. This will request that the Baler turn itself ON.

The Ethernet LINK LED will come on. The Status LED will begin to blink GRN/RED during the boot up. When the Baler CPU has booted, it will send a

broadcast query looking for an Address Server, and BaleAddr will respond.



The form will be populated with vital statistics learned from the Baler, including the Baler’s TAGID and current software version. Note in this case, the Baler firmware version is 1.62.

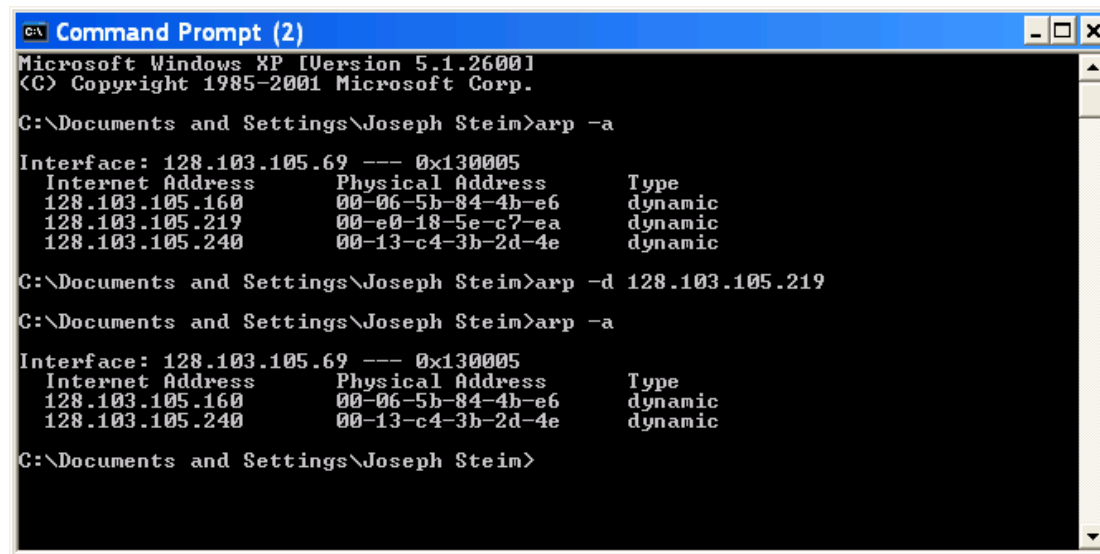
It is VERY IMPORTANT that you see “Baler OK”. This means that the two-way handshake assigning an address to the Baler has been completed.



WHAT IF YOU DON'T SEE "BALER OK" IN BALEADDR? ANSWER: DO NOT PROCEED UNTIL YOU DO!

If you do not see the "Baler OK" message, you should not proceed. Disconnect the Baler power, close the BaleAddr program, check the connections, and retry. Go back and review the physical connection, and check that you are strictly observing the Windows Networking Do's and Don't's described earlier, including checking that there is exactly one computer, and one baler ONLY on your LAN.

Note that if you upgrade more than one baler in a sequence, it may be necessary to flush your PC's arp cache of the baler's IP address, since we re-use the same IP address to associate with multiple Ethernet MAC addresses. In this case, you may observe the "no Baler OK" syndrome. To flush the cache, you may either wait about 5 minutes between balers, or issue the "arp -d <IP>" command explicitly. The example below shows deleting the address 128.103.105.219 (used by baleaddr) from the arp cache. This is all handled automatically by BalerAdmin – there is no need to be concerned with arcane details like this using BalerAdmin.



```

C:\ Command Prompt (2)
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Joseph Stein>arp -a

Interface: 128.103.105.69 --- 0x130005
  Internet Address      Physical Address      Type
  128.103.105.160      00-06-5b-84-4b-e6    dynamic
  128.103.105.219      00-e0-18-5e-c7-ea    dynamic
  128.103.105.240      00-13-c4-3b-2d-4e    dynamic

C:\Documents and Settings\Joseph Stein>arp -d 128.103.105.219

C:\Documents and Settings\Joseph Stein>arp -a

Interface: 128.103.105.69 --- 0x130005
  Internet Address      Physical Address      Type
  128.103.105.160      00-06-5b-84-4b-e6    dynamic
  128.103.105.240      00-13-c4-3b-2d-4e    dynamic

C:\Documents and Settings\Joseph Stein>

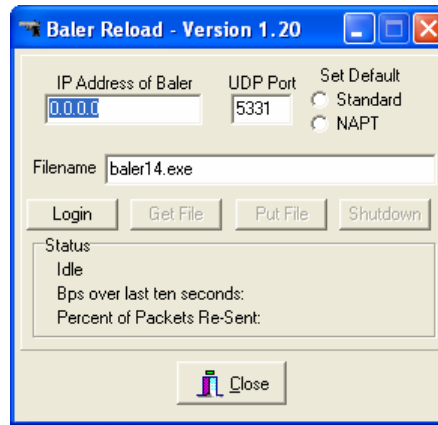
```

Once the "Baler OK" message appears, the Baler has been served its IP address, and will remain ON at the assigned IP address for 1 hour or until you press the ATTN button again to request a power off. In this mode, it is possible to offload data from the Baler using various methods, but we'll consider those procedures later. Leave the BaleAddr program running. We will use it following the next step to prepare the Baler for recording.

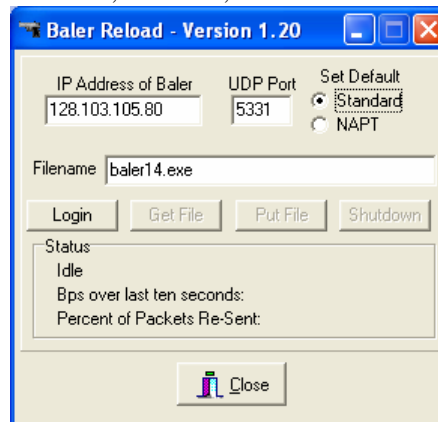
We will now update the Baler to current firmware. Note that this is necessary only when a revision is available. Updating firmware will not erase any data present on the Baler. If the Baler is going to be prepared for recording, it is generally preferable to make any required firmware update before offloading any data that may be present on the Baler, and before preparing the Baler for a new deployment, and reboot the Baler so that it will run updated firmware. This way, the preparation process will then be done using the latest firmware.

Uploading Firmware to the Baler

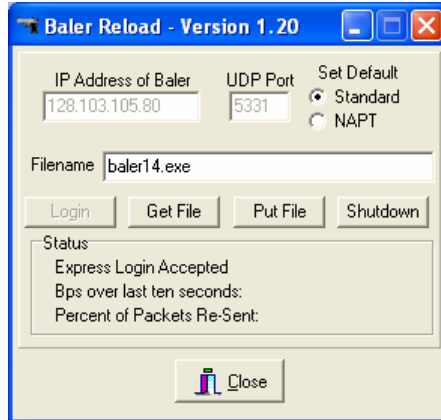
The Baler now has its IP address assigned by BaleAddr in the previous step. To upload firmware to a single baler, there is a utility called “*Reload.exe*” that may be used to “put” the baler’s binary file “*BALER14.EXE*” containing the baler firmware onto the baler. We’ll show later use of the BalerAdmin program to upload firmware to multiple balers. The first time you run *reload.exe* in a new directory, it will default to a 0.0.0.0 IP address.



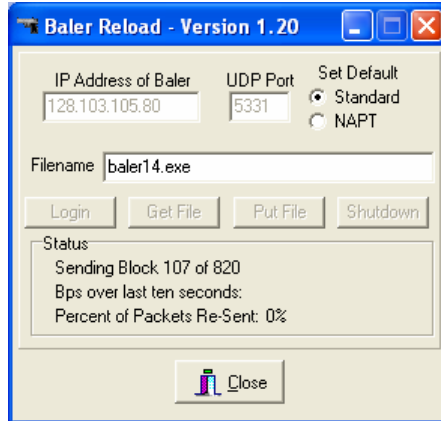
Type in the IP address you entered into BaleAddr and assigned to the Baler above. Select the “Standard” UDP port. This simply preloads the value 5331 into the UDP Port box. The “filename” box should contain *baler14.exe*. Any other filename, such as *Baler14-v1_62.exe*, will be transferred successfully to the Baler, but will never be automatically loaded and run during Baler reboot. The *baler14.exe* file must be in the same directory as the *reload.exe* program. The example below shows the address assigned in our network at Quanterra. Yours, of course, will contain an address appropriate for your network.



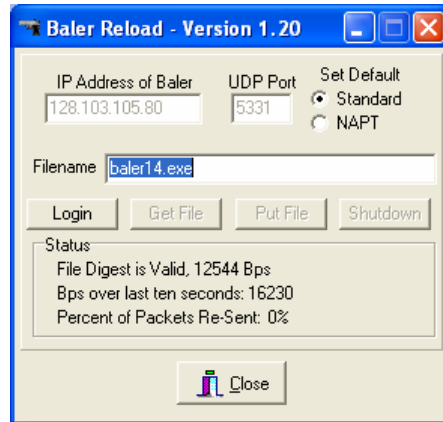
Press “Login”. The message “Express Login Accepted” should be displayed. Note that if you are upgrading a Baler containing old software, the message might say simply “Login Accepted”, which indicates a backward-compatible file transfer mode used in older baler software.



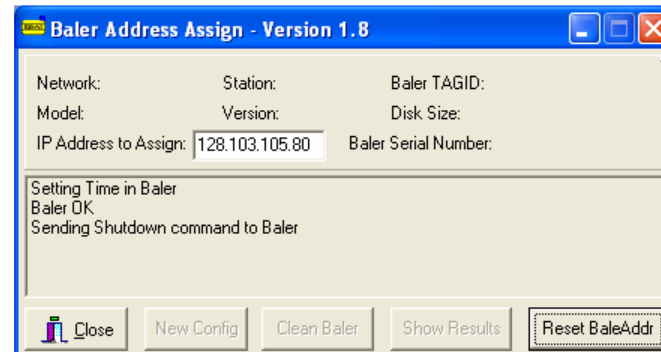
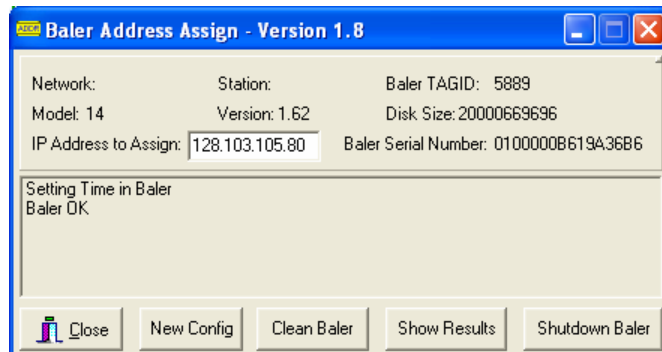
Press “Put file” to send the new baler firmware.



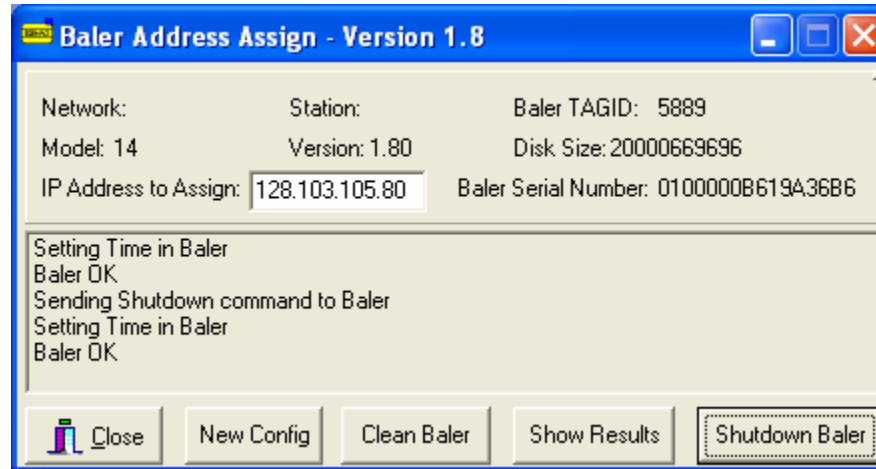
When the file is complete, the message “File Digest is Valid”, which indicates that the file has been transferred intact, and the Baler has accepted the new firmware. NOTE: If you are updating Baler firmware prior to version 1.45, you will NOT receive the “Digest Valid” message.



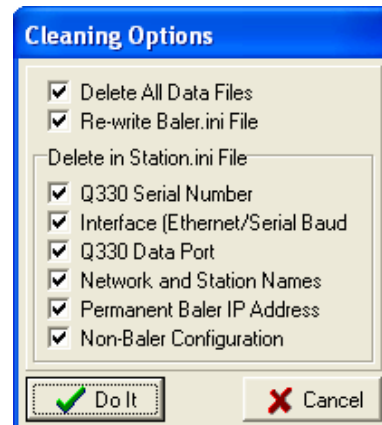
The new firmware, however, will not be executed until the baler is shutdown and rebooted. Therefore the next step is to command the baler to shutdown. For this step, BaleAddr is again used. Press the “Shutdown Baler” button. The BaleAddr program is also reset by this operation, so it is now again listening for a new Baler connection.



In the previous step, new firmware was loaded into the Baler, and BaleAddr was left listening for a new Baler reboot. Press the Baler's ATTN button, and wait for the "Baler OK" message. Note when the Baler reboots, firmware version 1.80 is indicated, the version loaded.



The Baler will now be prepared for connection to the Q330HR. Any data will be erased, and file structures will be written for recording. Press "Clean Baler". The form below will appear.



The default is for all “Cleaning Options” checked, indicating that all operations will be performed.

Select “Do It”, and note status in the BaleAddr message panel. The “Allocating...” stage will require about 2-3 minutes on a 20G Baler.

IMPORTANT: DO NOT REMOVE POWER FROM OR SHUT DOWN THE BALER WHILE CLEANING IS IN PROGRESS. IF POWER IS REMOVED DURING THE OPERATION, YOU MUST REPEAT THE CLEAN OPERATION TO ASSURE THE BALER IS IN A VALID STATE FOR RECORDING.



When complete, a message indicating “Done” will appear.



When the “Done” message appears, press “Show Results”.



On a 20G Baler, the normal conclusion to the “Clean” operation is the creation of 1178 files on 10 partitions. Other disk sizes create a different number of empty files and partitions; however, each type of disk always creates the same number. This number is diagnostic of a proper conclusion to the “Clean” operation.

IMPORTANT: IF THE OPERATION DOES NOT CONCLUDE AS ABOVE, THE BALER MAY NOT BE PROPERLY PREPARED TO RECORD DATA. SHUTDOWN THE BALER, AND REPEAT THE PROCEDURE. IF RESULTS DO NOT CONCLUDE CORRECTLY, CONSULT QUANTERRA.

Using BalerAdmin to Prepare a Baler for deployment

While the use of the BaleAddr and Reload tools is possible infrequently to maintain a small number of Balers, these tools do not scale well to larger operations. In fact, these tools have been developed and distributed only as “demo” applications, to illustrate what could be done with a “smart” tool that could simultaneously work with multiple balers, and automatically step through the various required sequences. The use of BaleAddr and Reload is deprecated by Quanterra, as we have moved to the more capable BalerAdmin tool.

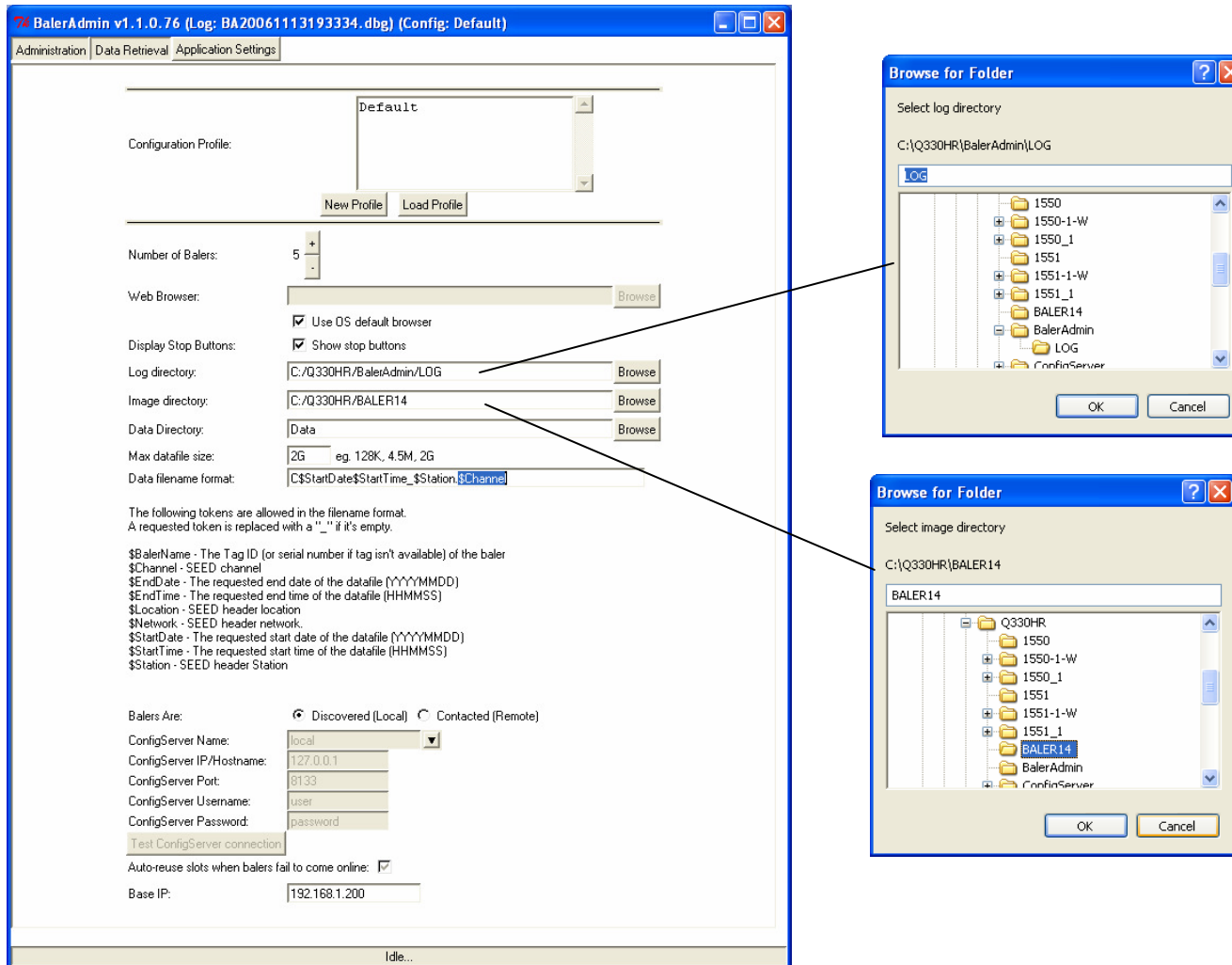
Quanterra, in cooperation with ISTI, has developed such an application, called BalerAdmin, designed to facilitate common simultaneous operations on multiple Balers. Operation of BalerAdmin provided in the support tools package is shown in the following pages to illustrate the capabilities of an automated tool. Quanterra uses BalerAdmin for factory Baler firmware update and preparation prior to shipment to customers.

BalerAdmin features:

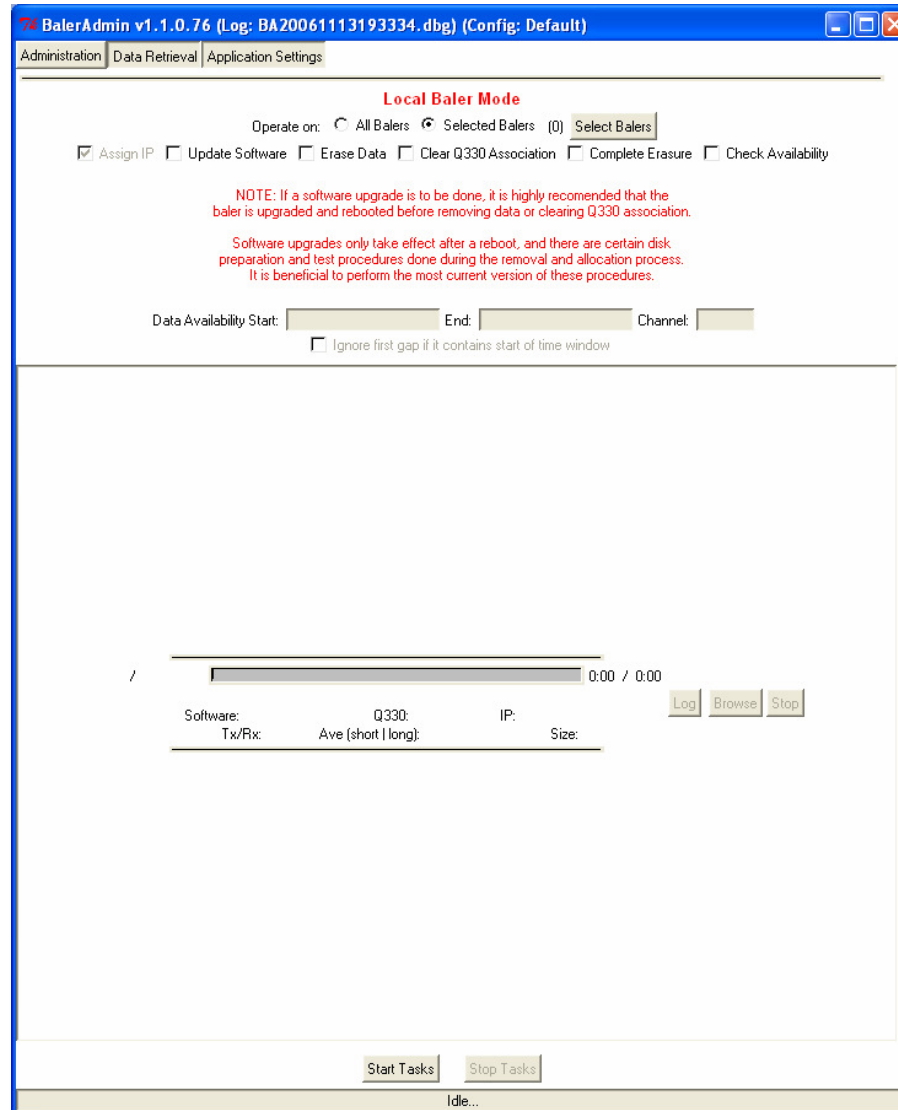
- Simultaneously operates on a group of Balers
- Tool provides administration, including Baler firmware update and “cleaning” management, as well as MSEED data retrieval.
- Allows operation on a selected set of “Remote” Balers, i.e. connected to Q330’s and collecting data, or “Local” Balers, where they are discovered and assigned an IP by the application.
- When Balers are “Local”, the application operates from an IP address pool, and checks for conflicts at candidate addresses before assigning them to newly discovered Balers.
- Where Balers are “Remote”, automatically issues the appropriate command sequence to its attached Q330 to power up the Baler.
- Interrupted data retrieval operations are retried to create complete retrieval data sets.
- Allows an Operator to select only specific Balers on which to operate based on station (Remote mode) or Baler TAG ID (Local mode).
- Keeps a detailed log of what happened with each Baler
- The BalerAdmin application is available for several platforms, including Win32, Linux, Solaris, and MacOS. Under Windows, the program executes as a single .exe file.

Running BalerAdmin for the first time

The first time BalerAdmin is run, the App settings need to be changed for your installation. Select the Settings form, and Browse to the LOG and BALER14 directory as shown. You should also enter an IP address in the “Base IP” box to be assigned to the Baler when operating in “Local” mode. Also, BalerAdmin allows for naming retrieved MSEED files with a definable format. If the “\$Channel” key is included, MSEED data will be sorted into separate Channel files. We suggest deleting the “.\$Channels” from the filename format template, so that all MSEED data per retrieval request are recovered as a single MSEED file. We will Browse to the Data Directory later when the application is used to recover data. For “Number of Balers”, reduce the count to 1.

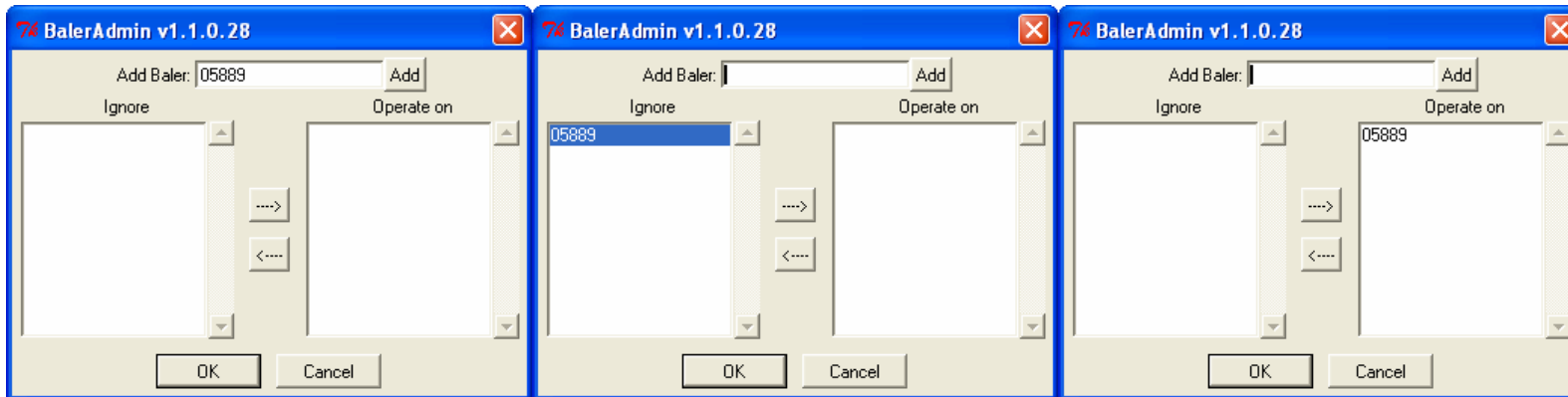


Next select the Administration panel, and press the “Select Balers” button.



This step will add the Baler you want to operate on to a “white list” of Balers. The application will ignore the broadcast messages from a Baler that is not placed on the list. This allows the application to control only a specified a group of Balers on a LAN where there may be many Balers operating. Multiple copies of BalerAdmin, running on different computers, may even be working on different groups of LAN-connected Balers at the same time.

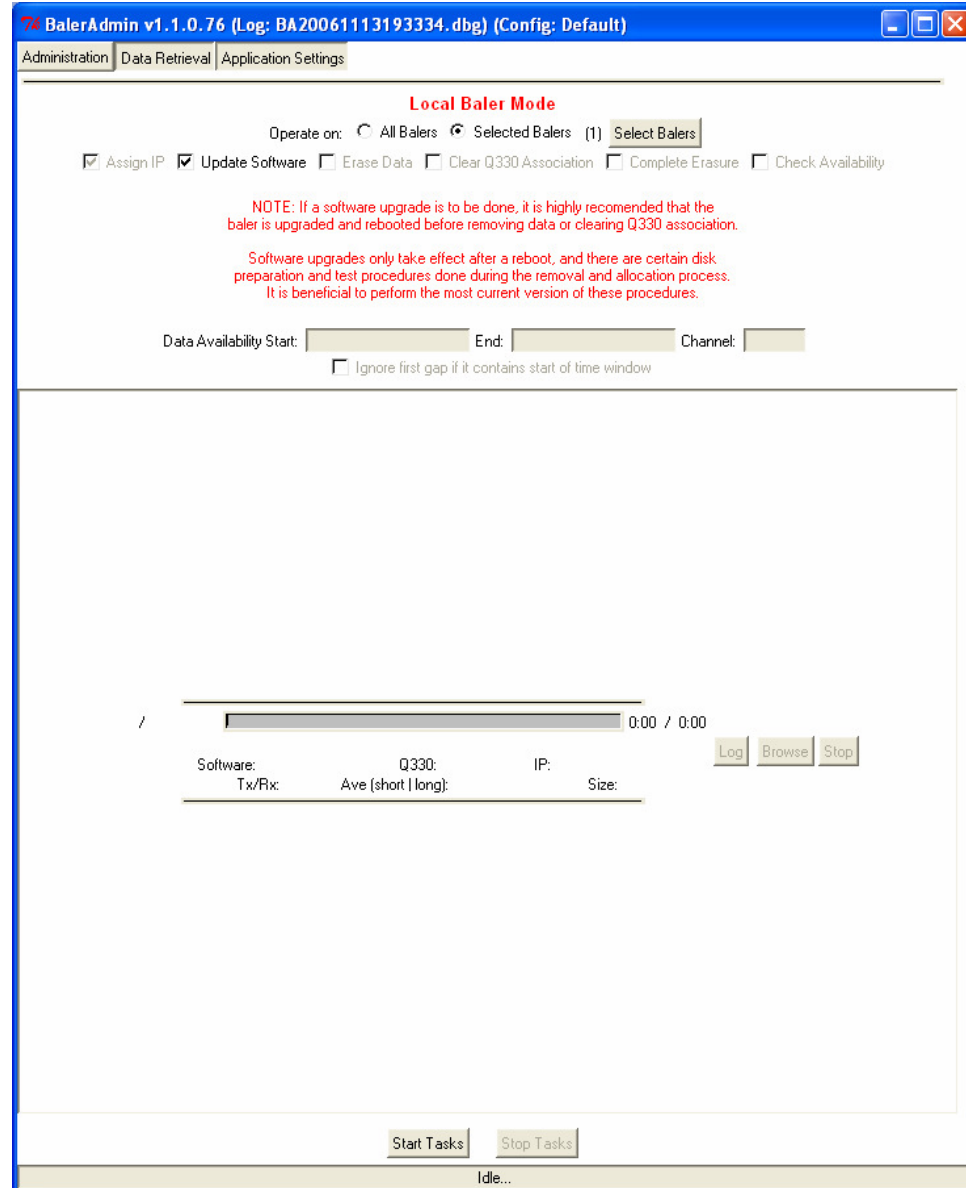
To add a Baler to the list, type the 5-digit Baler TAG ID (readable on the Baler’s front panel) into the “Add Baler” box, and press Add. The application will now remember this Baler and make its tag ID available for future runs. The example below shows Baler tag ID 05889. The new tag ID will appear in the “Ignore” pane. To select it, highlight it and press the -> to move it to the Operate pane. If you are working on more than one Baler, only the Balers on the “Operate” list will be processed.



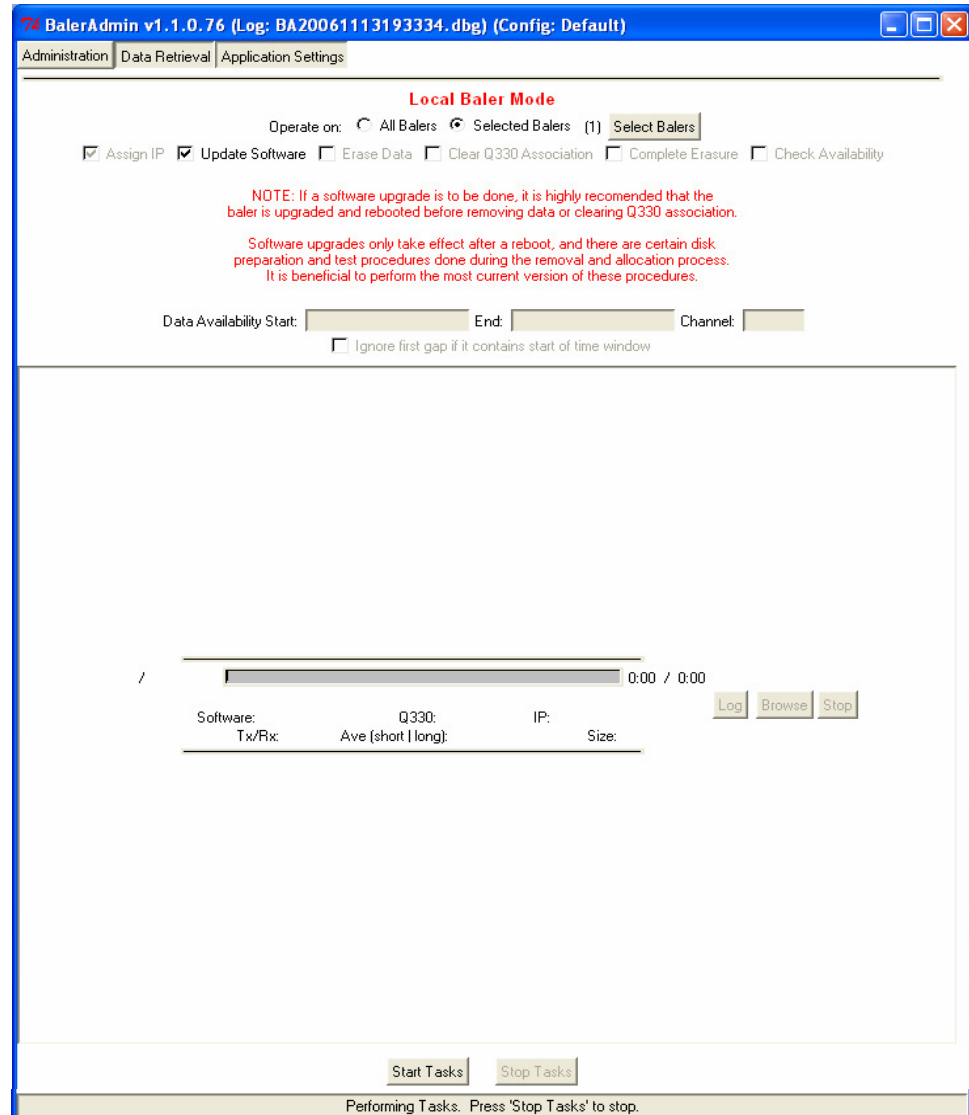
Click OK to return to the Administration panel

Since we want to update Baler software first before Cleaning, check “Update Software”. The boxes involving Erase Data will gray out, since you cannot update software and erase data at the same time. Be sure before proceeding that you have properly browsed to set the Image Directory to BALER14 as covered above. This is the directory that contains the BALER14.EXE program.

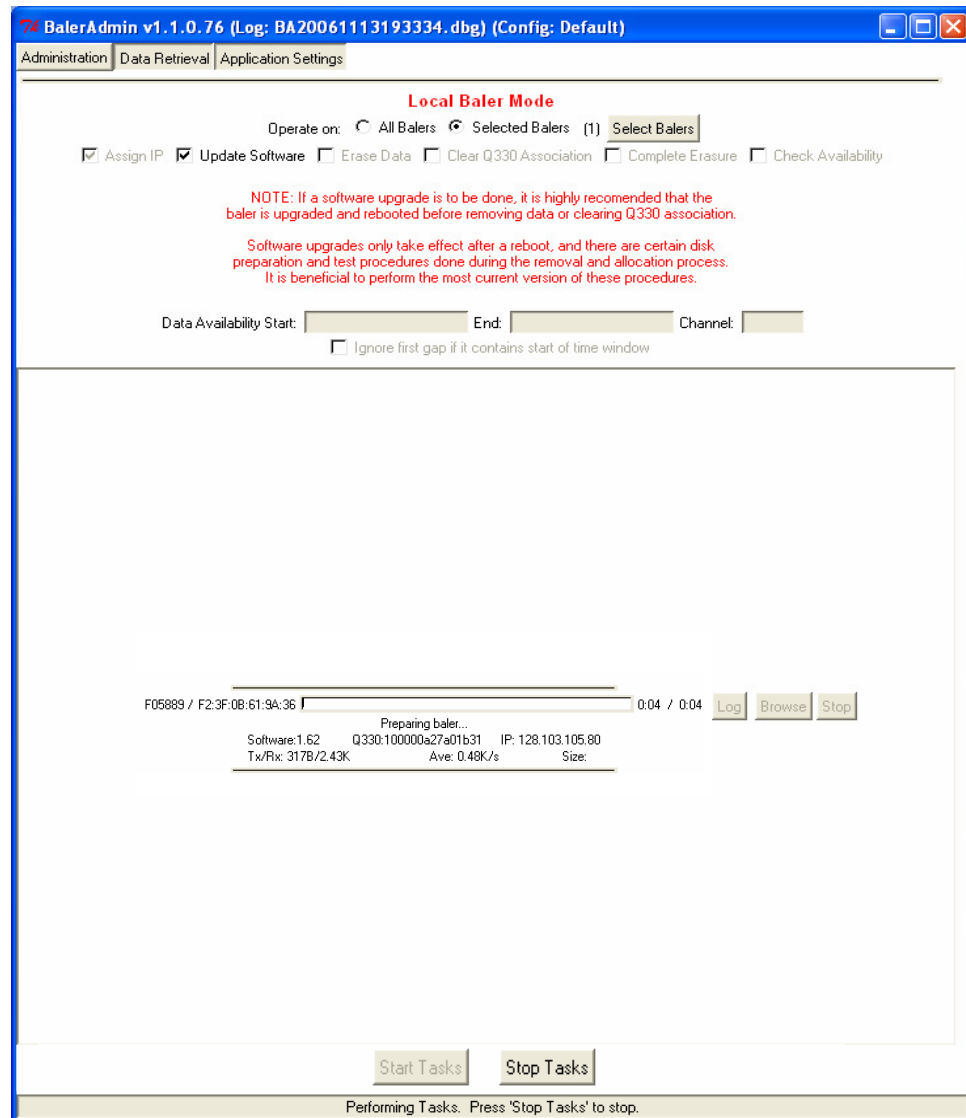
Since Baler operations are performed by the Baler itself, it is important for the latest Baler software to be installed before erasing or retrieving data from the Baler.



When ready, press the “Start Tasks” button. The application will begin by checking that the IP address range you’ve specified to assign to Balers has no conflict with other devices on your network, and are not currently in use. The application will then begin listening for the selected Baler.



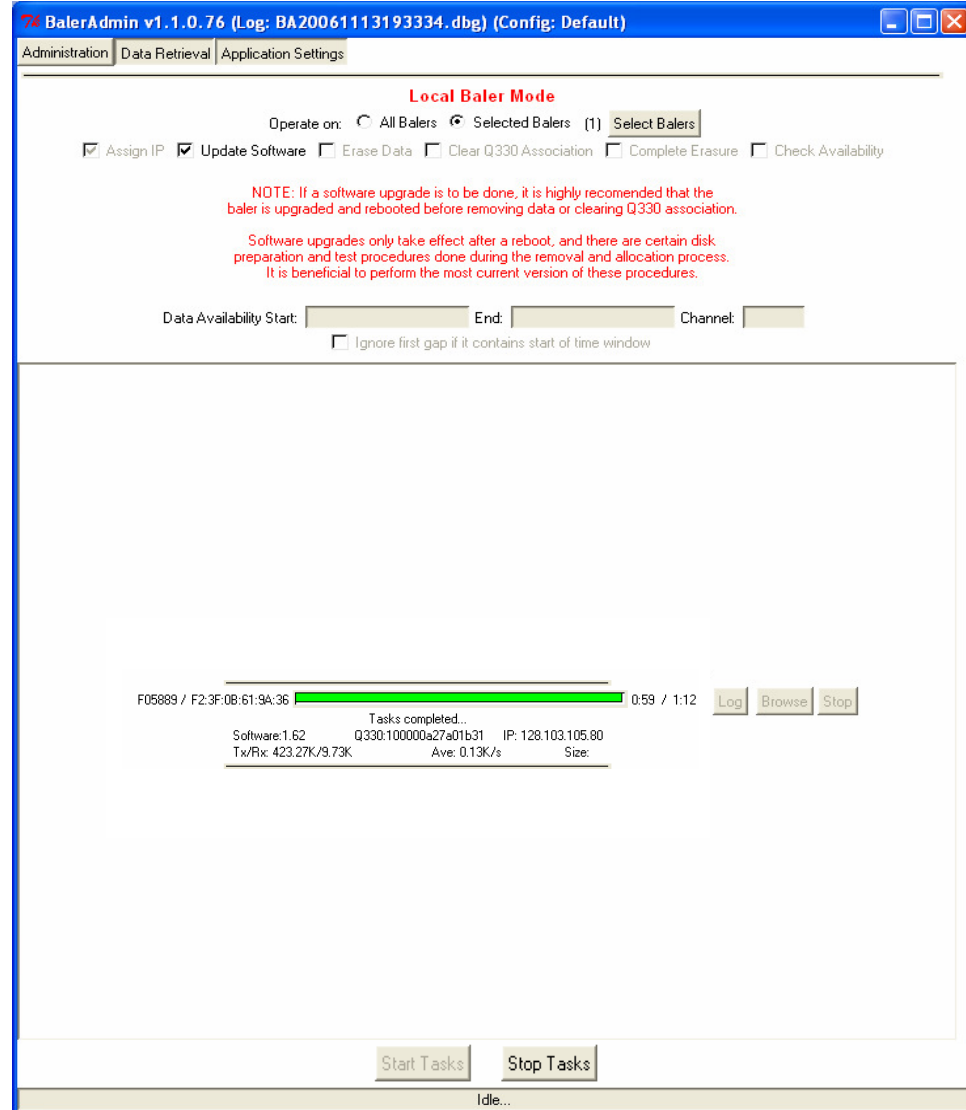
Press the Baler's ATTN button, and wait for the Baler to boot. When the application hears the Baler's broadcast, it will assign an IP and begin the specified task.



Here, the progress of sending the updated BALER14.EXE Baler firmware can be monitored.

The screenshot shows the BalerAdmin v1.1.0.76 interface. The title bar reads "BalerAdmin v1.1.0.76 (Log: BA20061113193334.dbg) (Config: Default)". The interface has three tabs: "Administration", "Data Retrieval", and "Application Settings". The "Local Baler Mode" section is active, showing "Operate on:" with radio buttons for "All Balers" and "Selected Balers (1)", and a "Select Balers" button. Below this are checkboxes for "Assign IP", "Update Software", "Erase Data", "Clear Q330 Association", "Complete Erasure", and "Check Availability". A red note states: "NOTE: If a software upgrade is to be done, it is highly recommended that the baler is upgraded and rebooted before removing data or clearing Q330 association. Software upgrades only take effect after a reboot, and there are certain disk preparation and test procedures done during the removal and allocation process. It is beneficial to perform the most current version of these procedures." Below the note are input fields for "Data Availability Start:", "End:", and "Channel:", with an "Ignore first gap if it contains start of time window" checkbox. A progress bar is shown for "F05889 / F2:3F:0B:61:9A:36" with a value of "0.06 / 0.19". Below the progress bar, it says "sending local version of BALER14.EXE" and lists "Software:1.62", "Q330:100000a27a01b31", "IP: 128.103.105.80", "Tx/Rx: 55.06K/3.41K", "Ave: 0.17K/s", and "Size:". At the bottom, there are "Start Tasks" and "Stop Tasks" buttons, and a status bar that says "Performing Tasks. Press 'Stop Tasks' to stop."

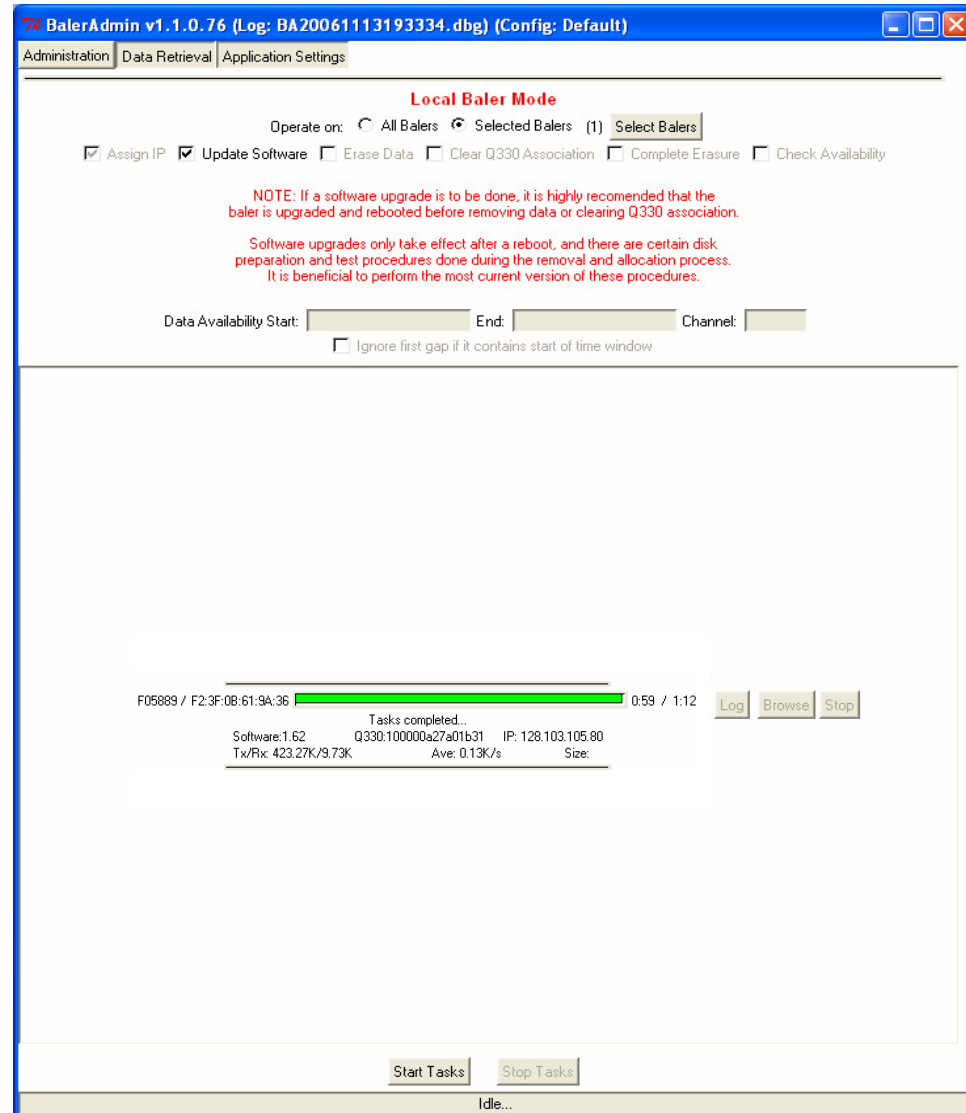
When complete, the task bar will turn GREEN indicating success (or RED for failure) and show the total elapsed time on the right.



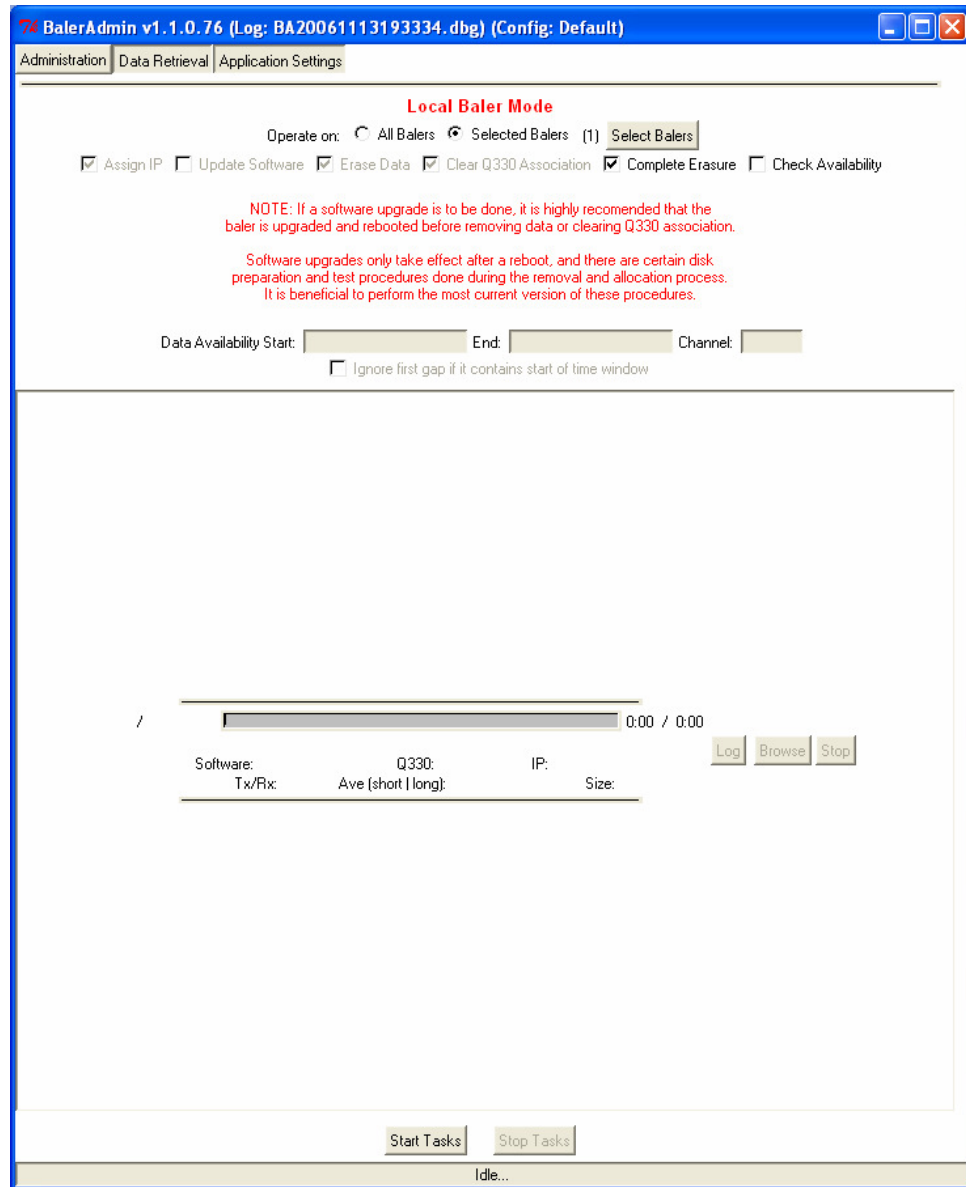
Now press “Stop Tasks” to idle the application, and we’ll move on to the next task, cleaning the Baler. Note that multiple Balers could have their firmware updated simultaneously in the same step as above, by configuring Application Settings for more Balers, and selecting multiple Baler tag ID’s.

After pressing the “Stop Tasks” button in the application, the main form will appear as at right.

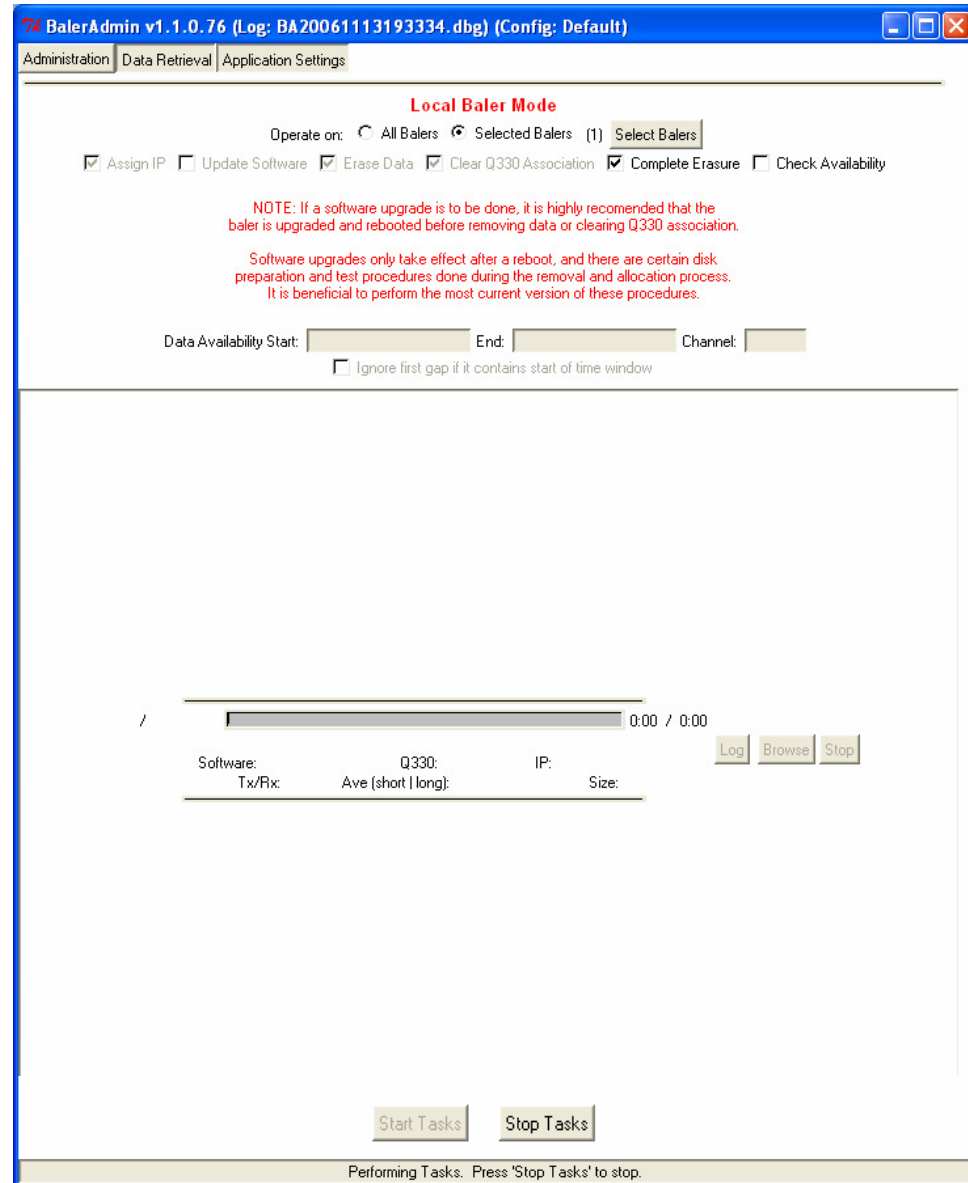
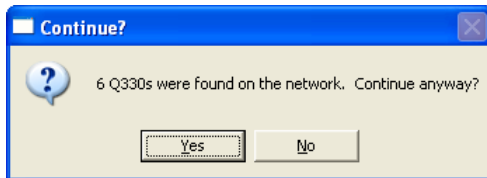
Press the Baler ATTN button again to request it to power down.



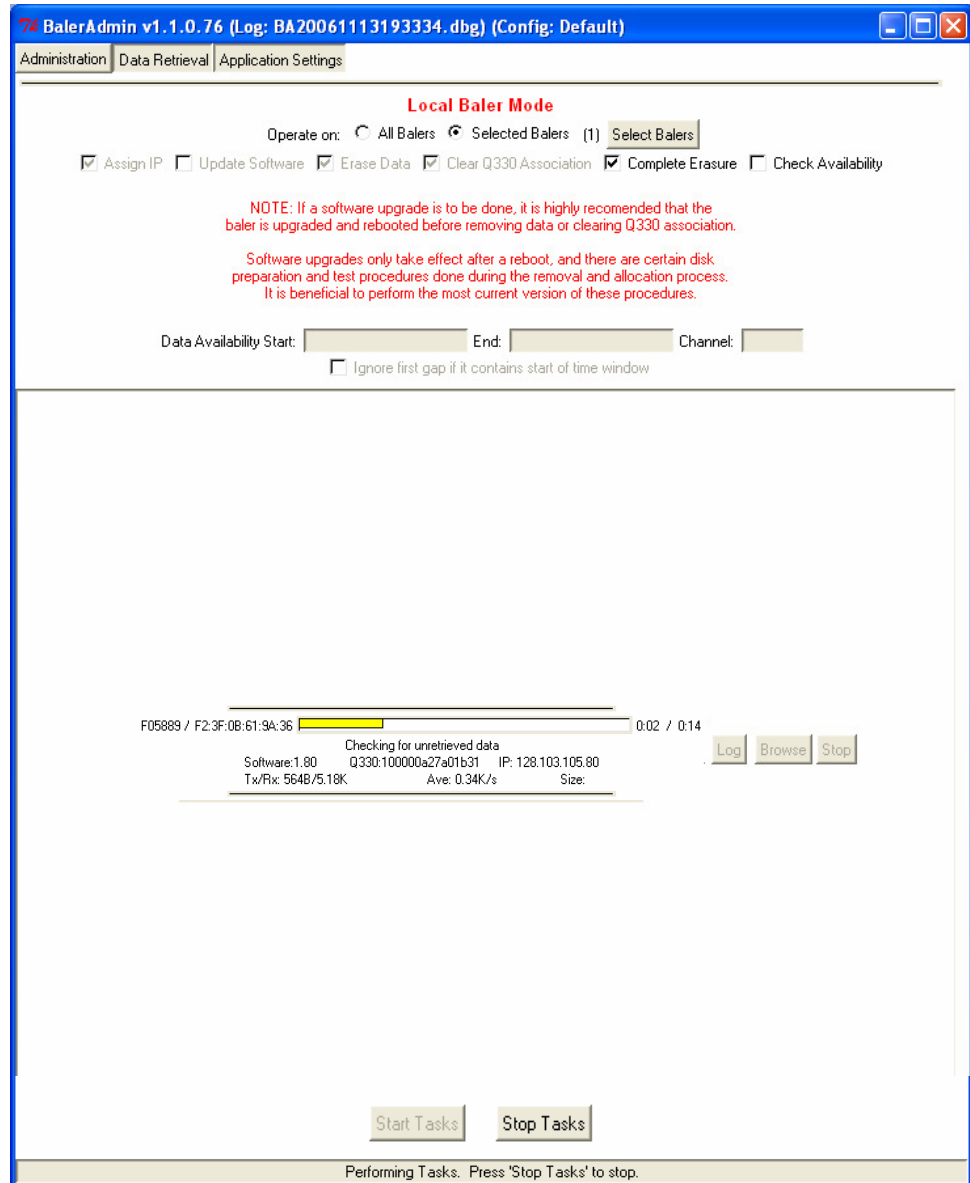
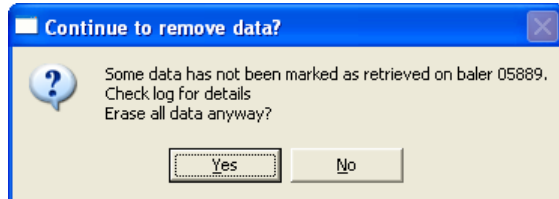
With the application in the idle state, uncheck the “update software” box, and check the “complete erasure” box. This is equivalent to the step in BaleAddr where the form is displayed offering to specify what information is cleaned on the Baler, i.e. all information in this case. Note that the Baler selection is retained, showing “(1)” selected Baler.



Press “Start Tasks” again. Note here, the application is advising before proceeding that Q330’s have been found on the network. It does so, because a network hosting Q330’s and Balers running old software versions may cause a conflict for access to the Baler. Current software releases do not have that problem. If Q330’s are found on the network, and they are running current software, proceed, i.e. press ‘Yes’.



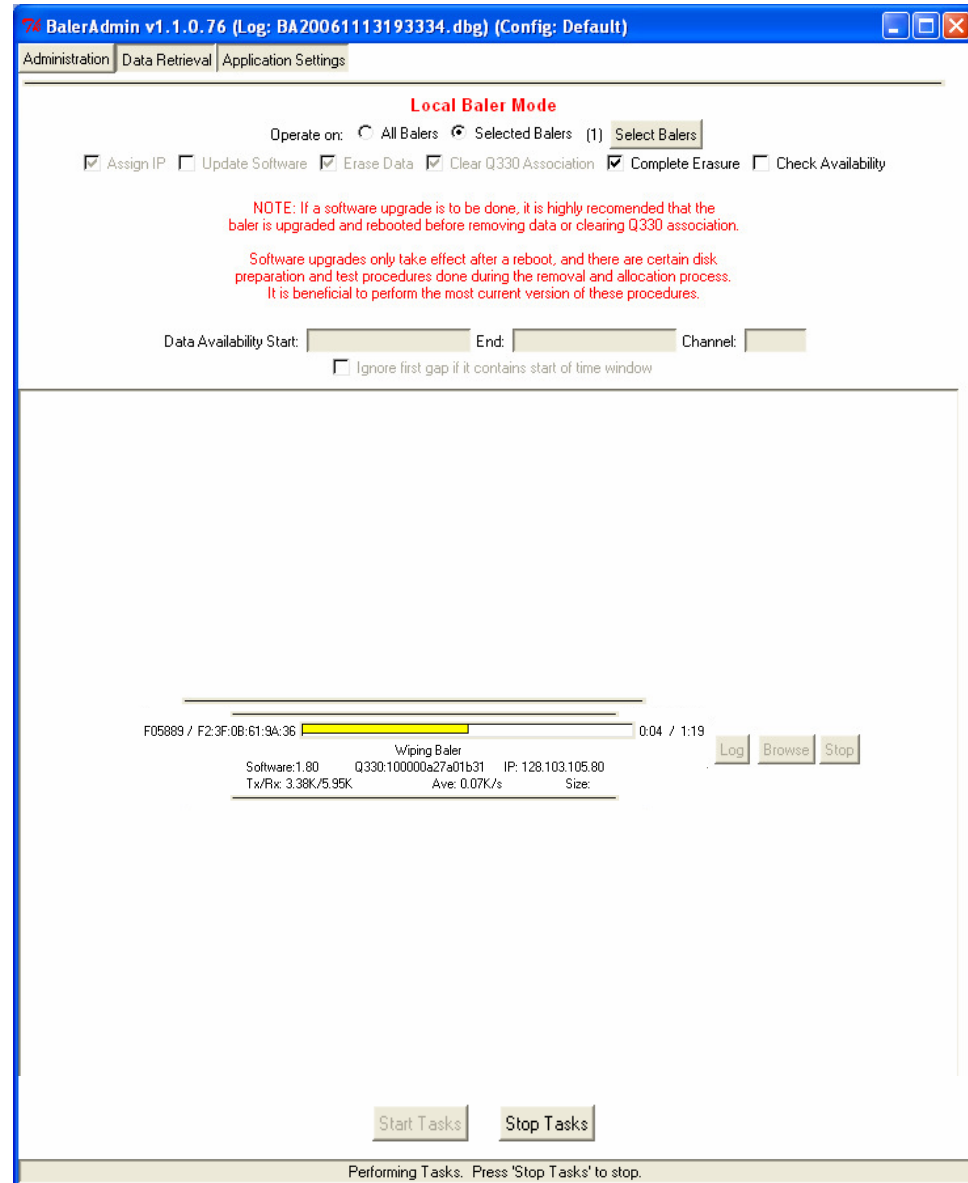
Press the ATTN button on the Baler to request it to power up. When the application connects with the Baler, before Cleaning, it will check whether there are data present on the Baler that the application has not previously retrieved. This is to advise that data may be lost, and to provide an opportunity to recover it. In this case, the application did find unretrieved data, but we elect to discard it, and proceed with the operation.



The application now begins to Clean the Baler, shown as “Wiping Baler” in the progress bar. The operation typically requires about 2-3 minutes.

IMPORTANT: DO NOT REMOVE POWER FROM OR SHUT DOWN THE BALER WHILE CLEANING/WIPING IS IN PROGRESS. IF FOR SOME REASON THE APPLICATION DOES NOT PROCEED TO THE COMPLETE STAGE AS SHOWN ON THE NEXT PAGE, YOU MAY RETRY THE OPERATION, BUT SUCCESSFUL CONCLUSION IS ESSENTIAL TO RELIABLE FIELD RECORDING. AN INCOMPLETE CLEAN OPERATION WILL RESULT IN DATA LOSS!

THE OPERATION MUST COMPLETE SUCCESSFULLY!



When complete, the task bar turns GREEN.

At this point, you may “Stop Tasks”, and press ATTN to power off the Baler. The Baler’s STATUS LED will blink GREEN at a faster rate than the normal IDLE blink, indicating a Clean state. The faster blink is about 1/s, and is easily distinguishable from the IDLE blink, which is a short GREEN blink once per 5s.

The Baler is now ready to connect to the Q330HR.

IMPORTANT!

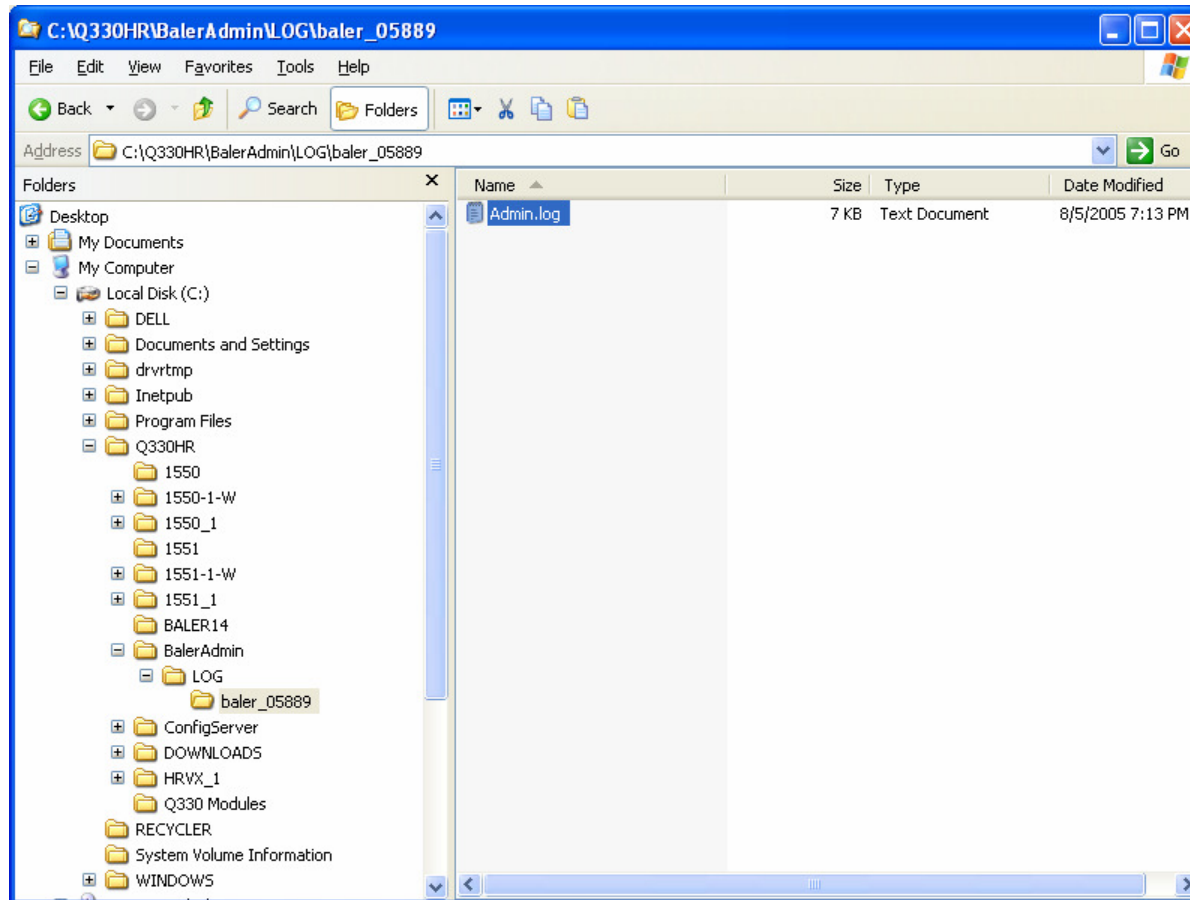


Now that the Baler has been wiped, make sure you do not connect the Baler to a LAN and request it to power on! If you do, it will bind to the first Q330 that hears the Baler’s initial broadcast after being wiped. This may not be the Q330 to which you intend a binding to be established. If the Q330 binds to an unintended Q330, you will need to Clean/Wipe the baler again.

Again, to emphasize, you should not at this time plug the Baler RJ45 Ethernet connector into a LAN. In the Clean state, it will bond to the first available Q330 it finds on the LAN!

Reviewing the BalerAdmin task log

BalerAdmin keeps a record of each operation on each Baler, automatically appended to a log file in the configured LOG directory. Drill down to the LOG directory, and you will find directories names for each Baler tag ID or Station ID that BalerAdmin has processed. For “Administrative” functions, such as Cleaning and Software Update, the tasks are recorded in the “Admin.log” file. Data retrievals are logged in a separate log.



The Admin.log file here shows the two operations we've done, and their results. Note also a list of the data discarded when we elected to proceed with Cleaning.

```
[2005/08/05 19:04:53] --- =====
[2005/08/05 19:04:53] --- - Admin tasks started
[2005/08/05 19:04:53] --- - Baler: 05889
[2005/08/05 19:04:53] --- - Baler Software: 1.62
[2005/08/05 19:04:53] --- - BalerAdmin version: 1.1.0.31
[2005/08/05 19:04:53] --- =====
[2005/08/05 19:04:53] --- Preparing baler...
[2005/08/05 19:05:03] --- Starting Task: ImageDirectory [Unconditional]:C:/Q330HR/BALER14
[2005/08/05 19:05:04] ---   sending local version of BALER14.EXE
[2005/08/05 19:06:04] ---   Local version sent
[2005/08/05 19:06:04] --- Completed Task: ImageDirectory [Unconditional]:C:/Q330HR/BALER14
[2005/08/05 19:06:04] --- Tasks completed...
[2005/08/05 19:10:04] --- =====
[2005/08/05 19:10:04] --- - Admin tasks started
[2005/08/05 19:10:04] --- - Baler: 05889
[2005/08/05 19:10:04] --- - Baler Software: 1.80
[2005/08/05 19:10:04] --- - BalerAdmin version: 1.1.0.31
[2005/08/05 19:10:04] --- =====
[2005/08/05 19:10:04] --- Preparing baler...
[2005/08/05 19:10:14] --- Checking for unretrieved data
[2005/08/05 19:11:09] ---   Part or all of the following data was not retrieved
[2005/08/05 19:11:09] ---     LHZ 2005-08-05 19:38:04 - 2005-08-05 19:41:42
[2005/08/05 19:11:09] ---     LHN 2005-08-05 19:38:04 - 2005-08-05 19:41:42
[2005/08/05 19:11:09] ---     LHE 2005-08-05 19:38:04 - 2005-08-05 19:41:42
[2005/08/05 19:11:09] ---     BHZ 2005-08-05 19:38:19 - 2005-08-05 19:41:57
[2005/08/05 19:11:09] ---     BHN 2005-08-05 19:38:19 - 2005-08-05 19:41:57
[2005/08/05 19:11:09] ---     BHE 2005-08-05 19:38:19 - 2005-08-05 19:41:57
[2005/08/05 19:11:09] ---     LCQ 2005-08-05 19:38:19 - 2005-08-05 19:41:57
[2005/08/05 19:11:09] ---     LCE 2005-08-05 19:38:19 - 2005-08-05 19:41:57
[2005/08/05 19:11:09] ---     LOG 2005-08-05 22:54:28 - 2005-08-05 22:54:30
[2005/08/05 19:11:09] ---     ACE 2005-08-05 19:26:09 - 2005-08-05 19:38:40
[2005/08/05 19:11:09] ---     OCF 2005-08-05 19:26:09 - 2005-08-05 19:26:09
[2005/08/05 19:11:17] --- Starting test: WipeTest
[2005/08/05 19:11:17] ---   Setting receive timeout to 10 minutes
[2005/08/05 19:11:17] ---   Wiping Baler
[2005/08/05 19:13:01] ---   Wipe completed
[2005/08/05 19:13:01] ---   Restoring receive timeout to 20 seconds
[2005/08/05 19:13:01] ---   Retrieving allocation results
[2005/08/05 19:13:01] ---   Total disk size is 20000079872 bytes in 10 partitions
[2005/08/05 19:13:01] ---   1178 Empty data files allocated
[2005/08/05 19:13:01] ---   File Allocation Complete
[2005/08/05 19:13:01] ---   Baler.ini Written
[2005/08/05 19:13:01] ---   Station.
[2005/08/05 19:13:01] --- Finished test: WipeTest [Passed]
[2005/08/05 19:13:02] --- Tasks completed...
```

check these log entries to assure proper cleaning

Connecting a Baler in the GSN Station Configuration and Verifying Operation

We'll move on now to connect the prepared, i.e. cleaned, Baler with the Q330HR in the GSN configurations, where the Baler and Q330 communication is serial, and the Ethernet interface of the Q330 and Baler are available for connection to a switch, and may be addressed separately. As it has been mentioned, this configuration allows data acquisition to take place on the Baler irrespective of the state of the Ethernet LAN, including power failure to the switch.

For the Q330HR-Baler connection, you will need the following cables and adapters:

- P/N 110401 Dual Serial Cable for Q330
- P/N 110057 Baler (QNet to RJ45, DB9P Serial, & 4-Pin Baler Power/Control)
- A 9-pin Male-Female Full Handshake Null Modem Serial adapter, P/N L-con DMA060MF or equivalent.

Rules for peaceful coexistence of multiple Q330-Baler pairs on a common LAN

Because cleaned Balers are designed to “bond” to any responding Q330, certain procedural rules must be followed where more than one Q330-Baler pair have their Ethernet interfaces connected to a common LAN, where unintended Q330/Baler pairing can occur because of the multiple-access nature of a LAN. These rules are designed to see that only the desired pairings take place when more than one Q330 and Baler are connected to a LAN.

1. WHERE MULTIPLE Q330-BALER HAVE THEIR ETHERNET INTERFACES CONNECTED TO A COMMON LAN, THE PAIRS MUST BE CONNECTED USING THE SERIAL INTERFACES.
2. EACH Q330-BALER PAIR MUST BE BONDED USING SERIAL COMMUNICATIONS BEFORE CONNECTING THE Q330 OR BALER TO YOUR LAN
3. ANY Q330 ON YOUR LAN SHOULD HAVE THE ETHERNET “BALER” OPTION TURNED OFF ON THE “CONFIGURATION\INTERFACES\ETHERNET ADVANCED” AREA USING WILLARD.
4. ANY TIME A BALER IS CLEANED, IT MUST NOT BE CONNECTED TO THE LAN UNTIL SERIAL-BONDED TO ITS Q330.

Performing the bonding

- Make sure the Q330 and Baler Ethernet LAN cables are unplugged from your LAN, as discussed above.
- Connect the cleaned Baler to the Q330HR using the connections shown in Figure 1 early in the document. The Baler's STATUS LED will blink either GRN every 5s, or GRN/RED alternately. If it is blinking GRN/RED, the Q330HR is already automatically turning on the Baler. If only the slow GRN blink (idle) is seen, press the ATTN button.
- Within about one minute, the Baler will bond to the Q330HR, signaled by the Baler STATUS showing continuous GRN with a blink. If other Q330-Baler pairs on your LAN are configured in accord with the rules above, it is now OK to connect the Q330HR and Baler to your LAN. When bonded, the Baler internally stores the Q330's S/N so that it may recognize to which Q330 it has bonded when multiple Q330's answer the Baler's LAN broadcast.

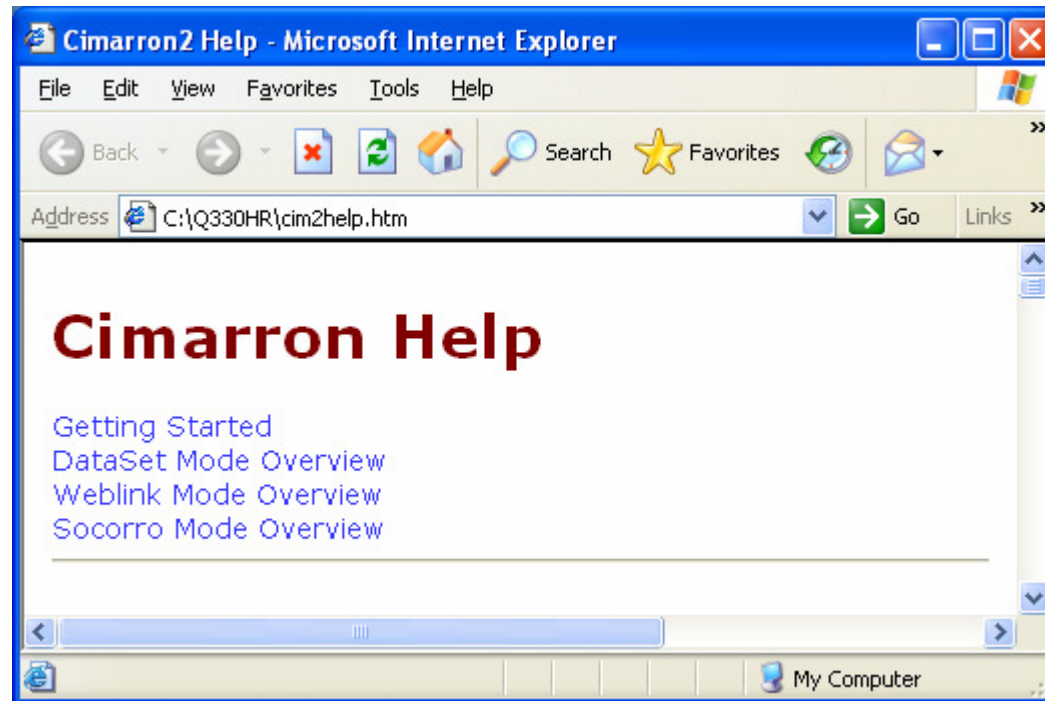
Cimarron MSEED review application

While the Baler is recording data for a while, let's prepare the Cimarron application so that we can look at the data.

Cimarron is a simple plotting tool for review of MSEED data recorded by a Baler (or the new application Pecos) or even a Q680 or Q4120. In addition, the Baler, and Pecos implement a new near-real-time protocol, called Weblink, to permit graphic review of recent data without having to explicitly extract a file – the data access is handled entirely by Cimarron. We'll setup the Weblink mode later, and concentrate first on the primary mode for review of extracted MSEED files.

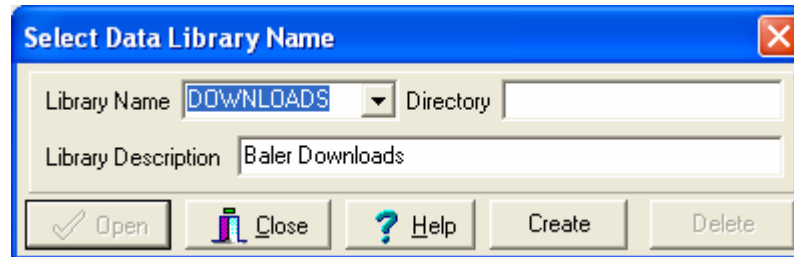
Setting up a Cimarron Station for review of 4K MSEED data files

Cimarron can be used conveniently to review arbitrary 4K MSEED files that we extract from Pecos, a Baler, or a Q680. To build the "DOWNLOADS Cimarron Library for review of 4K files, the Cimarron Manager needs to be run, like Willard and Pecos. To run the Cimarron Manager, start Cimarron. Again, the first time the program is run, a browser help is launched.

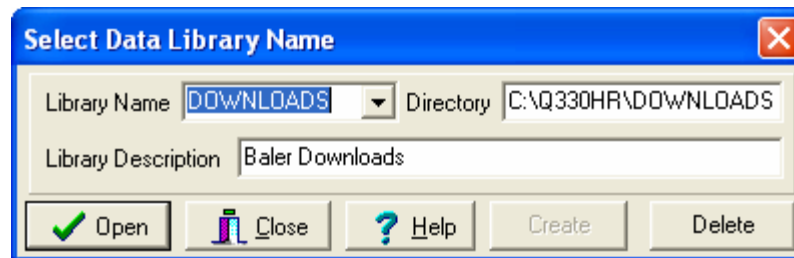


Review the help and close the browser.

The first time Cimarron is run, if no such default directory for 4K MSEED files exists, the Cimarron Manager will be run to allow you to build one. Cimarron calls this directory a Data Library, since you may store many downloaded files there from various stations. Cimarron contains functions for sorting and grouping downloaded data in the DOWNLOADS library.

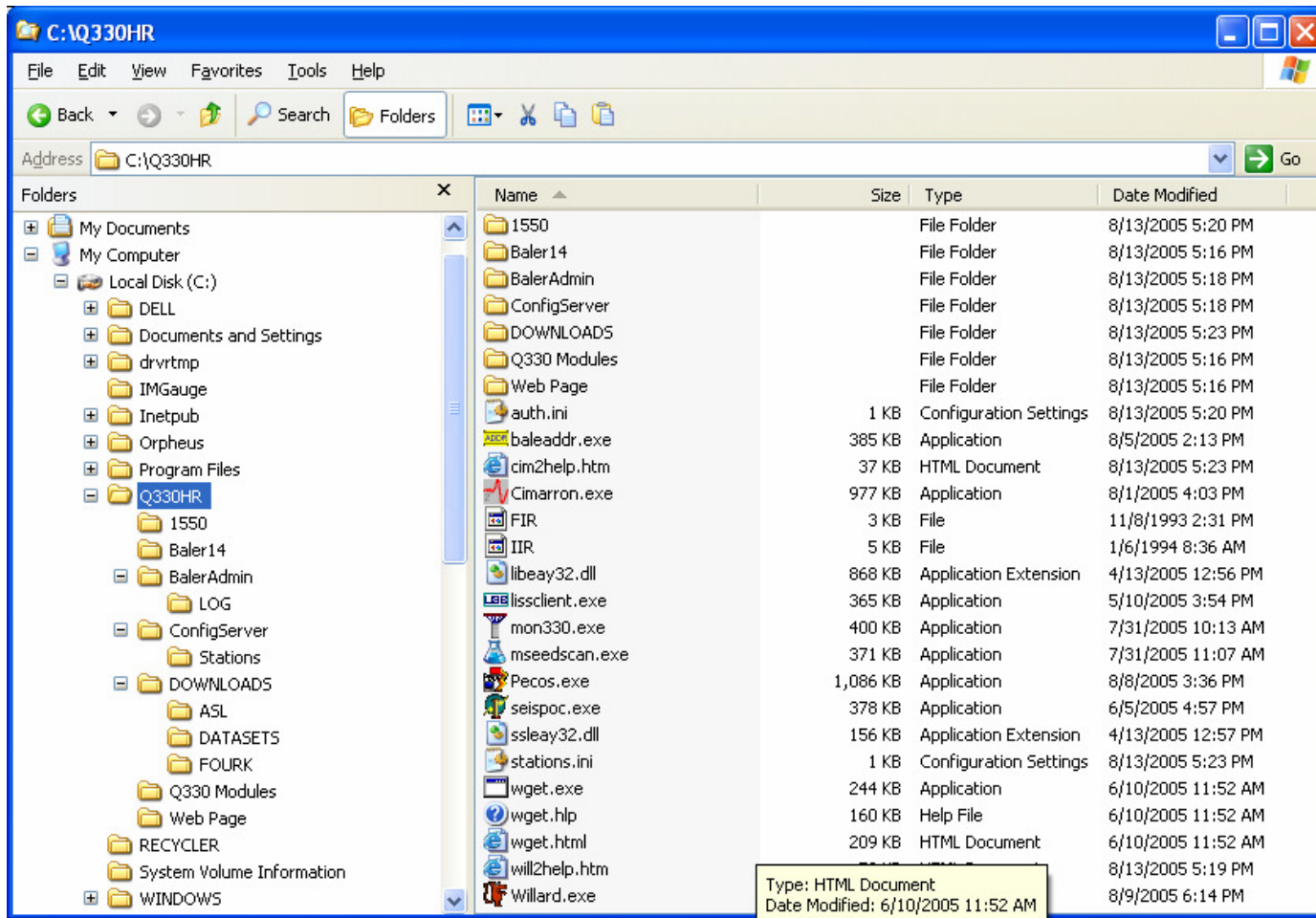


Press Create.



We will use this Library to display all 4K data extracted from various stations.

After the DOWNLOADS directory (and its subdirectories ASL, DATASETS, and FOURK) is created, the tree looks something like below



You Close Cimarron, or select the new DOWNLOADS Library. We'll then proceed to extract some data from a Baler into the DOWNLOADS Library, and have a look at it.

Retrieving Data from a Baler using a Browser

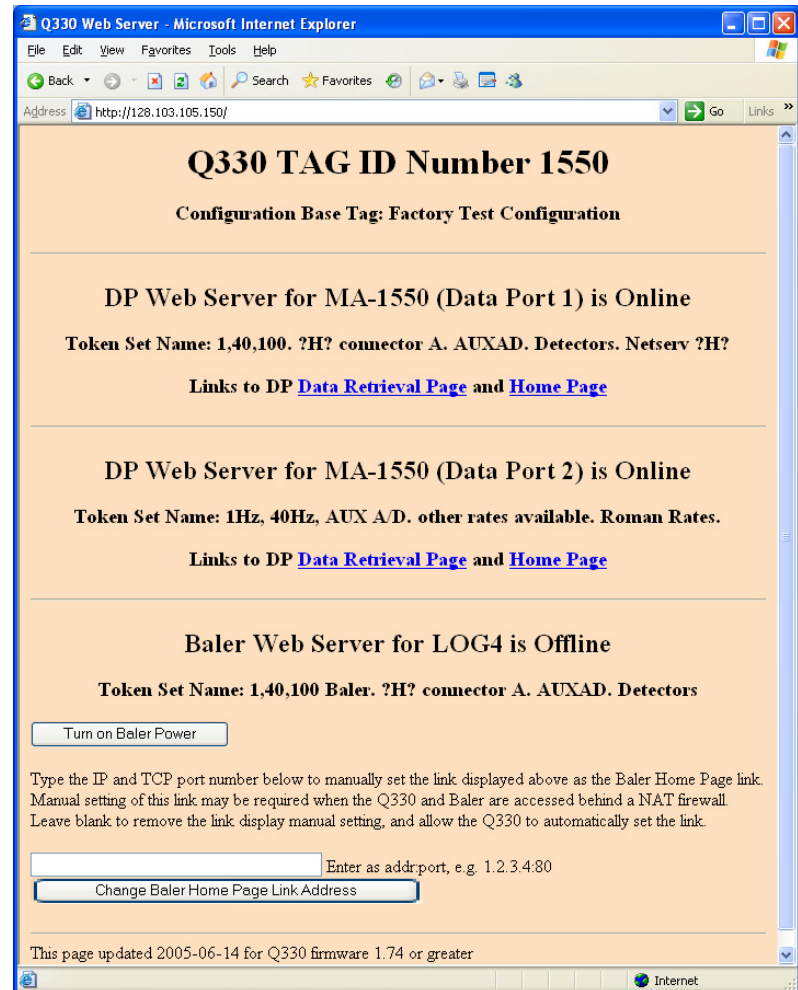
At this point, the Baler is recording data from the Q330HR, and these data can be retrieved and displayed. It is recommended to allow the pair to record for a short time, say half a day, and then retrieve a sample of data to verify that all is operating as expected.

On a power-cycled baler, as in the default configuration, data are written to the Baler at intervals defined by the amount of the Q330's packet buffer allocated for Data Port 4, where the Baler connects, and the data generation rate, which in turn depends on the number of channels and configured sample rates. In the default configuration, 6-channel data are telemetered to the Baler at rates of 100, 40, and 1 sps, where these data are recorded, resulting in an aggregate data generation rate of about 0.6-0.7kbyte/s, or 2.4Mb/hr. Again, with the default configuration, this results in a Baler cycle of about 1/hr.

Data become accessible for retrieval when its internal buffers are flushed, and its "index" files are updated. This occurs normally when the Baler powers down. Therefore, in typical operation, data will appear available for retrieval up to the end of the previous power cycle. In order to retrieve data up to as close to the present as possible, it is necessary to power up the Baler to begin a cycle, allow the cycle to finish which powers down the Baler, and then power the Baler on again.

In a later section, we'll show use of the BalerAdmin tool to automatically handle data retrieval. In this section, we'll show using only a web browser to retrieve data. The process, and the retrieval web page, is similar to that on Quanterra MSHEAR systems, except that the Baler must be explicitly powered on if it is not already on, the usual resting state. If a Baler is programmed to operate in Continuously Powered mode the Baler is always available for data access.

To begin a retrieval, point your web browser to the Q330HR's web page, i.e. the Q330HR's IP address and Web Port number (80 by default). Note that the Baler is reported as "Offline", i.e. not connected to the Q330HR, probably because it is powered down.

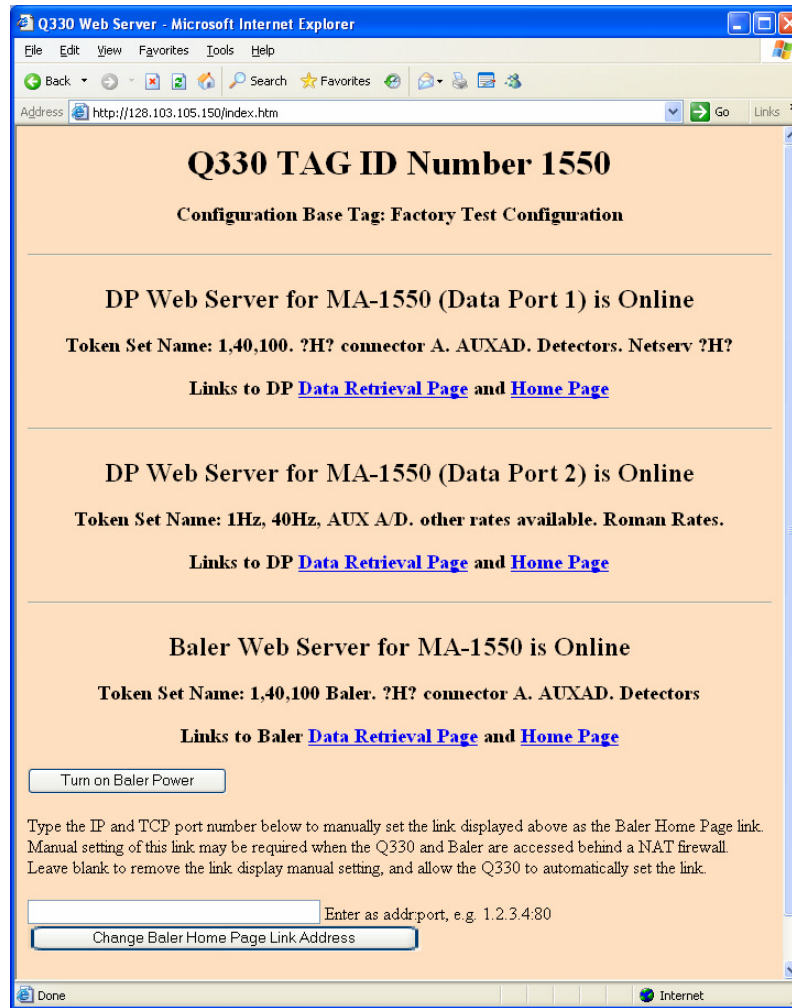


Press the “Turn on Baler Power”, and the browser will confirm having sent the command to the Q330.

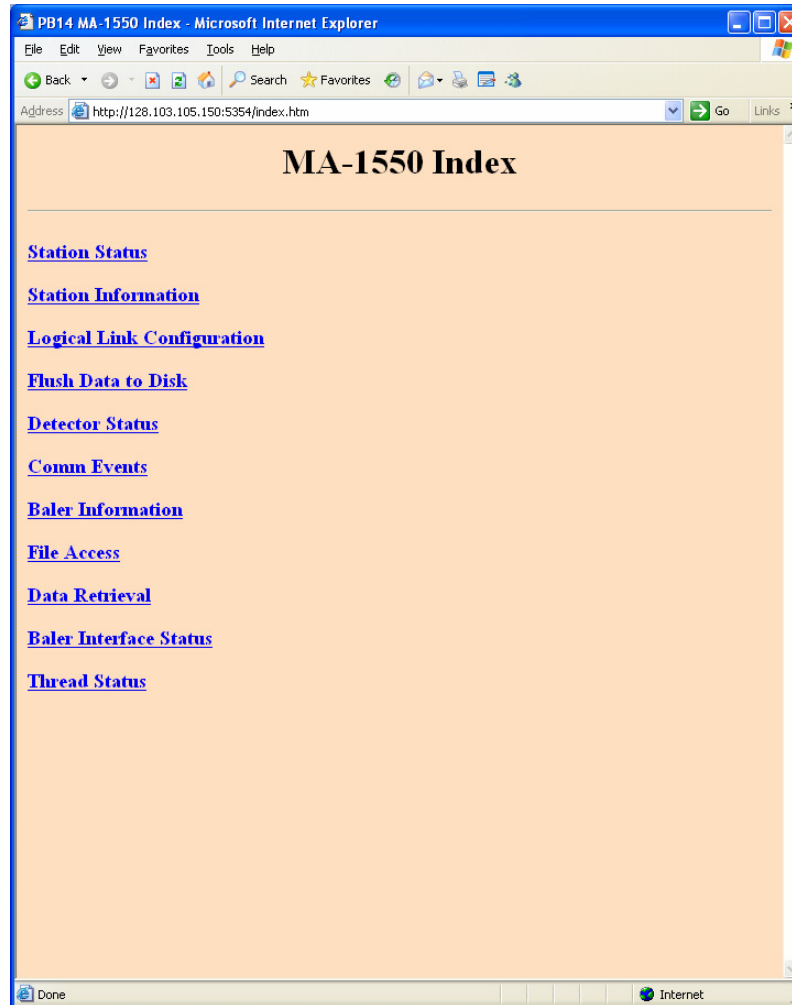
Select the “Back to Index Page” to wait for the Baler to boot up.



The page will auto refresh every 30-40s. When the Baler connects with the Q330, the links to the Data Retrieval Page of the Baler will become active.



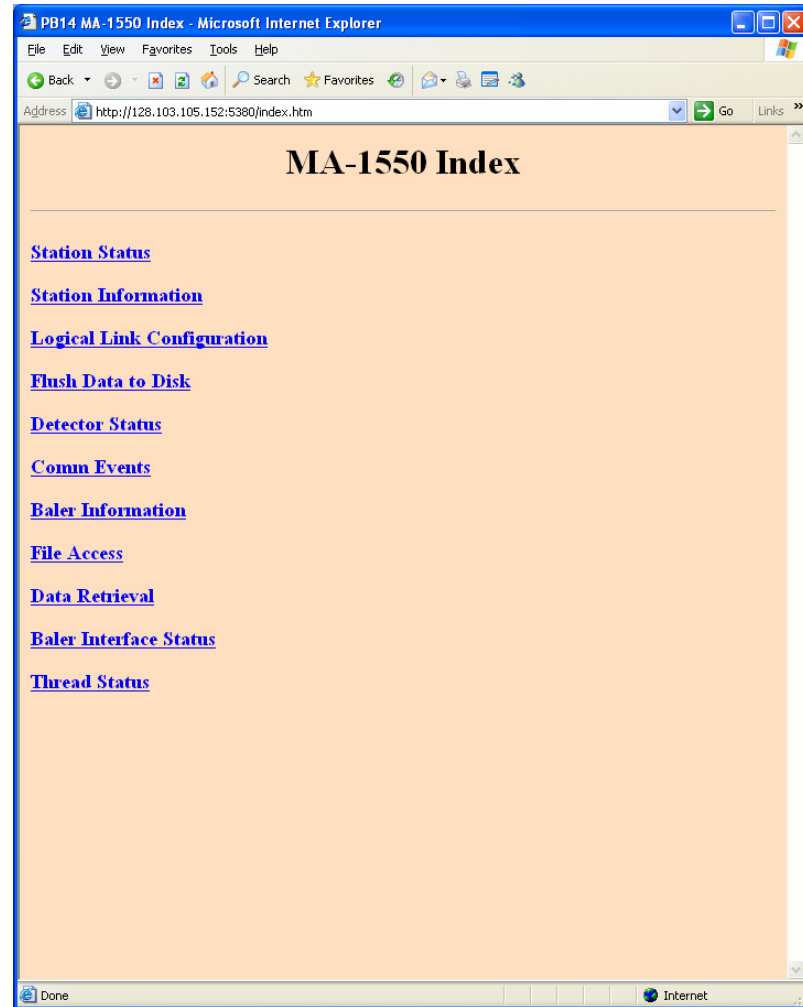
Now here's a subtlety resulting from the network configuration. If you simply click on the link to Baler, you will be directed to TCP port 5354 at the Q330 IP, which is the NAT translated port connecting to the Baler through the Q330's serial interface. This path, which may be appropriate if you do not have Ethernet connectivity directly to the Baler, has a transfer rate limited by the Q330-serial Baler connection.



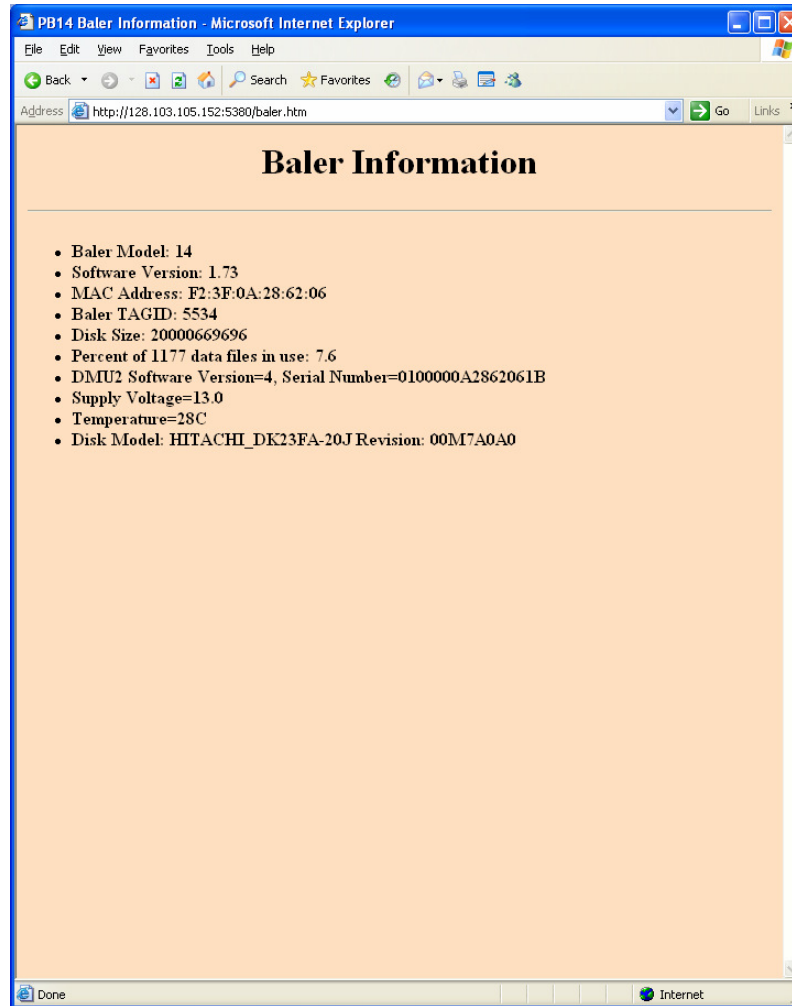
Instead, type in the Baler's direct-access Ethernet interface and HTTP port number. We can access this because the Baler's Ethernet is plugged into the Ethernet switch. Because in our standard topology described in this document, the Baler is connected to the Q330 using the Q330's "Serial Interface 2", we know the Baler's IP from looking up the information assigned to the Baler by the Q330 in the Q330's Configuration\Interfaces\Serial2\Advanced settings. The Baler's web server TCP port number (5380) is defined in the "DP Token" for the Baler, i.e. the Token on the Q330's Data Port 4. The port and IP usage is also explained in the IP Resource Planning table.

We could, by the way, use the Change Baler Home Page Link Address button to set the link one time to the Baler's Ethernet to be displayed in the Q330 web page, so that it is not necessary to type the Baler's direct-access IP:PORT. Or it is possible to switch off NAPT in the Q330's Configuration\Interfaces\Serial2\Advanced settings for connection to the Baler. In typical use, however, if a browser is used, you will create a Bookmark or Favorites setting in your browser. You will also see in later sections that the BalerAdmin program has a comprehensive means of storing the correct address and port information for all means of contacting Balers, so that whether the web page links in the Q330's web page point to your desired path is in practice not too important.

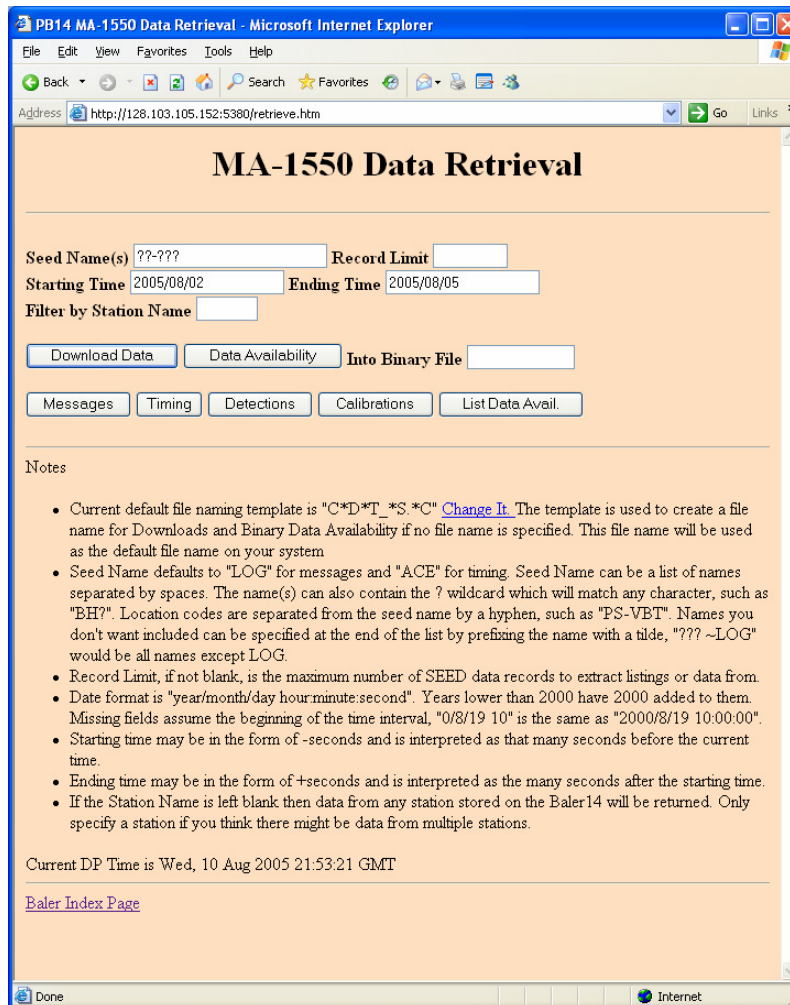
For this walk-through, we'll use the Baler's direct access address. You'll see in following sections that this does very substantially affect the transfer rate, as one would expect.



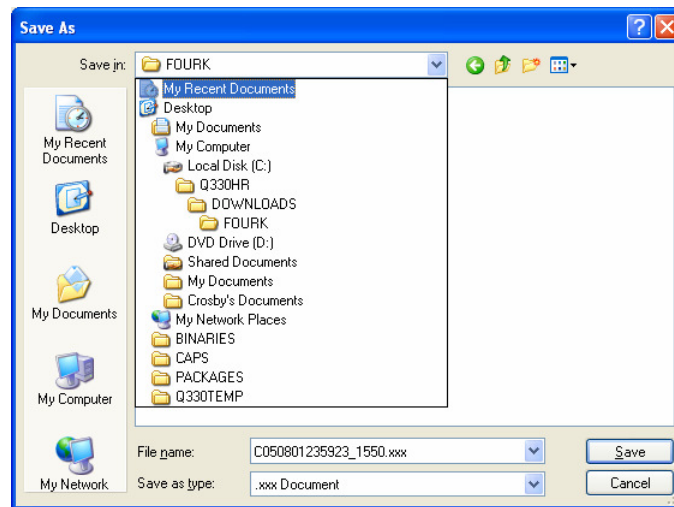
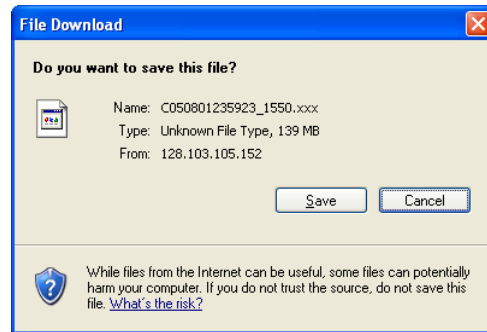
You may click on the Baler Information link in the Baler's home page to check on the Baler software version and status.



Return to the Baler’s home page, and click on the Data Retrieval page. Enter the desired MSEED channels, in this case all possible channels are selected with the all possible location codes using ??-???, and a date/time range. The Baler’s own page provides help on the form of data to be entered here. Click “Download Data”, and the Baler will come back within 10-20s with a download box.



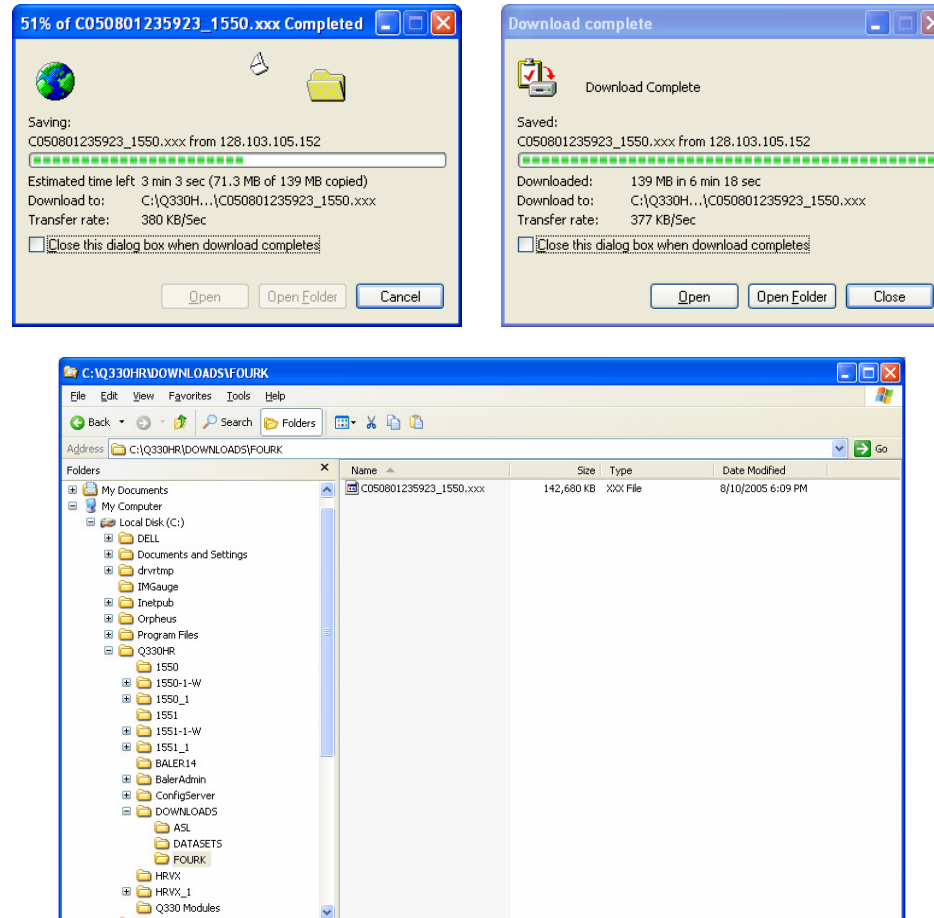
When prompted to save the file, drill down to the C:\Q330HR\DOWNLOADS\FOURK directory created during the Cimarron installation.



And Click Save.

Note that in some browsers, like FireFox, the location for downloads is set when configuring the browser settings. You should configure the browser appropriately to save downloaded files into the Q330HR\DOWNLOADS\FOURK directory to be compatible with Cimarron's default download Library.

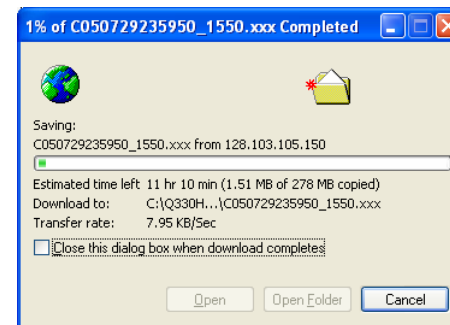
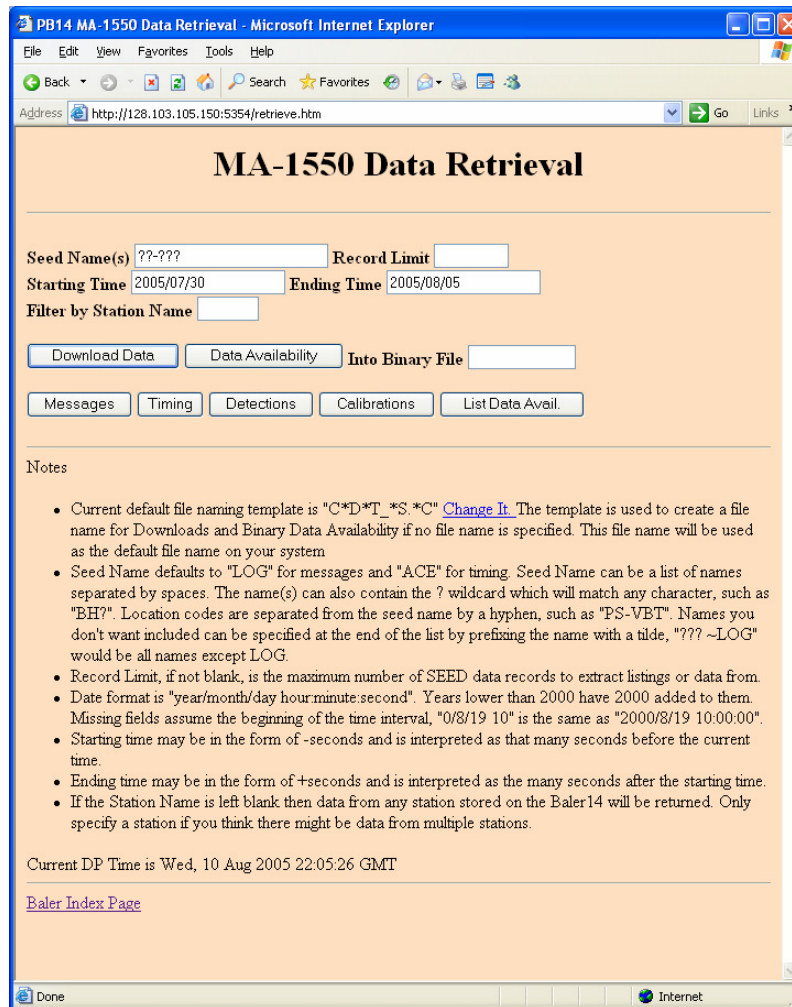
The download will begin, typically at the rates shown below, and proceed to completion.



Select Close

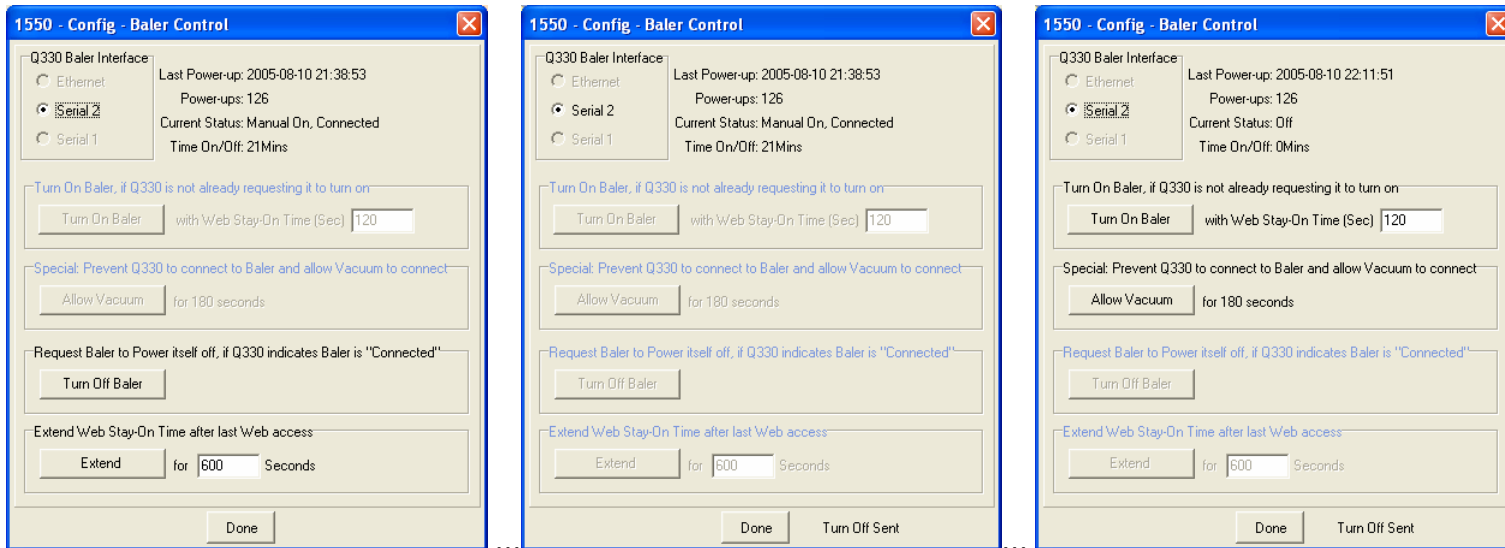
In this example, we downloaded 139Mb representing 3 days of continuous 6-channel data sampled at 100, 40, and 1sps, or somewhat over 40Mb/day. This is consistent with typical MSHEAR data volumes for equivalent sample rates. The MSEED file can be seen in the DOWNLOADS\FOURK directory.

As an aside, what would happen if we download data through the NAPT routed connection to the Baler through the Q330's serial interface? If a similar download is repeated by clicking on the link in the Q330 web page to the Baler, we'll be directed to TCP port 5354 on the Q330 IP address, and a typical transfer rate around 8kbyte/s is achieved because data are relayed from the Baler through the Q330 using the serial interface. Quite a difference!



When you're done retrieving data, no special action is required. The Baler will turn itself off 5 minutes after the last data access. For reference, if you want to

explicitly turn off the Baler, there is no web page command to do that. You must register with the Q330 using Willard, and send the “Turn Off Baler” command from Willard’s Baler Control menu. This is not normally ever needed. You can see the progression as the command is entered, and the Baler reported as “Off” within 10-20s after issuing the command.



The primary function of the recording and data access system is now fulfilled, i.e. to deliver MSEED files. As a convenience to improve engineering and station maintenance, it is also possible to review the retrieved data directly on a PC using Cimarron. We’ll also see in subsequent sections how Cimarron can be used to peek into the near real time data stream using the Weblink protocol without having to do an explicit extraction.

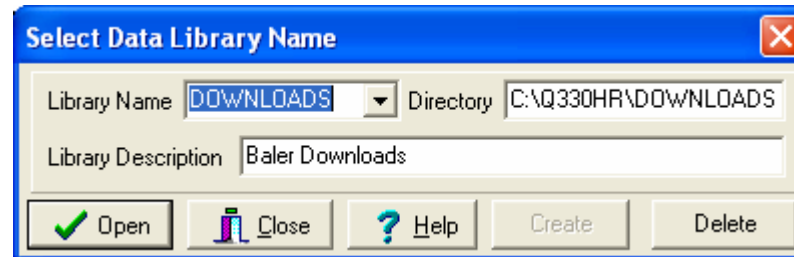
Now, let’s proceed to display the retrieved data using Cimarron.

Displaying MSEED files using Cimarron

Cimarron handles display of MSEED files using a three-step procedure. In step one, one or more MSEED files pertaining to a specific MSEED station code are scanned to create an “index”, essentially a table for Cimarron’s use telling the program at what point in the file data a specific channel and time period may be found. This index is called a “dataset”. Once a file is indexed, it need not be indexed again. The “dataset” files, i.e. the index files, are retained in the DOWNLOADS\DATASETS Cimarron library directory. In step two, one or more “datasets” may be selected to be displayed together onscreen simultaneously. For example, you may first index data from several different stations, and then select the datasets generated to display all stations simultaneously. In the third step, using the dataset combination you’ve selected, Cimarron presents a detailed list of the station/channel/time period for each data stream found in the selected datasets, allowing you to choose which to plot. Let’s show an example.

For this example, we’ll look at a file C20050801000000_1550 saved in DOWNLOADS\FOURK.

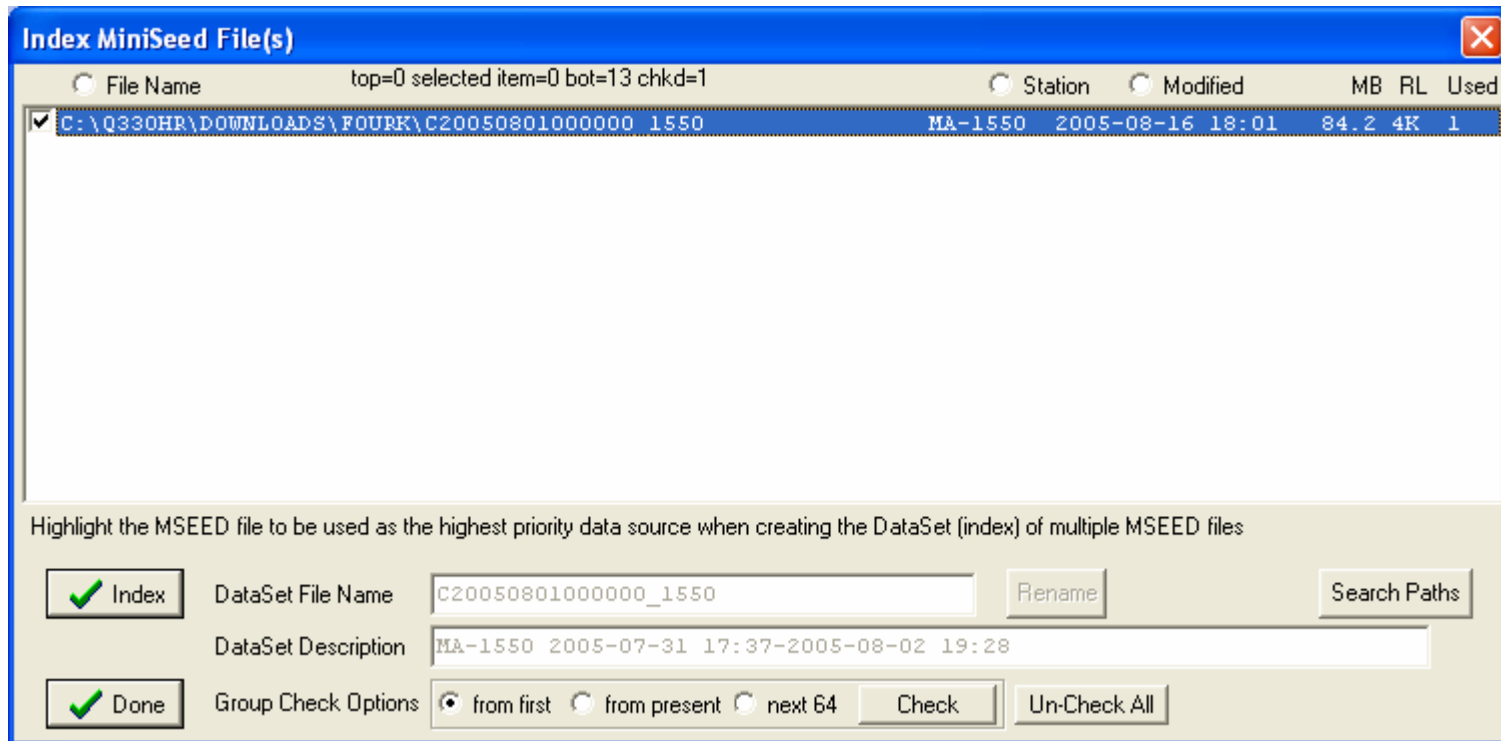
Start Cimarron, pull down the DOWNLOADS Library and Open it.



Select FileIndex MiniSeed Files. Check the file you’ve just downloaded and select Index

Note that if you want to plot a file which you have already previously indexed, the “index” step need not be done again on that file, and you can proceed directly to “Select Dataset”. We’ll show that procedure in a later section.

For now, we’ll cover the indexing operation.



Check the file you've just downloaded and select Index.

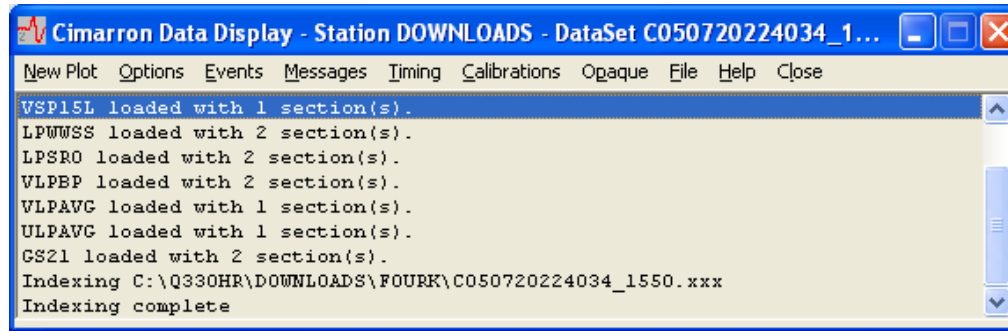
More than one MSEED file can be included in a data set, allowing, say, building complete contiguous records where data may have been recovered in multiple extractions or from multiple sources. Data from any sample rates may be simultaneously displayed. Only data from a single station may be Indexed into a single DataSet. File names may be sorted by name, station code, or creation date to simplify selecting from a large list. You may also add multiple directories to the list of "search paths" where Cimarron will look for MSEED files. By default, DOWNLOADS\FOURK is used. Note that if you want to simultaneously display data from multiple stations, multiple Datasets may be selected. We'll see an example of that later.

For this example, the MSEED file will be quickly scanned for time span and a confirming box will be shown

After you've Indexed the file, the data entry boxes will gray.

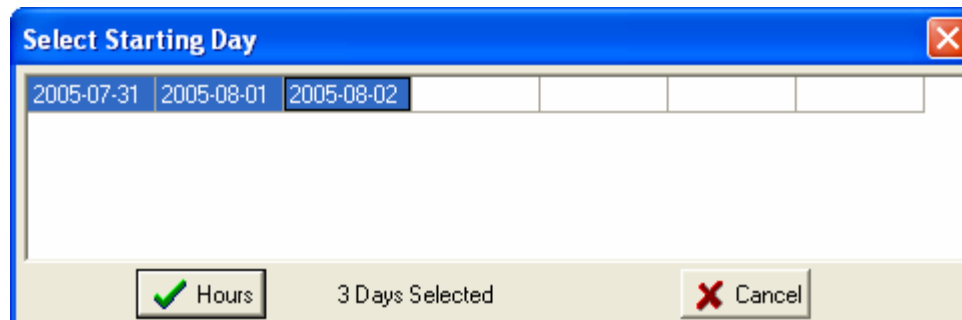
Select Done. The data have been scanned and indexed, ready to plot. Next time you want to plot this data, the index already exists, and you need only "File>Select DataSet" to display it.

Select New Plot



...and a map of available days will be presented.

Days are selected either by clicking on the starting day and dragging to select additional days, or by simultaneously pressing the CTRL key while left clicking to add additional days to your selection. The days highlighted in BLUE will be selected for plotting.



After selecting the Days you want to plot, press the Hours button...

Note that as the availability grid moves toward data acquired at lower sample rates, the grid appears with some hours missing. This is because individual MSEED records at low sample rates in general contain more than 1 hour of data. The grid map shows the hours in which MSEED records begin. Such a sparse appearance does not necessarily indicate missing data. Selection for plotting will incorporate all available data, we we'll see in a few pages...

Select Hour(s) and Stream(s)

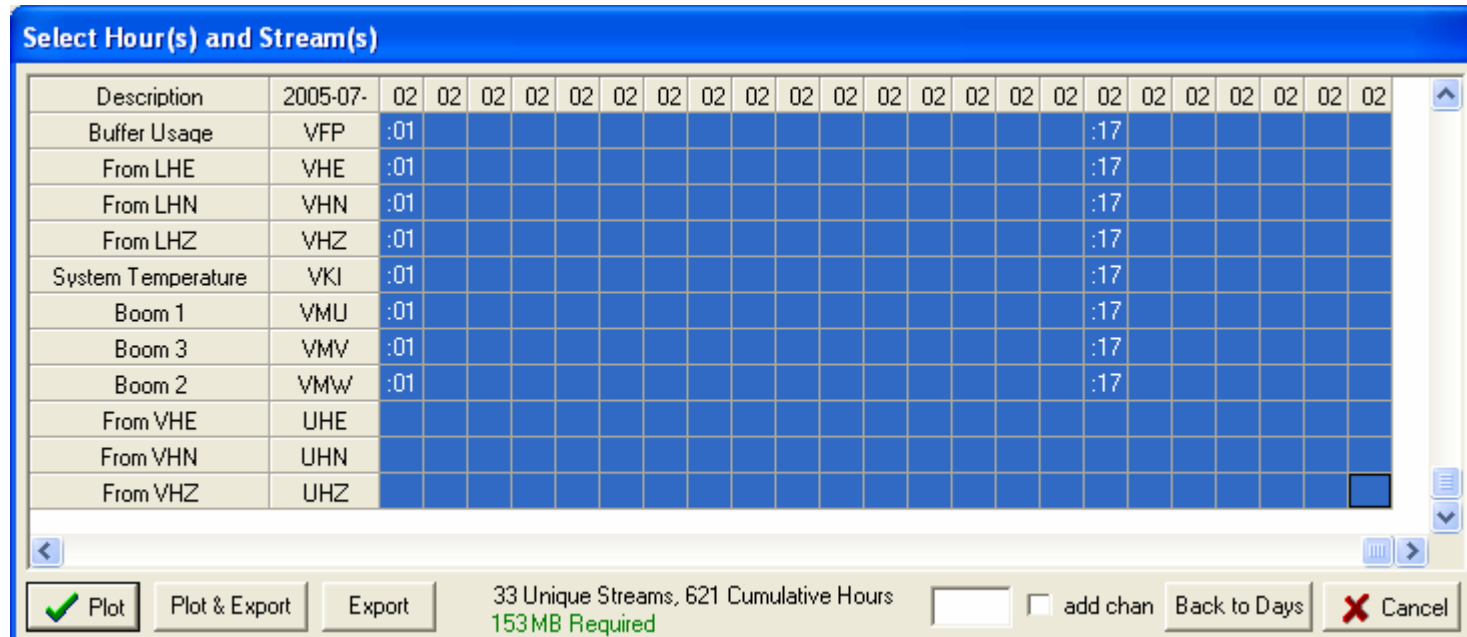
Description	2005-07-	31	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01		
Channel 4 40Hz	BLZ	:23	:00	:01	:02	:03	:04	:05	:06	:07	:08	:09	:10	:11	:12	:13	:14	:15	:16	:17	:18	:19	:20	:21	:22
AuxAD 1	AX0	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
AuxAD 2	AX1	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
AuxAD 3	AX2	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
AuxAD 4	AX3	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
Clock Phase	LCE	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
Clock Quality	LCQ	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
Channel 3 1Hz	LHE	:23		:01		:03	:04		:06		:08		:10		:12	:13		:15		:17		:19		:21	:22
Channel 2 1Hz	LHN	:23		:01		:03	:04		:06		:08		:10		:12	:13		:15		:17		:19		:21	:22
Channel 1 1Hz	LHZ		:00		:02		:04		:06	:07		:09		:11		:13		:15	:16		:18		:20		:22
Channel 6 1Hz	LLE	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	
Channel 5 1Hz	LIN	:23		:01		:03		:05	:06		:08		:10		:12		:14	:15		:17		:19		:21	

0 Unique Streams, 0 Cumulative Hours
 0 MB Required

Plot
 Plot & Export
 Export
 add chan
 Back to Days

Scroll further through the channel list, as shown on the next page...

Now in our first plotting example, we're going to select all available data. Do so by returning the channel scrollbar to the top. Select the top left-most hour, and hold the left mouse key down while dragging and sweeping to the right and down. The entire availability grid will be selected in this way, as shown below. Alternatively, select the 'Description' or 'Year-Month' box to select everything.



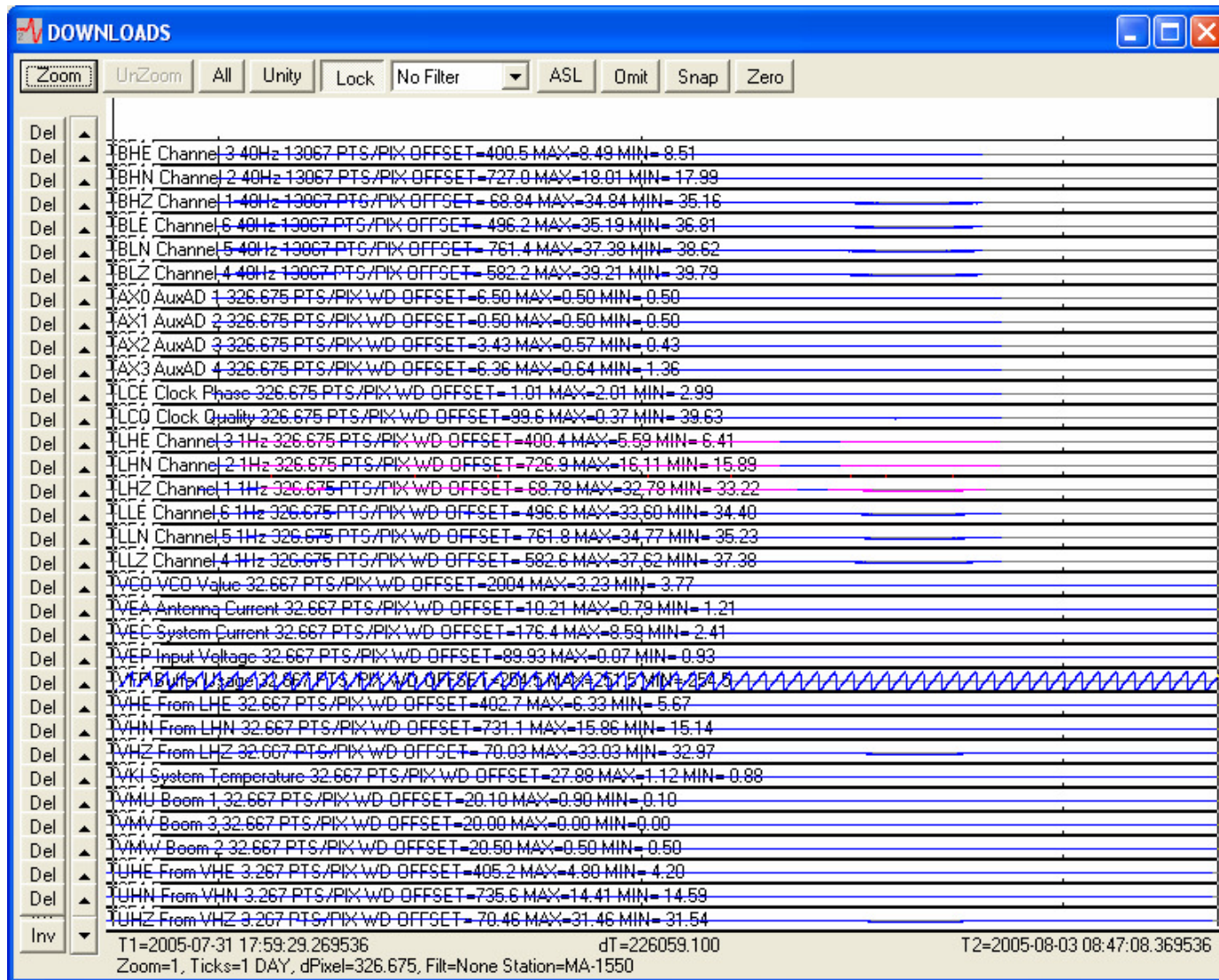
If you don't want all the channels, individual non-contiguous hour selections may be built by holding down CTRL while left-clicking. When you move the cursor to a new grid cell and left click, the selection is cleared if you do not hold down the CTRL key.

When desired hours are highlighted, press Plot. In the example here, we will see all available channels.

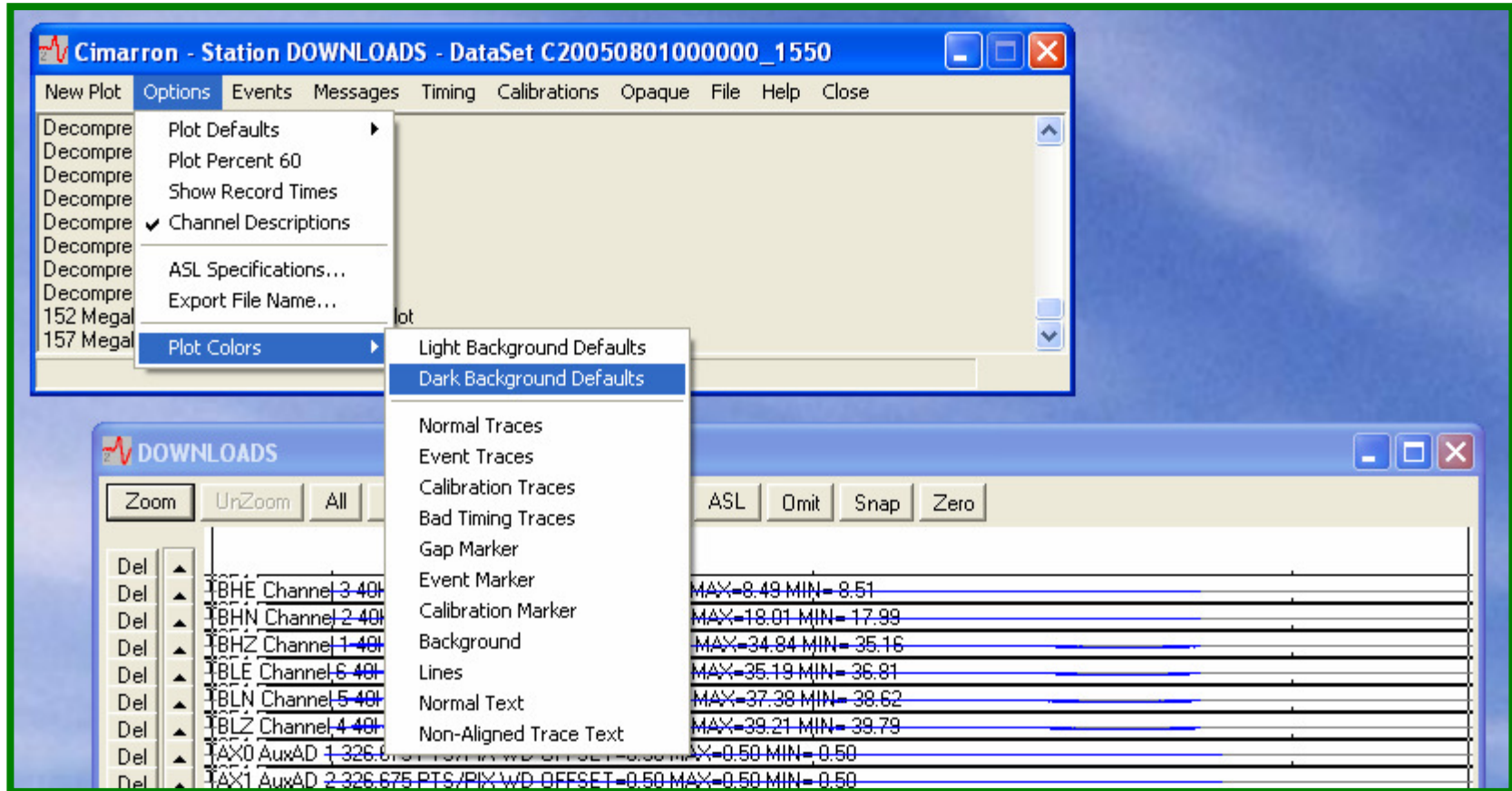
Note that selected MSEED records may be exported to a file using the "Export" button at this point.

Review the Cimarron Help file and experiment with the various plot tools. The scales may be locked or autoscaled, and individual traces may be flipped, scaled, or deleted from the plot. Filters in the IIR filter file may be applied. We'll return later with another example.

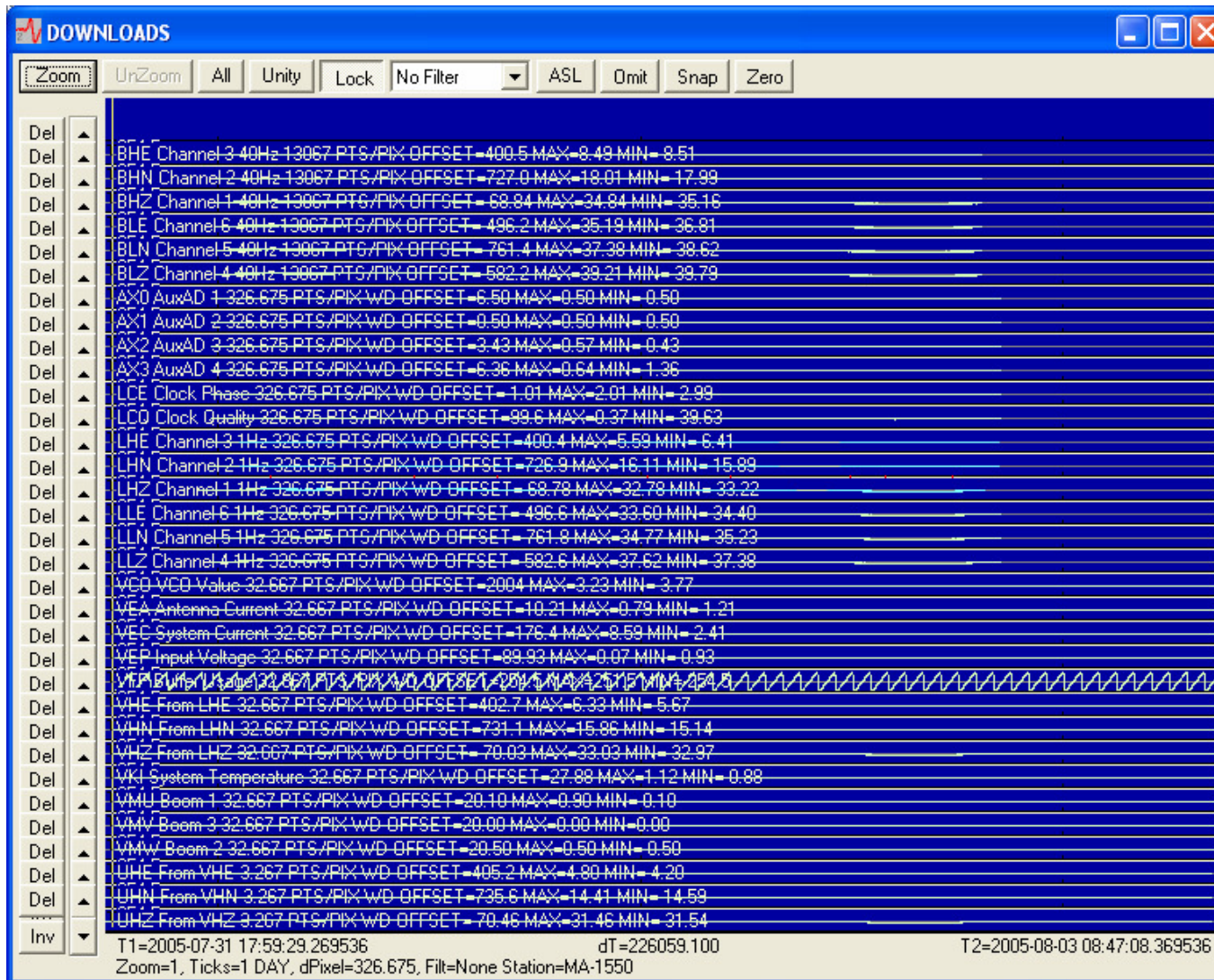
The first time you plot after installing, the default presentation values will be used – a “light” background and locked scale.



You can set the default plot options to a more eye-pleasing format, such as “dark background”.



Same plot with “dark background”. You may set colors for each feature as you desire.



Retrieving Data from one or more Remote Balers using BalerAdmin

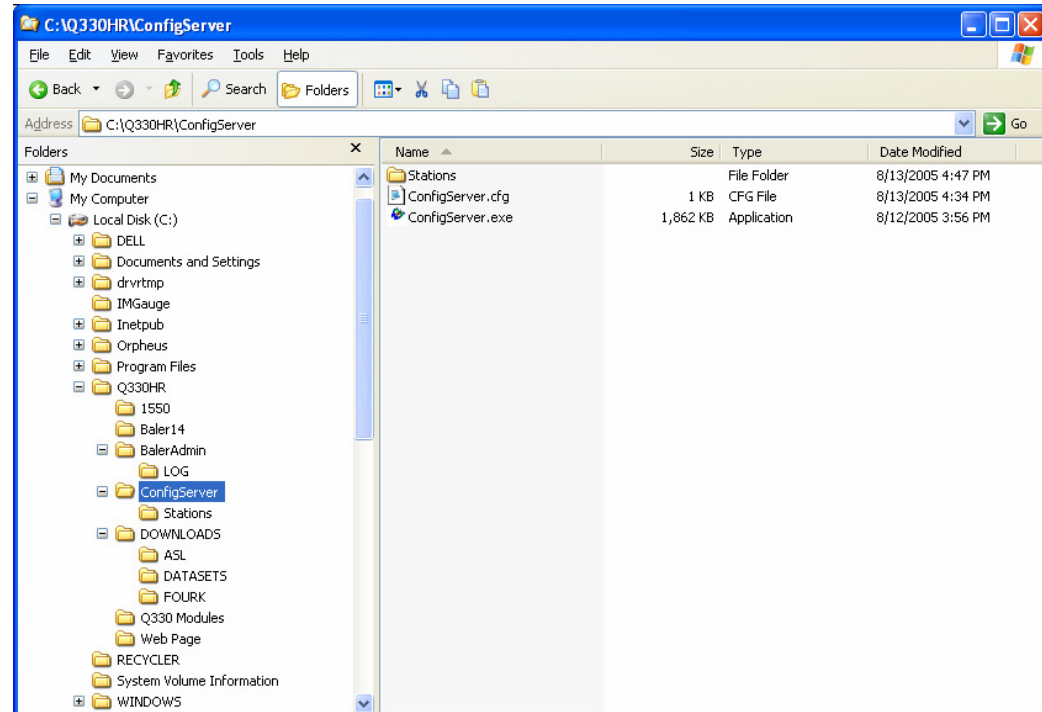
The basic steps of operating a Q330HR and Baler, and retrieving and displaying MSEED data have been covered. Operationally, of course, one frequently deals with many field stations. In the case of retrieving Baler data, one might frequently want to recover segments of data from multiple stations. Maintenance checks may also deal with numerous individual units. You'll note, therefore, that one of the main tasks in accessing numerous systems is maintaining an accurate, current record of the separate pieces of information required to contact remote equipment, including IP address and port numbers, electronic serial numbers, and station names. In addition, the addresses used to contact particular units may differ depending on which side of a firewall access is initiated.

Central Configuration Management – ConfigServer

To “address” the concern for effective management of contact information, we are introducing a centralized, web-based “configuration server” that maintains and serves a contact, i.e. addresses...etc, database to cooperating applications. We will migrate future versions of tools such as Willard to be able to use this information. At present, only the BalerAdmin application utilizes the centralized database. We'll now set up a basic ConfigServer database for BalerAdmin's use.

What's a centralized database good for?

- Minimizes redundant, error prone and tedious reentry of contact information
- Web based and distributed, so applications can access a ConfigServer from any internet-accessible location to obtain a fresh copy of configuration information
- May be updated dynamically to handle dynamic IP addresses using the Q330's “Point of Contact” messaging facility
- Provides “realm-aware” addressing information to handle differing public vs. private addresses where firewalls and address translation are used.
- Uses a very simple stateless XML database, easily interpreted.
- Multi-platform (Win32, Linux, Unix, and Mac).



Starting ConfigServer

Drill to the Q330HR\ConfigServer directory. Locate the file Configserver.cfg (yes, even the ConfigServer has to have a configuration...). Since the ConfigServer is designed to provide information to a client contacting it from other computers besides the one it runs on, the ConfigServer needs to listen on the PC's primary network interface. At installation time, therefore, use a plain text editor to set the "ConfigServer.IPAddress =" Line to the Ethernet address of your PC. At the time of shipment, the IP address will be set to the IP loopback address, 127.0.0.1, which prevents access to ConfigServer from any other computer.

Configserver.cfg

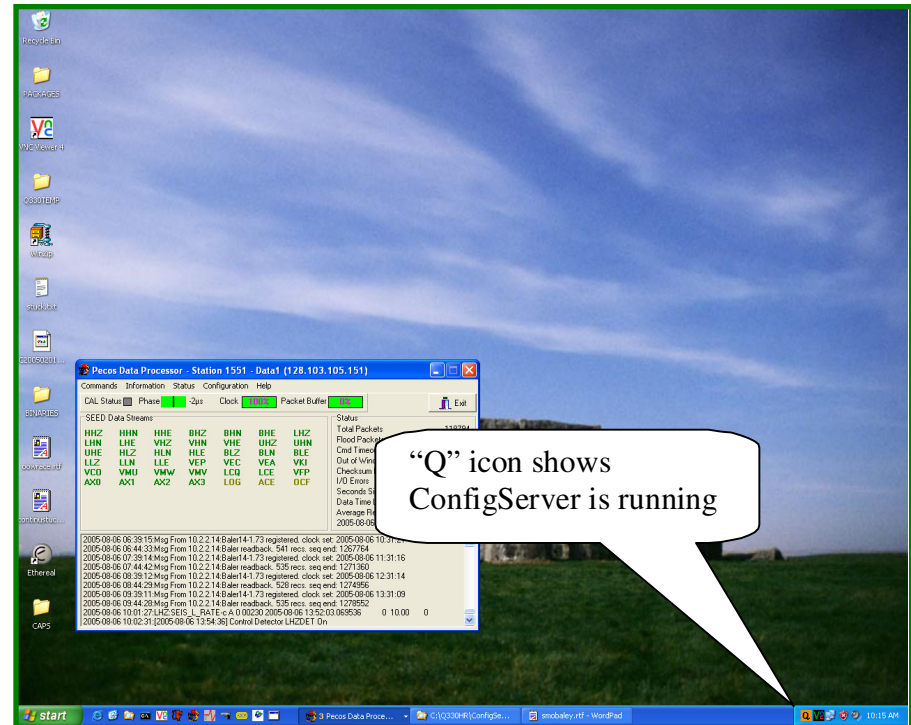
```
ConfigServer.StationDefinitionDirectory = Stations
ConfigServer.Client.User = user:password
ConfigServer.Client.Secure = 0
ConfigServer.IPAddress = 127.0.0.1
ConfigServer.Port = 8133
ConfigServer.Editor.Secure = 0
ConfigServer.Editor.User = user:password
```

change this to your computer's Ethernet IP

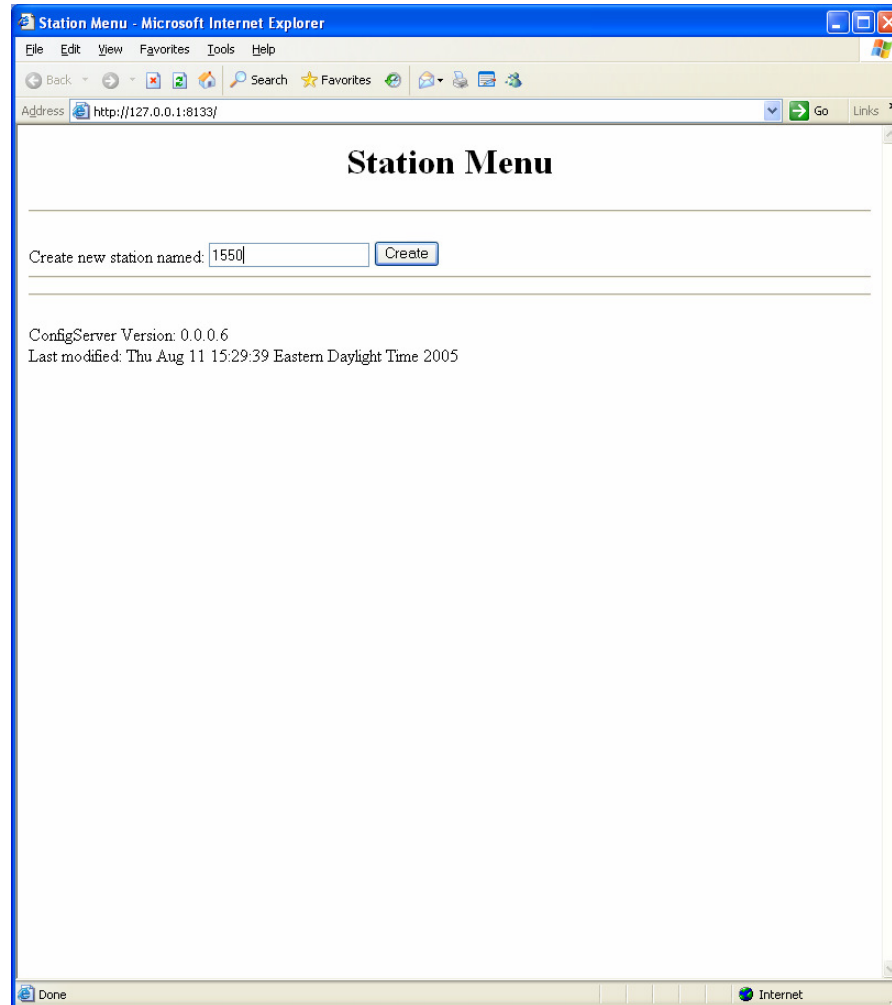
ConfigServer's operation is simple. We'll step through building a database for one Q330HR. When we're finished, ConfigServer will have built an XML file containing all the vital information for contacting this Q330HR, and its Baler.

After you've edited the IP address in ConfigServer.cfg, run the ConfigServer.exe application. You'll see a "Q" icon appear in your system tray, (see the lower right corner of this screen shot) indicating Configserver is running.

You can stop ConfigServer by double-clicking the icon, and you will be asked if you want to stop it. There is no problem to leave it running.



Point your browser to your computer's IP address:8133. In the example below, we left the ConfigServer.cfg file address set at the "IP loopback" address 127.0.0.1. A browse to ConfigServer's web page enters a data entry mode. Type in the name of your Q330 station, or its tag ID, as an identifier. In a fresh installation, there will be no other existing stations. Press Create.



A new station database entry will be created. The information will appear initially as below.

Station Editor

[\[Menu\]](#)

Station created

```

<Station>
  <Q330>\[Add Realm\]
    <SerialNumber>0100000000000000</SerialNumber>
    <TagID>0000</TagID>
    <BasePort>5330</BasePort>
    <Ethernet>\[Add Realm\]
      <IP Address>10.172.53.4</IP Address>
      <WebPort>5380</WebPort>
    </Ethernet>
  </Q330>
  <DP4>\[Add Realm\]
    <BasePort>5331</BasePort>
    <Type>Baler14</Type>
    <StationID>1550</StationID>
    <IP Address>192.168.4.4</IP Address>
    <WebPort>80</WebPort>
  </DP4>
</Station>

```

Some notes on Realms:

Realms were created to help with the situation where some of the information required for communication (IP, Ports etc...) would depend on the location of a computer wishing to communicate with that station. This would generally be a result of NAT/Firewalls but could be for other reasons as well.

A client may specify which realm it would like to use. If none is specified, the server will check the RealmPort items to see if

Fill in the actual information including S/N, the Q330's TAGID, and actual IP addresses and port numbers for your Q330 and Baler. Press Save. You can make changes and Save any time. When done, click on the [Menu] link to browse back to the station menu.

Station Editor - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Go Links

Address http://127.0.0.1:8133/editor/edit/1550

Station Editor

[\[Menu\]](#)

```
<Station>
<Q330>\[Add Realm\]
  <SerialNumber>0100000B69BA17D3</SerialNumber>
  <BasePort>5330</BasePort>
  <Ethernet>\[Add Realm\]
    <IPAddress>128.103.105.150</IPAddress>
    <WebPort>80</WebPort>
  </Ethernet>
</Q330>
<DP4>\[Add Realm\]
  <BasePort>5331</BasePort>
  <Type>Baler14</Type>
  <StationID>1550</StationID>
  <IPAddress>128.103.105.152</IPAddress>
  <WebPort>5380</WebPort>
</DP4>
<TagID>1550</TagID>
</Station>
```

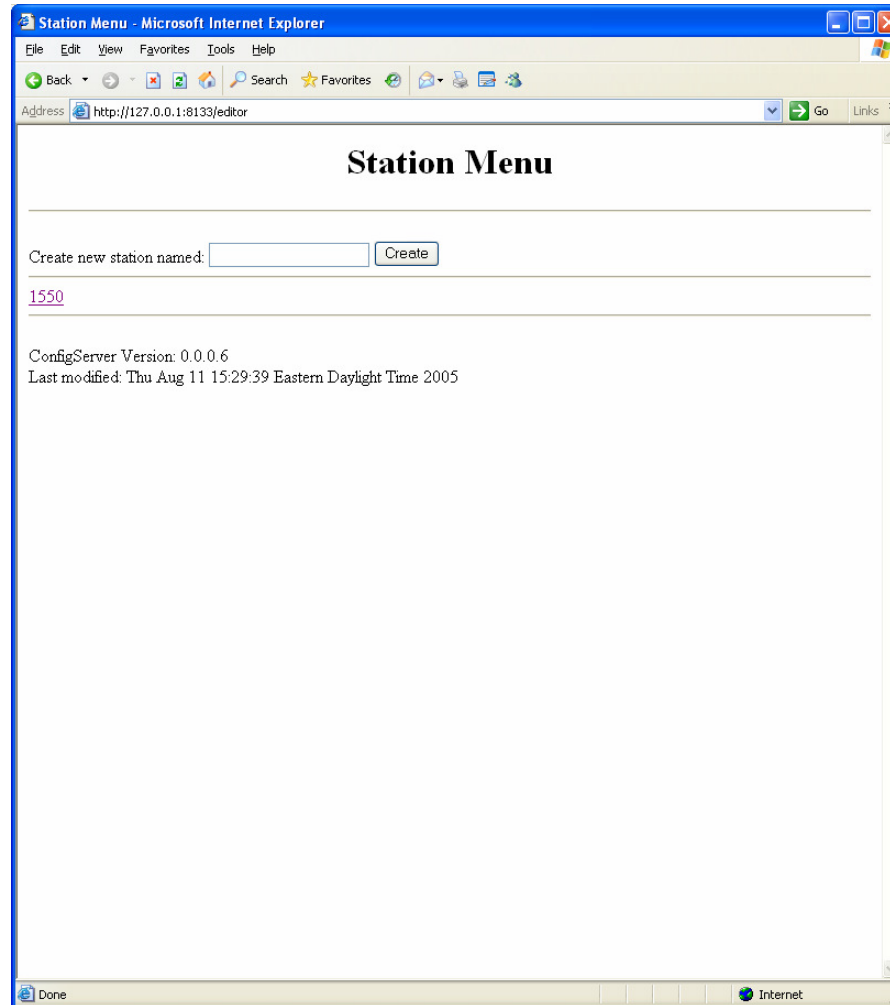
Some notes on Realms:

Realms were created to help with the situation where some of the information required for communication (IP, Ports etc...) would depend on the location of a computer wishing to communicate with that station. This would generally be a result of NAT/Firewalls but could be for other reasons as well.

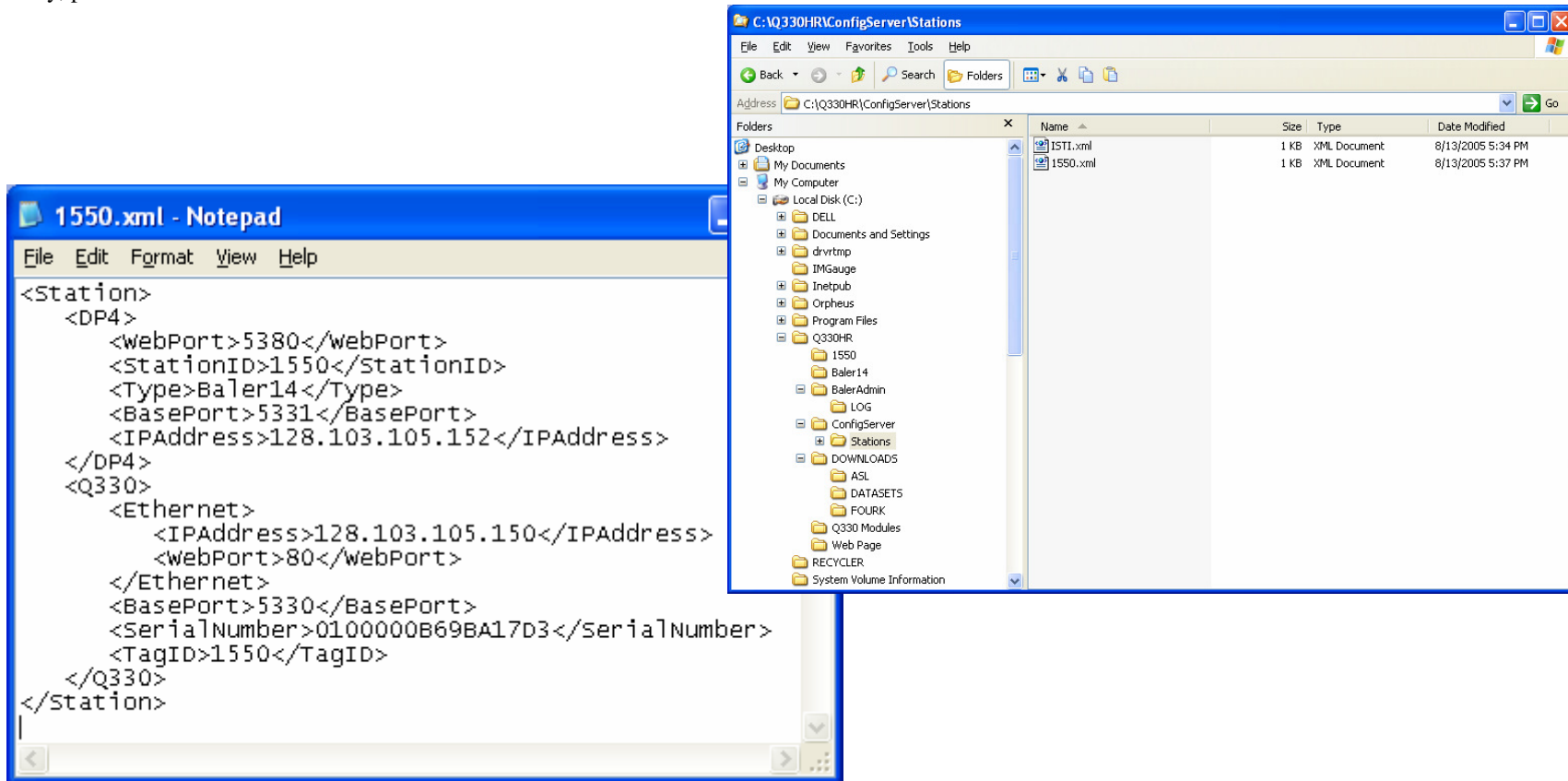
A client may specify which realm it would like to use. If none is specified, the server will check the RealmRange items to see if the client's IP falls in one of the ranges. If it does, that Realm will be used. If no specific realm was requested, and an appropriate realm can't be determined, a realm named RealmDefault will be used if it exists. Failing all three, the configuration

Done Internet

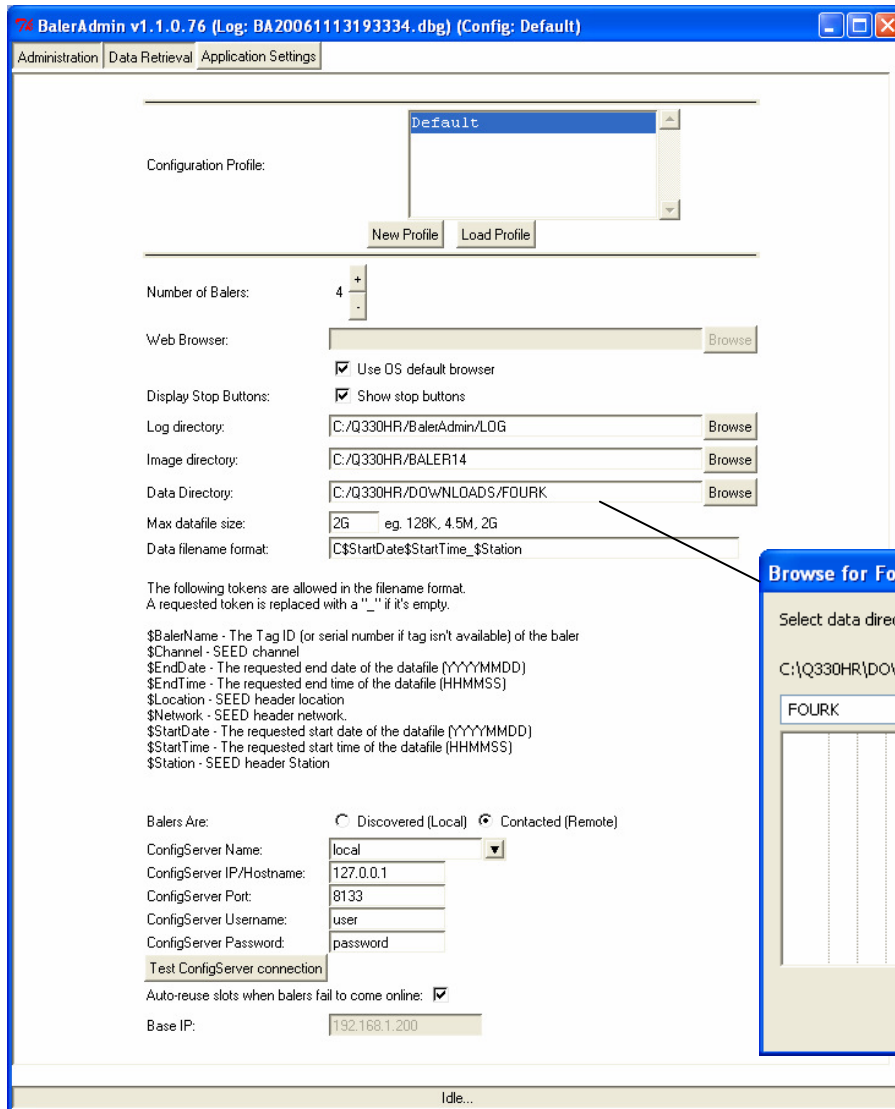
You'll see the new station created. This process can be repeated for any Q330/Baler pairs that you want to add to your ConfigServer database. To emphasize again, the purpose is not to make *more* places to enter data, but *fewer*. Eventually, all net-connected applications will have access to this centralized configuration information on a server of your choice.



You'll see that a file is created in the ConfigServer\Stations directory for each Q330/Baler pair, with a name we assign. By convention, the station name would typically be used. In this case, the file "1550.xml" is built in the Stations directory. Don't by the way confuse this file with the XML file in which Willard saves the Q330's configuration! Double check your address and port information, since BalerAdmin can't do much with incorrect contact information. When you're ready, proceed.



Using Baler Admin to collect data from “Remote” Balers



What is a remote Baler? One to which BalerAdmin does not need to assign an IP address. This may mean that it is connected to a Q330 which assigns its IP address, or it may mean that the baler is already online and has an IP address assigned. A “remote” baler may be in your office, or halfway around the world. To contact a remote Baler, we can now use the ConfigServer database that tells the BalerAdmin application exactly how to do it. No browser needed.

The first time we run BalerAdmin with remote balers, we need to set, in the Application Settings form, the directory into which to download data. Set this to DOWNLOADS\FOURK as shown. Note that in this example, set the number of Balers to 4. Set “Balers Are” to “Remote”. Create a new ConfigServer profile by typing “Remote” for ConfigServer Name, and changing the ConfigServer's IP. You can test the connection to the ConfigServer by pressing the button labeled “Test ConfigServer Connection”

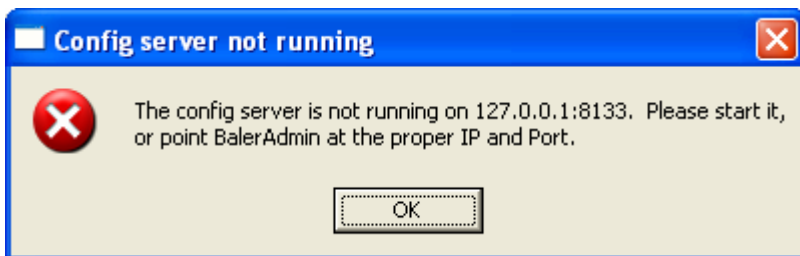
Select the Data Retrieval tab,

Press the Select Stations/Balers button. This should bring up a dialog box to allow you to select the “remote” balers from which you want to retrieve data.

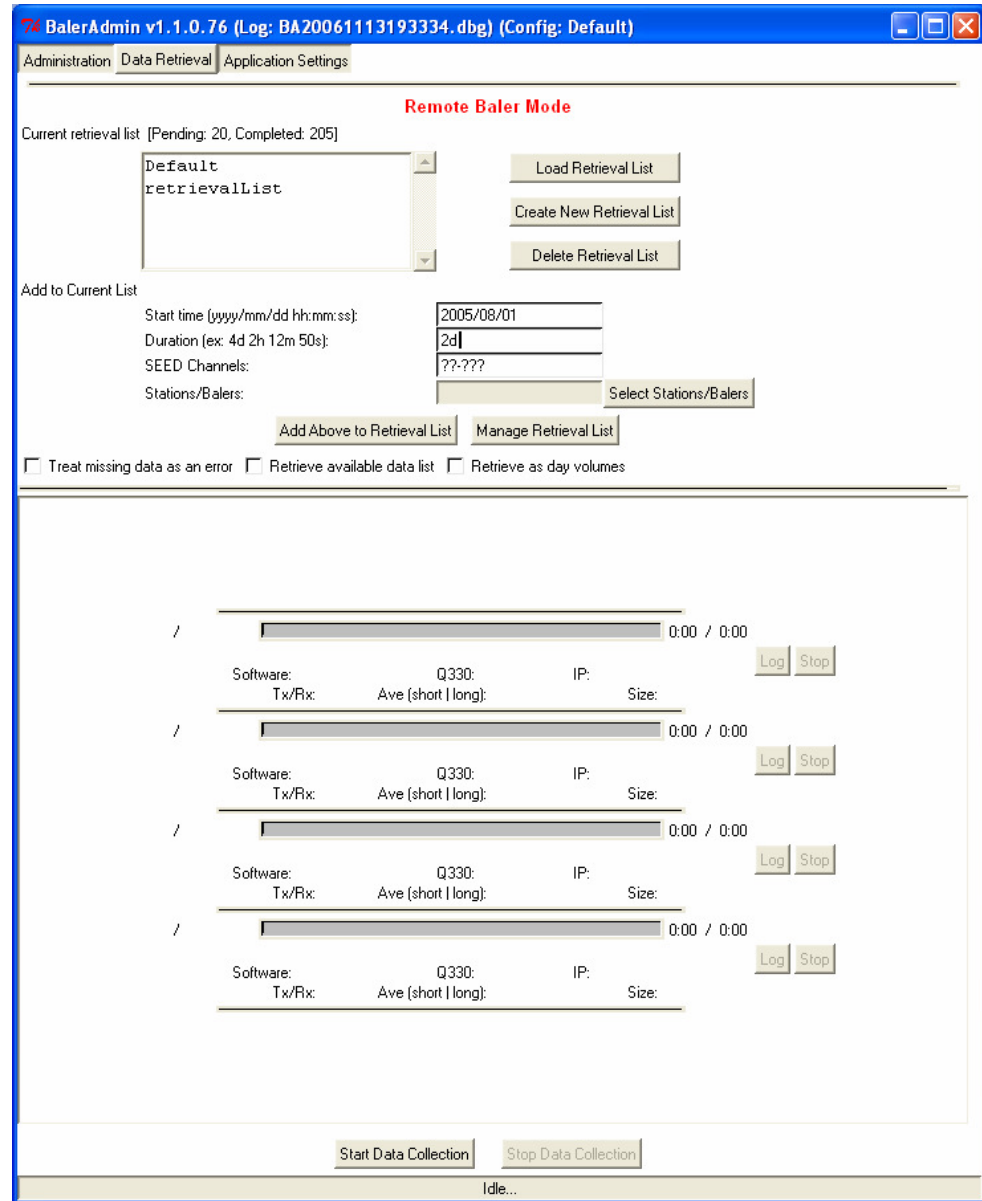
BalerAdmin uses the concept of a “retrieval list”, which comprises a list of balers, channels, and time ranges, to automate collection of a diverse set of data from a group of Balers. To collect a specific time range and channel set of data, you need to either import such a “retrieval list” in a specified format, or you may interactively create one. That’s the procedure we’ll use here.

By creating “retrieval lists”, BalerAdmin is able to catalog operations that have completed, and resume them at a later time if a remote baler is unable to be contacted. Multiple retrieval lists may be saved, and reloaded between sessions using BalerAdmin.

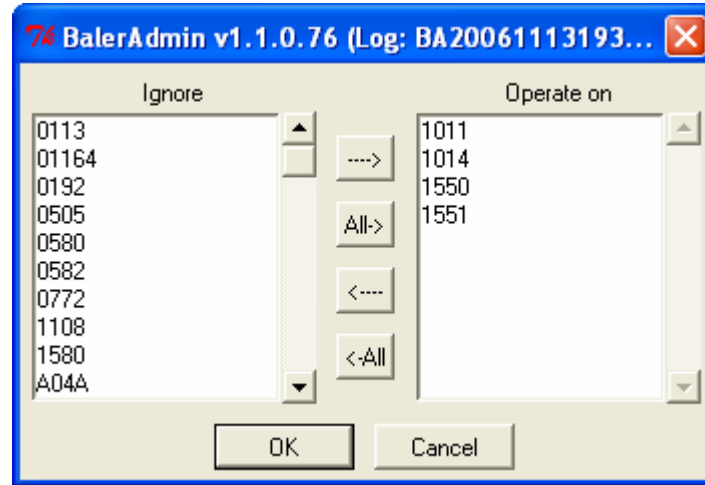
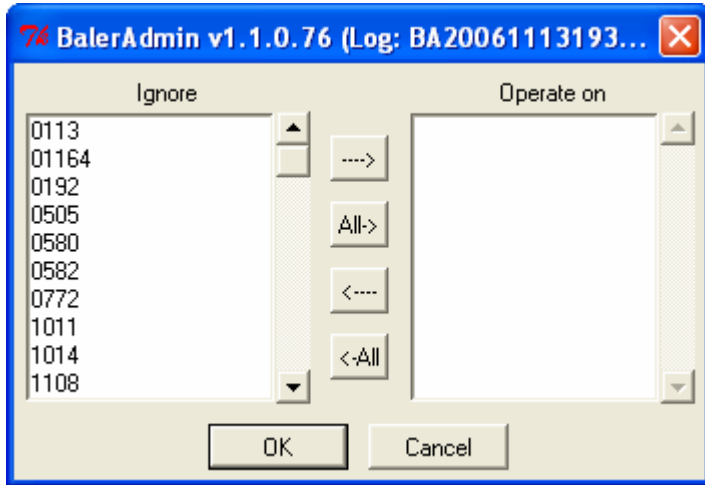
If a message like this is displayed when you try to Select Balers, check your ConfigServer.cfg and that ConfigServer is running on the IP:PORT that BalerAdmin is trying to contact. This is set in BalerAdmin’s Application Settings form.



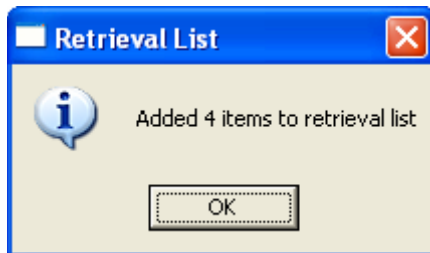
IMPORTANT NOTE: Only Balers that you have entered into your Configserver database will be available from which to choose in “remote baler” mode.



If you have a properly-configured “Configserver” database, when you press the “Select Stations/Balers” button, a form will be presented allowing you to move the Balers you want from the Ignore list to the Operate list, as in the example we completed above for Administration. This time, however, the list contains not Baler TAG numbers, but those station ID’s that you entered into ConfigServer. At the main form, enter the time range and channels to retrieve, and press the “Add Above to Retrieval List” button. Press the “Start Data Collection” button to proceed.



When you have selected all the Balers you want from which data will be retrieved, press OK, and a confirmation of the items added to the retrieval list will appear.



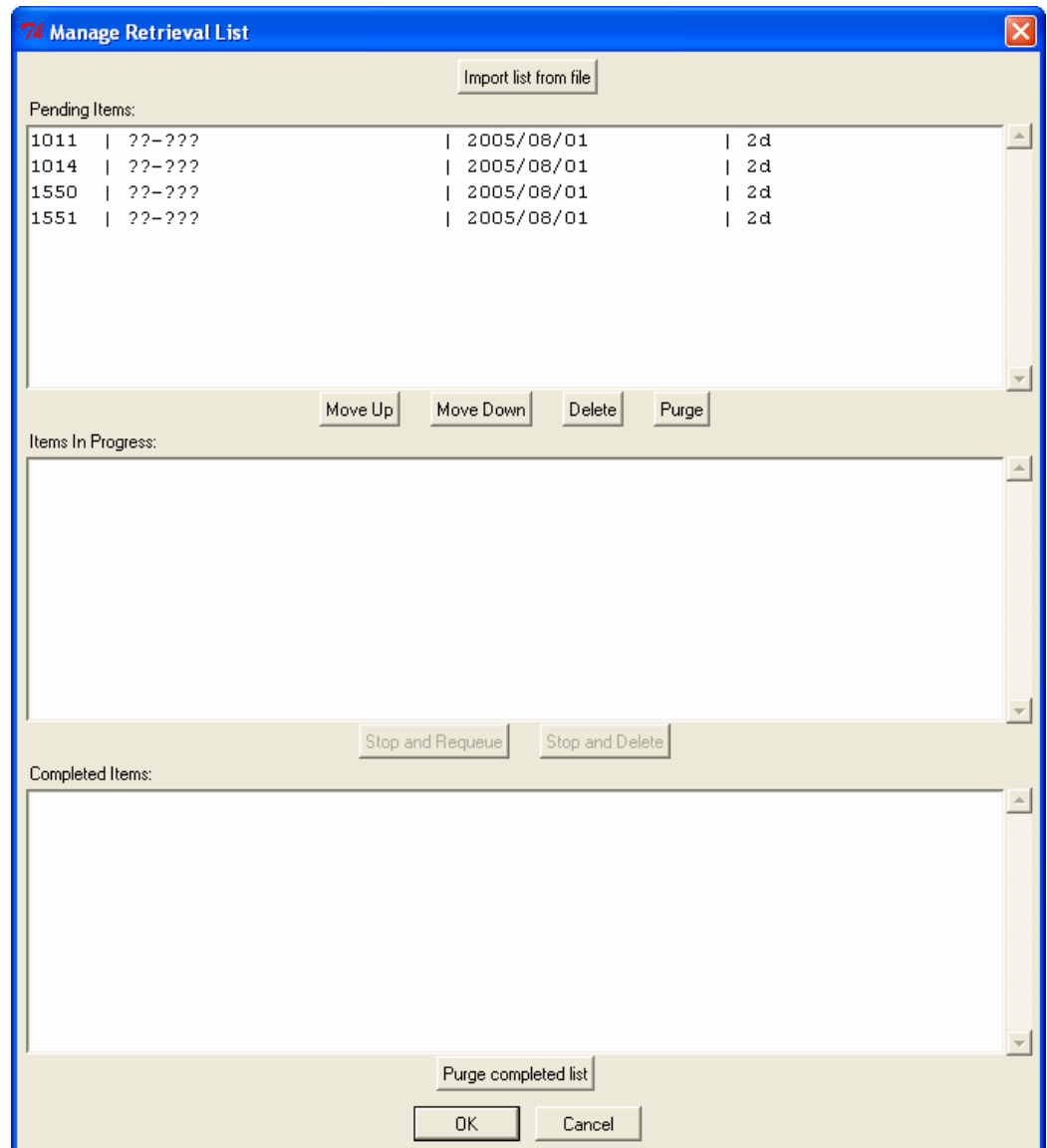
You may select the “Manage Retrieval List” button to see the pending and completed items.

You may remove items while a long retrieval is in process.

When each item is completed, it is moved to the “Completed items” list so that BalerAdmin knows not to re-attempt this item should you stop and restart BalerAdmin.

NOTE: When you begin BalerAdmin agent, having run a retrieval that may have not run to completion, you should check the retrieval list for pending items. BalerAdmin will resume items that were not completed, although you may no longer want these previously pending items. In that case, you should stop the retrieval and delete the items in which you’re no longer interested, or delete the entire retrieval list, and re-enter the items you want.

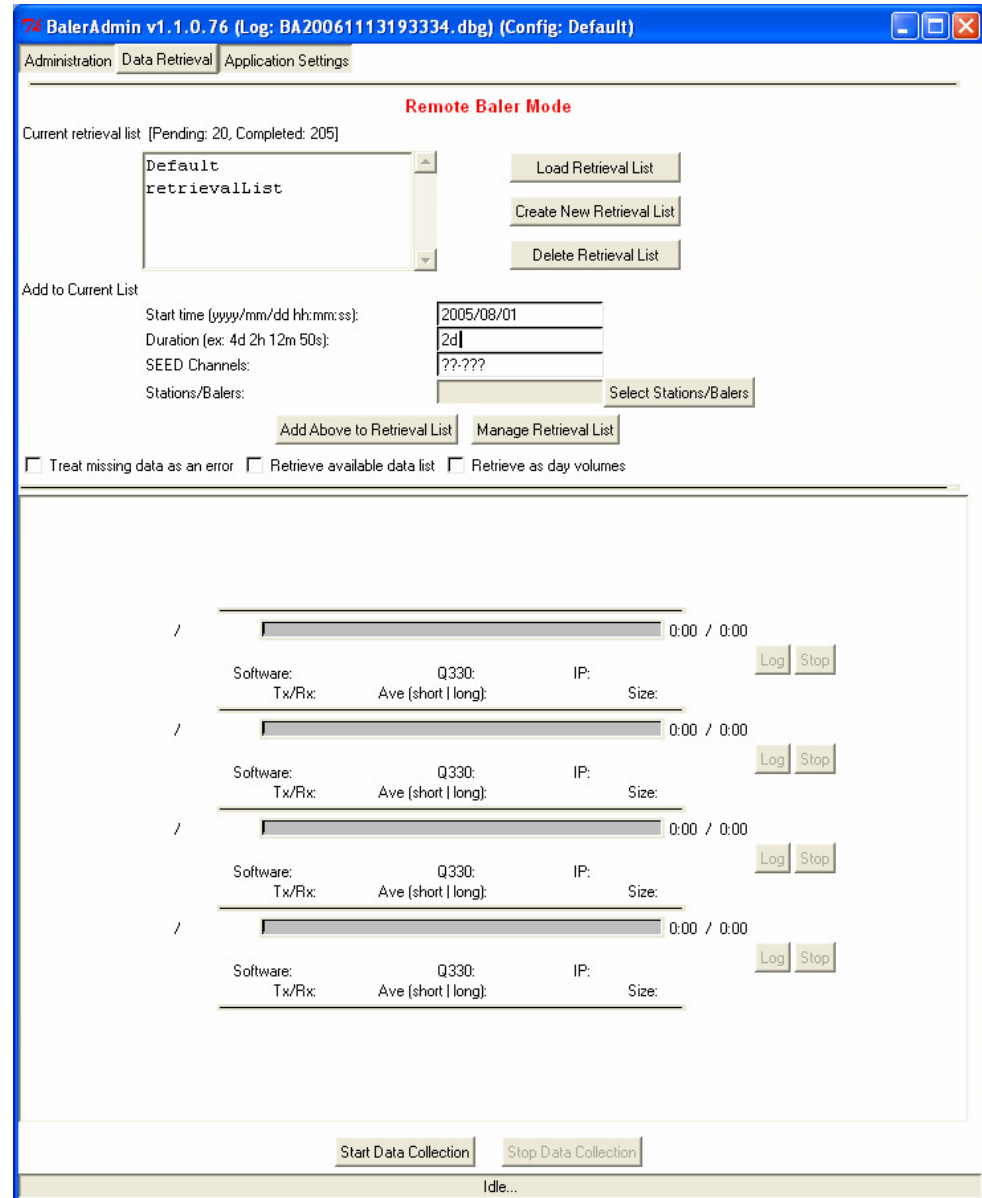
When you are finished inspecting the Retrieval List, press OK.



Now press “Start Data Collection” to begin the automatic process of contacting the Balers and retrieving the data on your requested list.

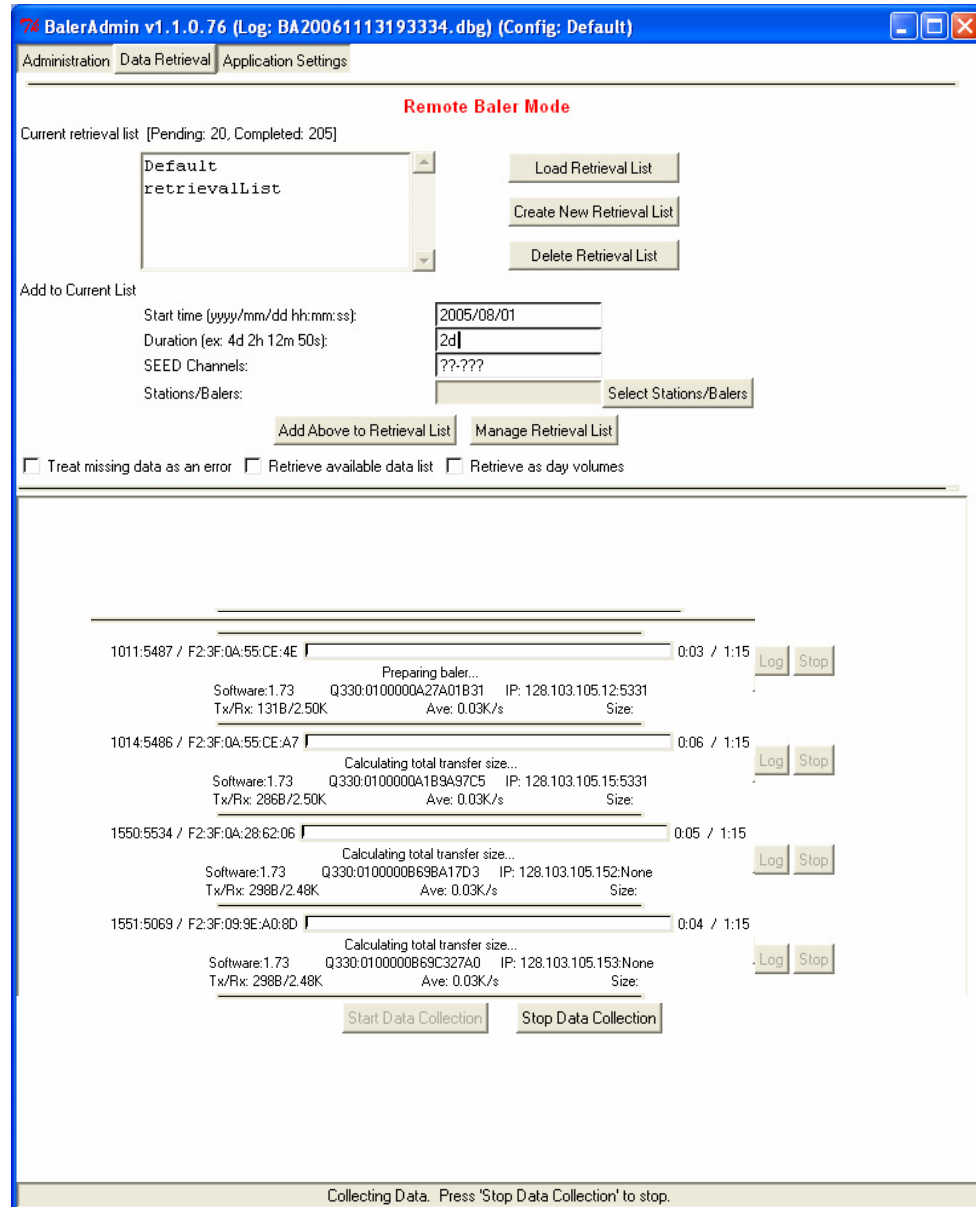
NOTE: BalerAdmin will automatically request the Q330 to which the Baler is attached at a remote station to apply power to the Baler. For this capability to work properly, the prerequisites are:

- 1) The Q330 must be running software version 1.74 or higher
- 2) The Configserver database must contain the correct contact information for the Q330’s IP and web server TCP port and it must contain the proper information for the baler’s IP and web server TCP port. These are two separate addresses. Consult and understand the “IP Resource Planning” section earlier in this document for this information.



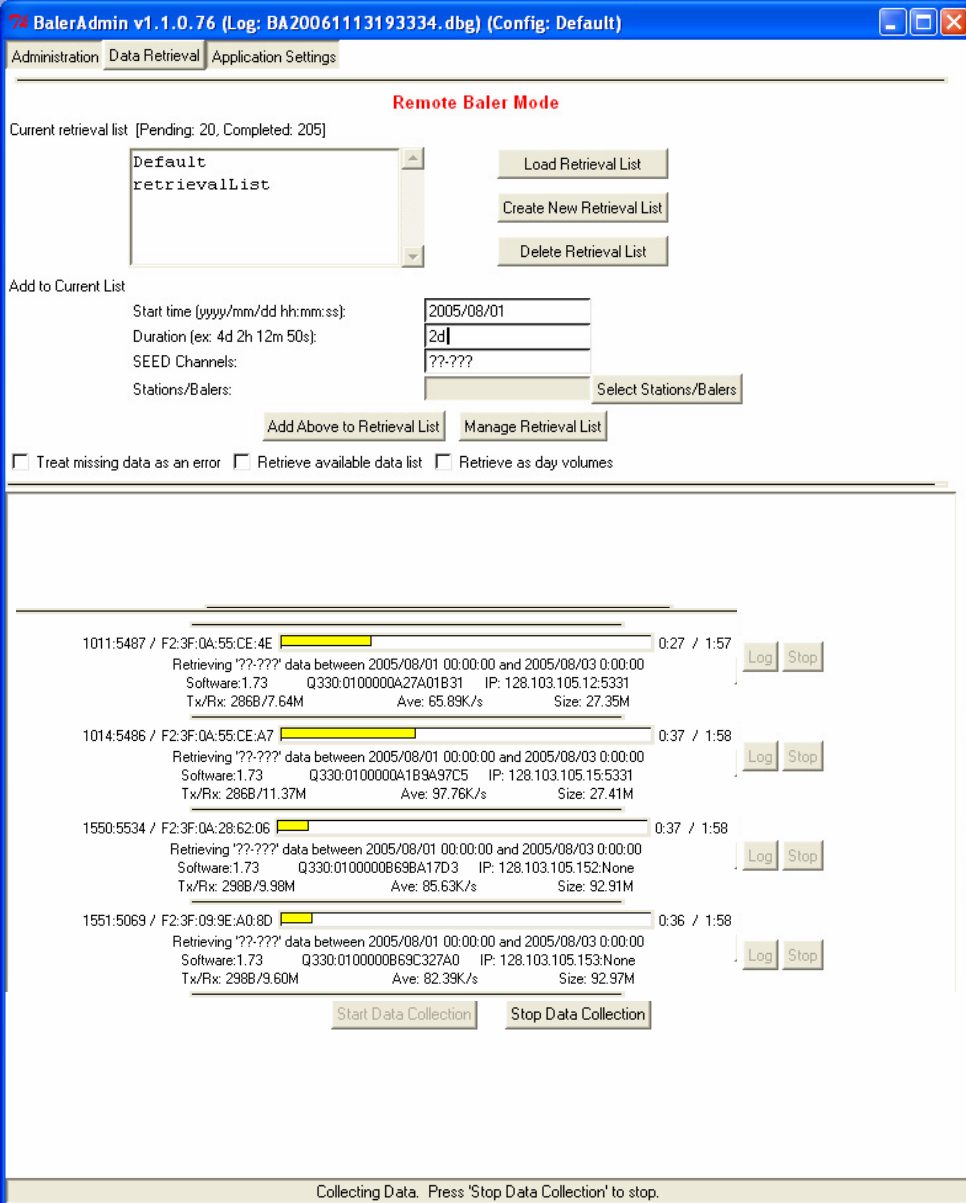
BalerAdmin will now attempt to establish contact with each Baler to test whether it is on, and if not, will instruct its Q330 to turn on the power. BalerAdmin will then connect with the Baler, and begin retrieving the data into the DOWNLOADSFOURK directory.

If BalerAdmin is able to contact the remote Baler, a message will appear after about 1.5 minutes saying “Preparing Baler”. Then a sequence of operations will follow as the retrieval progresses.



The transfer will progress to completion, showing a number of statistics including total bytes expected, total bytes transferred, elapsed time and both short-term and long-term transfer rate. The rate will depend on the nature of the communications link to the Baler.

BalerAdmin will attempt to retry a failed retrieval. If after a number of retries, the station can not be contacted to complete the retrieval, the state of the retrieval will be saved in the Retrieval List and can be restarted at a later time.



BalerAdmin v1.1.0.76 (Log: BA20061113193334.dbg) (Config: Default)

Administration | **Data Retrieval** | Application Settings

Remote Baler Mode

Current retrieval list [Pending: 20, Completed: 205]

Default
retrievalList

Load Retrieval List
Create New Retrieval List
Delete Retrieval List

Add to Current List

Start time (yyyy/mm/dd hh:mm:ss): 2005/08/01
Duration (ex: 4d 2h 12m 50s): 2d
SEED Channels: ??-??
Stations/Balers:

Treat missing data as an error Retrieve available data list Retrieve as day volumes

1011-5487 / F2:3F:0A:55:CE:4E	<div style="width: 50%; background-color: yellow; border: 1px solid black;"></div>	0:27 / 1:57	<input type="button" value="Log"/> <input type="button" value="Stop"/>
Retrieving '??-???' data between 2005/08/01 00:00:00 and 2005/08/03 0:00:00 Software:1.73 Q330:0100000A27A01B31 IP: 128.103.105.12:5331 Tx/Rx: 286B/7.64M Ave: 65.89K/s Size: 27.35M			
1014:5486 / F2:3F:0A:55:CE:A7	<div style="width: 50%; background-color: yellow; border: 1px solid black;"></div>	0:37 / 1:58	<input type="button" value="Log"/> <input type="button" value="Stop"/>
Retrieving '??-???' data between 2005/08/01 00:00:00 and 2005/08/03 0:00:00 Software:1.73 Q330:0100000A1B9A97C5 IP: 128.103.105.15:5331 Tx/Rx: 286B/11.37M Ave: 97.76K/s Size: 27.41M			
1550-5534 / F2:3F:0A:28:62:06	<div style="width: 50%; background-color: yellow; border: 1px solid black;"></div>	0:37 / 1:58	<input type="button" value="Log"/> <input type="button" value="Stop"/>
Retrieving '??-???' data between 2005/08/01 00:00:00 and 2005/08/03 0:00:00 Software:1.73 Q330:0100000B69BA17D3 IP: 128.103.105.152:None Tx/Rx: 298B/9.98M Ave: 85.63K/s Size: 92.91M			
1551-5069 / F2:3F:09:9E:A0:8D	<div style="width: 50%; background-color: yellow; border: 1px solid black;"></div>	0:36 / 1:58	<input type="button" value="Log"/> <input type="button" value="Stop"/>
Retrieving '??-???' data between 2005/08/01 00:00:00 and 2005/08/03 0:00:00 Software:1.73 Q330:0100000B69C327A0 IP: 128.103.105.153:None Tx/Rx: 298B/9.60M Ave: 82.39K/s Size: 92.97M			

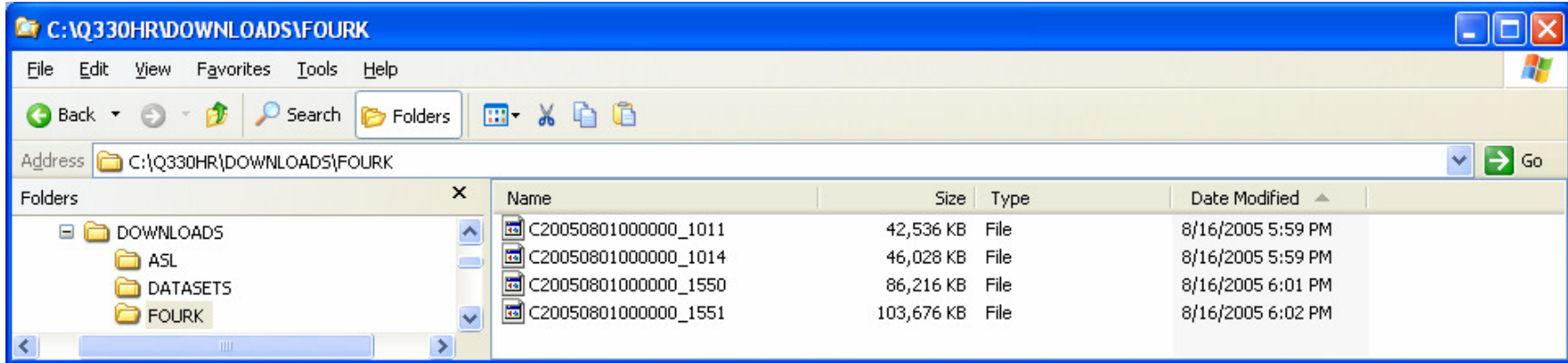
Collecting Data. Press 'Stop Data Collection' to stop.

Done! When completed, the task bars will turn GRN and show the total amount of data actually recovered (on the left) and the total time elapsed. Clearly once the application setup information and ConfigServer database information is initially built, data retrievals from multiple Balers whether on or offsite is essentially a one-step operation.

The screenshot displays the BalerAdmin v1.1.0.76 interface in Remote Baler Mode. The window title is "BalerAdmin v1.1.0.76 (Log: BA20061113193334.dbg) (Config: Default)". The interface is divided into several sections:

- Navigation:** Administration, Data Retrieval, Application Settings.
- Current retrieval list:** [Pending: 20, Completed: 205]. A list box shows "Default retrievalList". Buttons include "Load Retrieval List", "Create New Retrieval List", and "Delete Retrieval List".
- Add to Current List:**
 - Start time (yyyy/mm/dd hh:mm:ss): 2005/08/01
 - Duration (ex: 4d 2h 12m 50s): 2d
 - SEED Channels: ??-???
 - Stations/Balers: [Empty field]
 - Buttons: "Select Stations/Balers", "Add Above to Retrieval List", "Manage Retrieval List".
- Options:**
 - Treat missing data as an error
 - Retrieve available data list
 - Retrieve as day volumes
- Data Collection Progress:**
 - 1011:5487 / F2:3F:0A:55:CE:4E: 1:23 / 2:54. Data Collection complete. Software: 1.73, Q330: 0100000A27A01B31, IP: 128.103.105.12:5331, Tx/Rx: 286B/27.36M, Ave: 160.64K/s, Size: 27.35M.
 - 1014:5486 / F2:3F:0A:55:CE:A7: 1:25 / 2:45. Data Collection complete. Software: 1.73, Q330: 0100000A1B9A97C5, IP: 128.103.105.15:5331, Tx/Rx: 286B/27.41M, Ave: 169.67K/s, Size: 27.41M.
 - 1550:5534 / F2:3F:0A:28:62:06: 4:47 / 6:08. Data Collection complete. Software: 1.73, Q330: 0100000B69BA17D3, IP: 128.103.105.152:None, Tx/Rx: 298B/92.92M, Ave: 258.44K/s, Size: 92.91M.
 - 1551:5069 / F2:3F:09:9E:A0:8D: 4:49 / 6:11. Data Collection complete. Software: 1.73, Q330: 0100000B69C327A0, IP: 128.103.105.153:None, Tx/Rx: 298B/92.97M, Ave: 256.02K/s, Size: 92.97M.
- Buttons:** "Start Data Collection" and "Stop Data Collection".
- Status Bar:** "Collecting Data. Press 'Stop Data Collection' to stop."

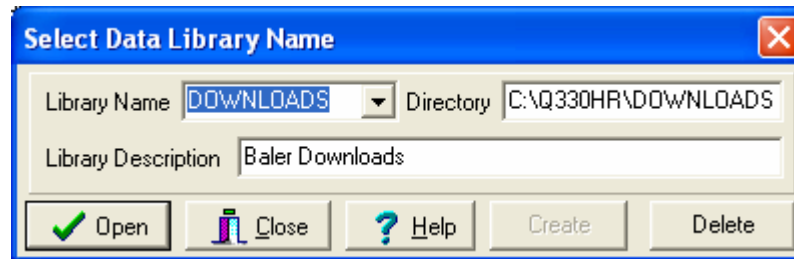
Browse to the DOWNLOADS\FOURK directory to see the MSEED files recovered from the 4 stations above. This group actually contains two Q330HR's, tag 1550 and 1551, and two low-power Q330's, 1011 and 1014. We'll now plot this data and show the comparison.



Using Cimarron to plot data from multiple stations simultaneously - multiple Datasets

As a further Cimarron illustration, we can plot the 4 station MSEED files retrieved by BalerAdmin on one screen. We'll do this in a side-by-side comparison showing typical terminated-input noise data from a low-power Q330, and a Q330HR.

Start Cimarron, and select the DOWNLOADS library.



Select FileIndex Miniseed Files from the main menu, and you'll see the MSEED files recovered previously by BalerAdmin from 4 stations.

The screenshot shows a dialog box titled "Index MiniSeed File(s)". It contains a table with columns for File Name, Station, Modified, MB, RL, and Used. Below the table are several controls: a "Done" button, a "Group Check Options" section with radio buttons for "from first", "from present", and "next 64", and buttons for "Index", "DataSet File Name", "DataSet Description", "Rename", "Search Paths", "Check", and "Un-Check All".

File Name	Station	Modified	MB	RL	Used
C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1550	MA-1550	2005-08-16 18:01	84.2	4K	0
C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1551	MA-1551	2005-08-16 18:02	101.2	4K	0
C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1011	QT-1011	2005-08-16 17:59	41.5	4K	0
C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1014	QT-1014	2005-08-16 17:59	44.9	4K	0

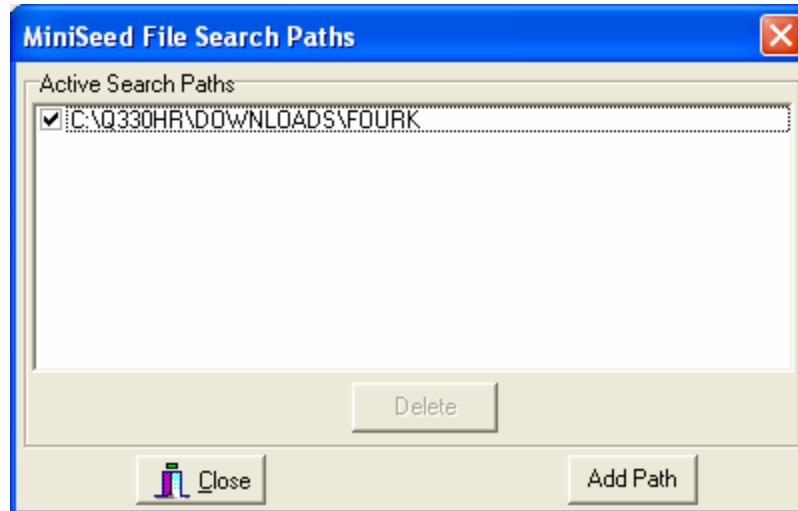
Highlight the MSEED file to be used as the highest priority data source when creating the DataSet (index) of multiple MSEED files

Index DataSet File Name:

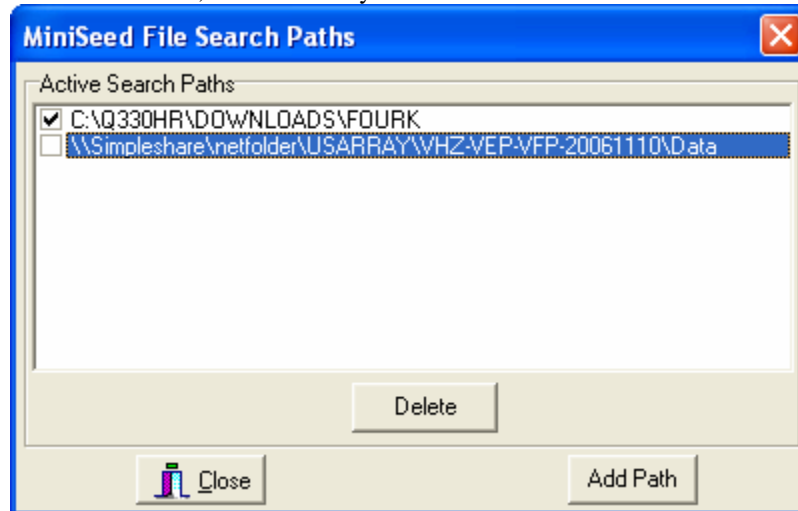
DataSet Description:

Done Group Check Options: from first from present next 64

Note that by default, the path searched for MSEED files is the “FOURK” directory in the selected Library.



You may, however, add additional paths to search, and select (in the check box) whether they are currently actively scanned for files to index. Below, for example, a path on a network drive is added to the search list, but is currently not included in the active search list.



Check the first one, and press Index

Index MiniSeed File(s)

File Name top=0 selected item=0 bot=13 chkd=1 Station Modified MB RL Used

<input checked="" type="checkbox"/>	C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1550	MA-1550	2005-08-16 18:01	84.2	4K	0
<input type="checkbox"/>	C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1551	MA-1551	2005-08-16 18:02	101.2	4K	0
<input type="checkbox"/>	C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1011	QT-1011	2005-08-16 17:59	41.5	4K	0
<input type="checkbox"/>	C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1014	QT-1014	2005-08-16 17:59	44.9	4K	0

Highlight the MSEED file to be used as the highest priority data source when creating the DataSet (index) of multiple MSEED files

Index DataSet File Name: C20050801000000_1550

Done Group Check Options: from first from present next 64

While the indexer is working, the progress percentage will be displayed....

Index MiniSeed File(s) ✖

File Name top=0 selected item=0 bot=13 chkd=1 Station Modified MB RL Used

File Name	Station	Modified	MB	RL	Used
<input checked="" type="checkbox"/> C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1550	MA-1550	2005-08-16 18:01	84.2	4K	0
<input type="checkbox"/> C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1551	MA-1551	2005-08-16 18:02	101.2	4K	0
<input type="checkbox"/> C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1011	QT-1011	2005-08-16 17:59	41.5	4K	0
<input type="checkbox"/> C:\Q330HR\DOWNLOADS\FOURK\C20050801000000_1014	QT-1014	2005-08-16 17:59	44.9	4K	0

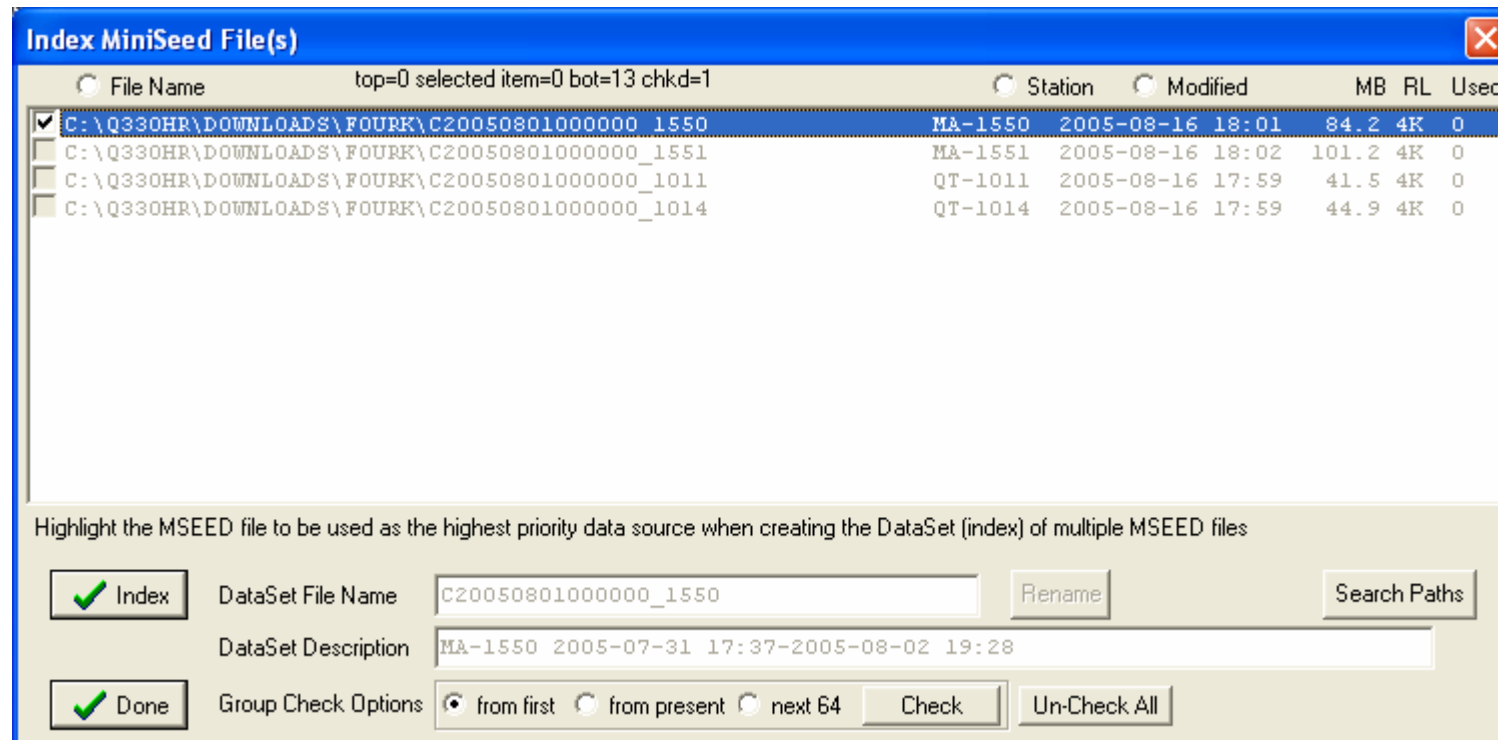
Highlight the MSEED file to be used as the highest priority data source when creating the DataSet (index) of multiple MSEED files

Index DataSet File Name:

75% DataSet Description:

Done Group Check Options: from first from present next 64

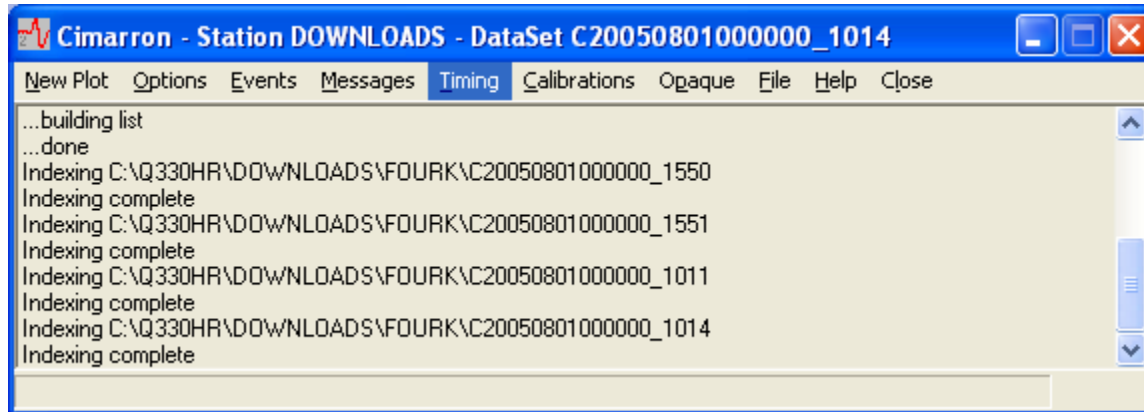
The index summary will then be presented.



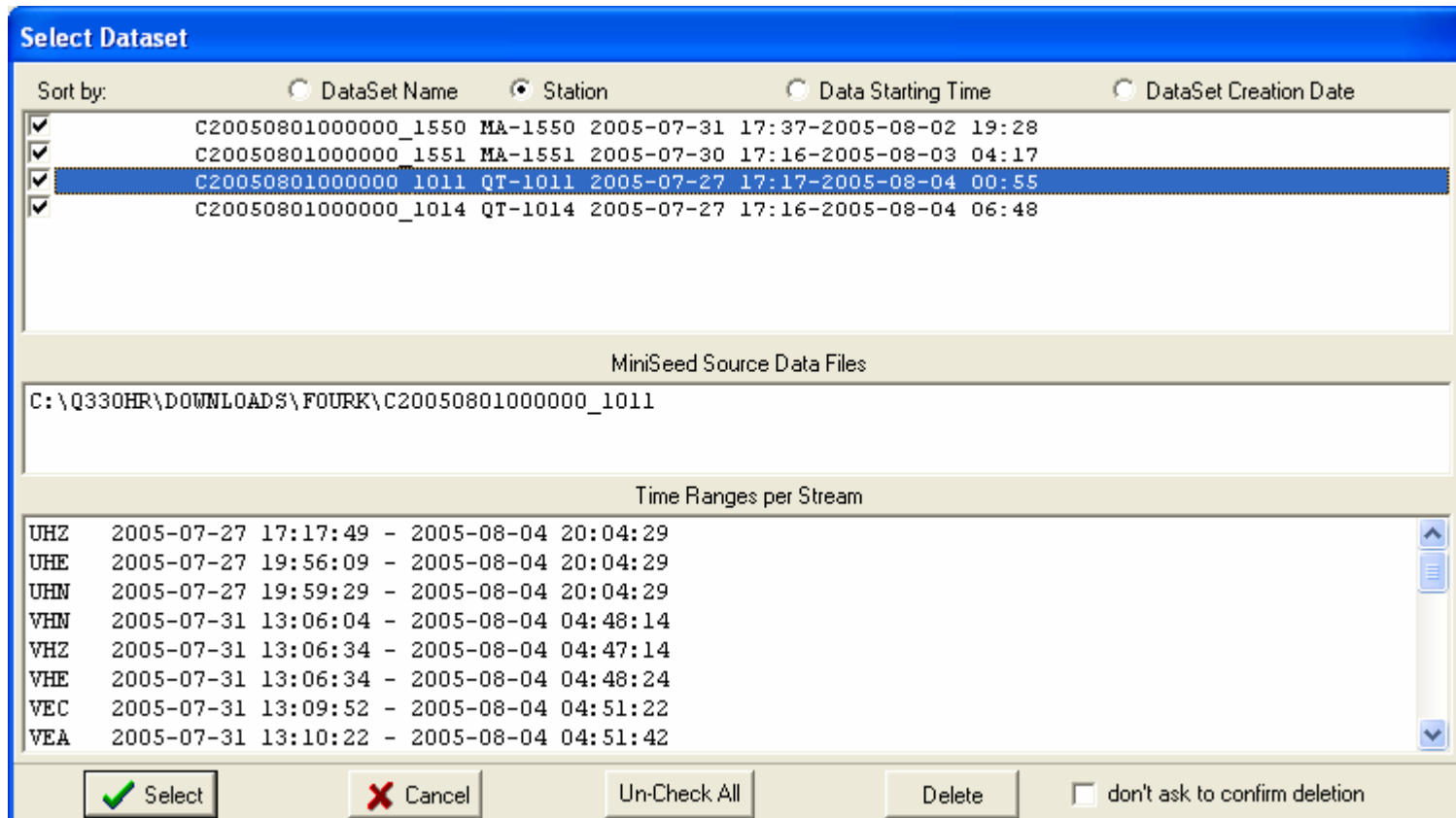
Repeat this for each of the other MSEED files, so that all 4 of them are indexed.

When the other files have been indexed, press "Done"

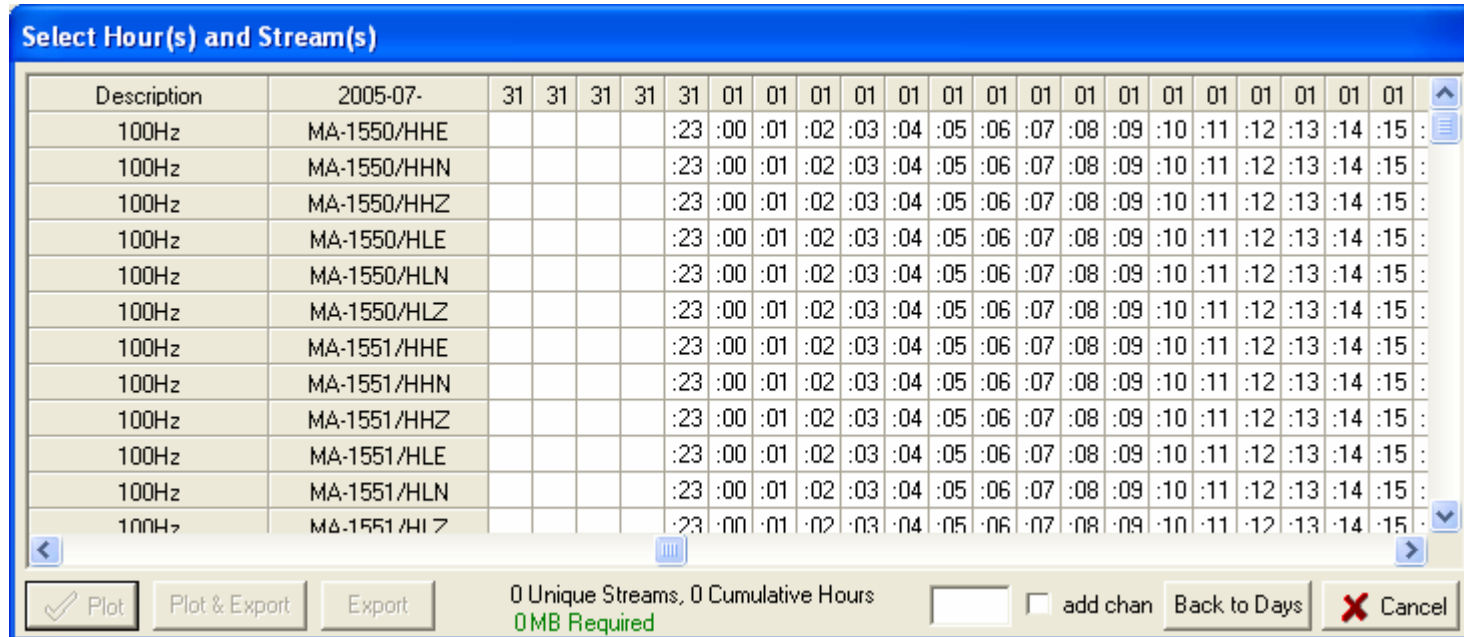
The main window will acknowledge each Indexing operation.



Select File Select Dataset. Check each Dataset to display simultaneously, and press Select.



Note that the **Network-Station name** is now part of the selection criteria, because multiple stations are available.



For the next plot, we want only certain channels to declutter the display. We're going to select only the L?? broad-band channels (1sps), and the Q330's internal temperature channel, VKI. To select these channels graphically, we may, as usual, select the first hour, and, while holding CTRL and the left mouse button, drag to the right across the selected channel.

Alternatively, there is another graphical means to select an entire channel. Left click on the channel name. Holding CTRL while you left click allows selecting multiple channels.

For example, to look at a long-period comparison between these 4 systems, scroll down through the channel selections, and CTRL left click the VKI (ambient temperature) and L?Z channels from each unit – a total of 8 1sp channels, 2 from each unit.

There is a third very convenient method of selecting specific channels from a large selection.

You can also just type the channel names you want in the selection box. The entire time range will be selected.

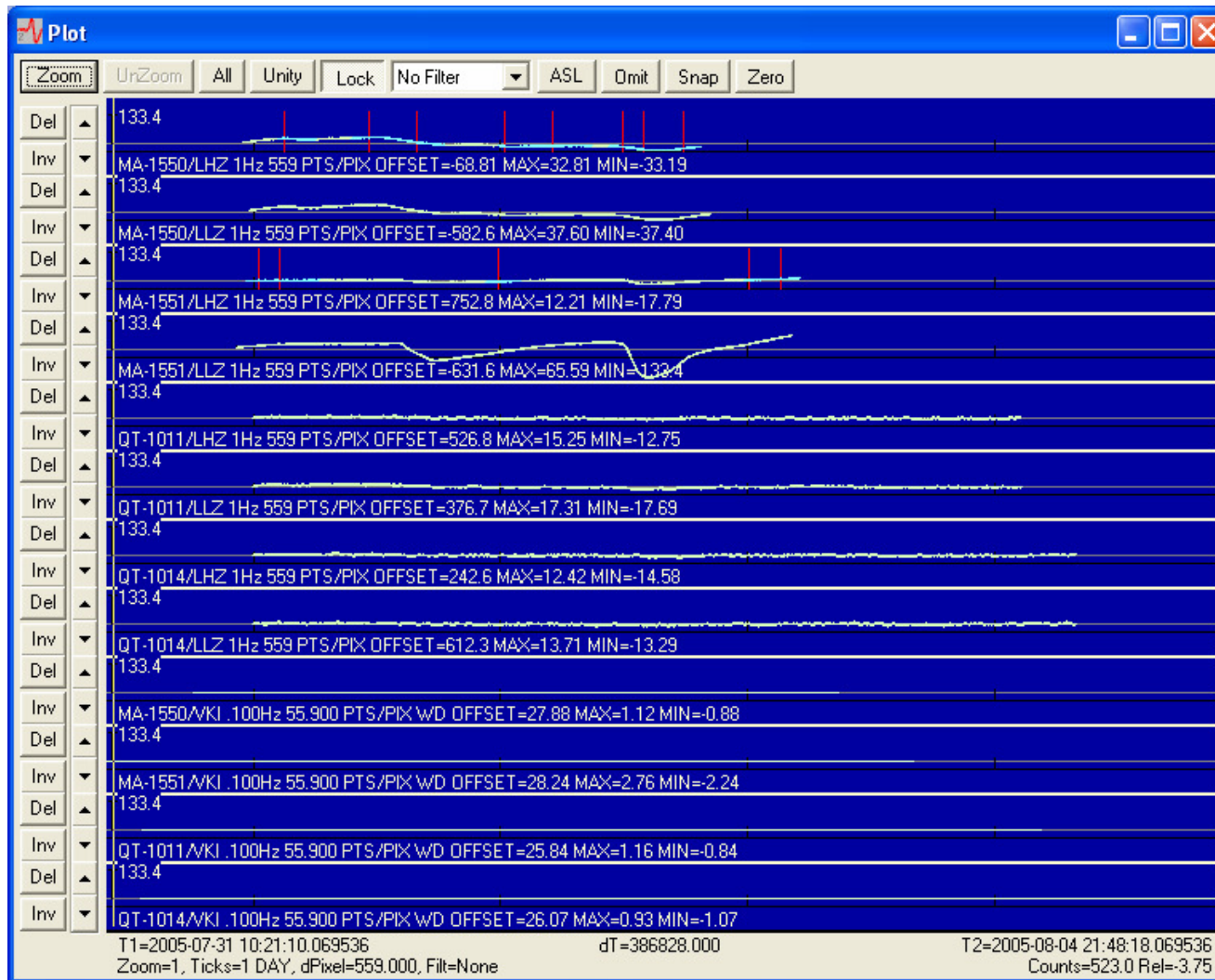
If you want to add multiple channels, check the “add chan” box. Otherwise the selection list is reset with each new entry.

Description	2005-07-	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
1Hz	MA-1550/LHZ	<input checked="" type="checkbox"/>																		
1Hz	MA-1550/LLE																			
1Hz	MA-1550/LLN																			
1Hz	MA-1550/LLZ	<input checked="" type="checkbox"/>																		
1Hz	MA-1551/AX0																			
1Hz	MA-1551/AX1																			
1Hz	MA-1551/AX2																			
1Hz	MA-1551/AX3																			
1Hz	MA-1551/LCE																			
1Hz	MA-1551/LCQ																			
1Hz	MA-1551/LHE																			
1Hz	MA-1551/HH																			

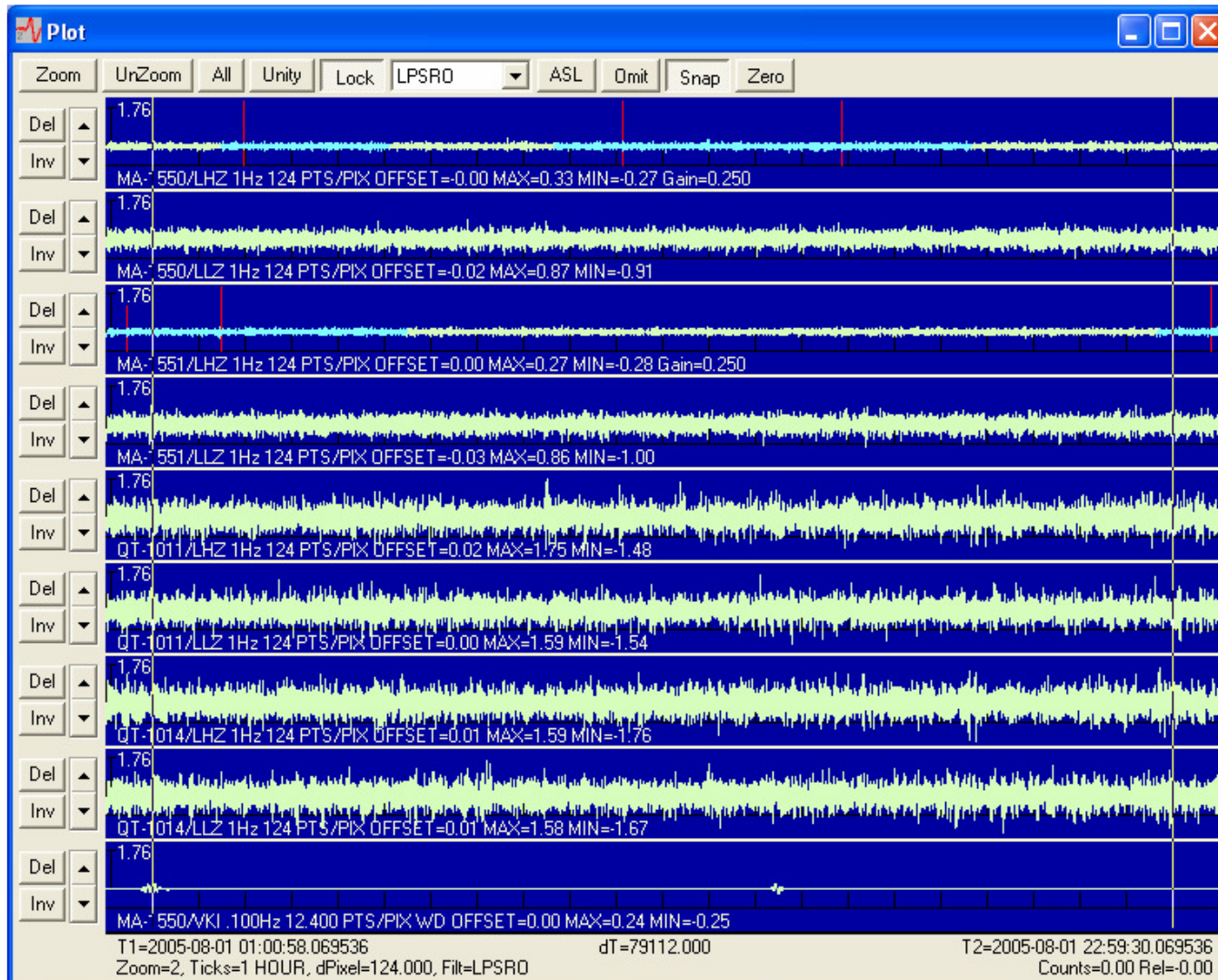
8 Unique Streams, 280 Cumulative Hours
4 MB Required

add chan

In this case, 4 days of data was selected on 8 channels (+temperature). By default, the scales are locked, and the displays are in digital counts. About mid-way through the traces, the sun begins to shine through a window on unit 1551, abruptly raising the temperature several degrees, but remarkably affecting the baseline by only about 0.5ppm/deg. In a signal-appropriate band, there is no affect of the abrupt temperature change.

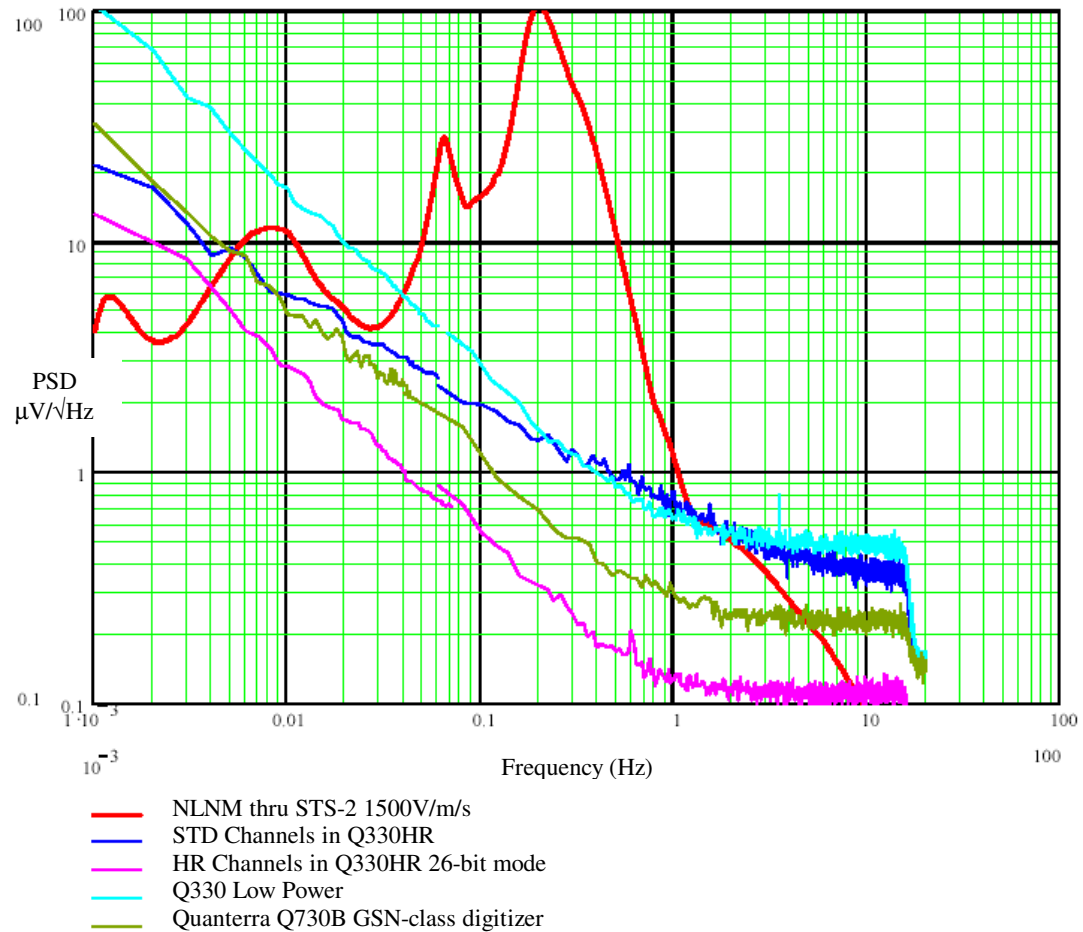


Now the most interesting comparison based on the plot above – in-band (LPSRO) filtered long-period noise of the Q330HR’s “HR” channels, the Q330HR’s “standard” channels, and a low-power Q330 compared at room temperature on a fixed scale using the Lock and gain adjustment arrows. Unit 1550/LHZ and 1551/LHZ are the HR’s. The “standard” channels are about equivalent to a Q680. The HR’s are a striking difference!



Q330HR Performance data

Typical room-temperature performance data (Voltage Density, Terminated Input 40sps) for the “STD” and “HR” channels in the 6-channel Q330HR are shown below compared with similarly measured values of the Quanterra Q730B GSN-class digitizer, and the Quanterra Q330 ultra low power digitizer.

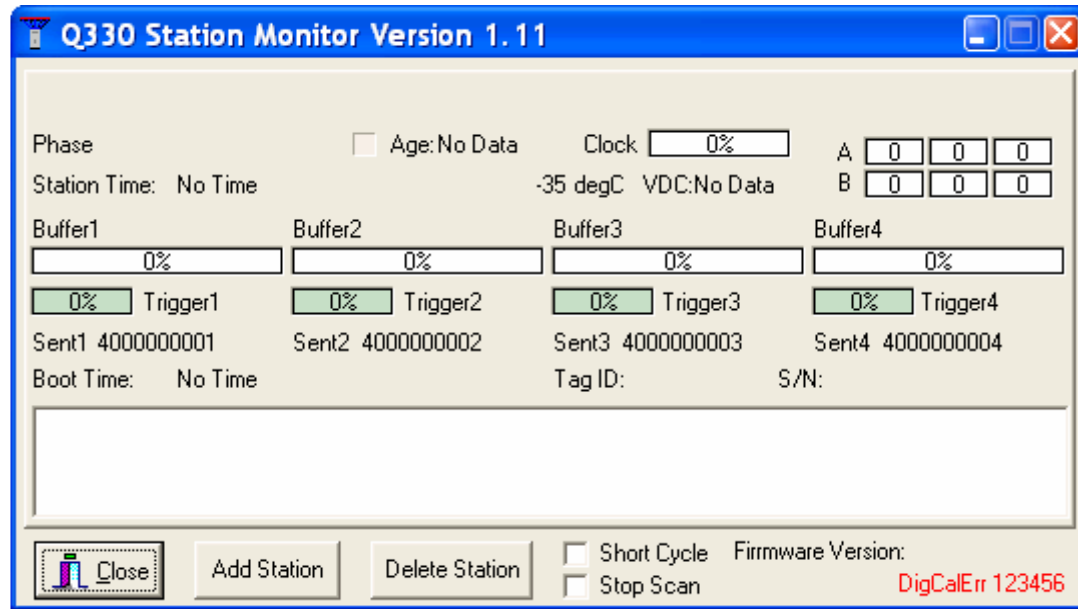


Using the Mon330 station monitoring scanner

Is there a simple, non-invasive tool to monitor station performance without requiring a registration or data collection from a Q330?

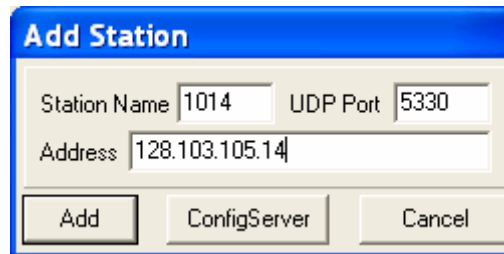
Yes. The Q330 has a capability to respond to a non-registered request for system status. Such a capability allows a simple application to easily gather status information from many Q330's to which IP connectivity is available. The distribution includes a demonstration application called "Mon330". To acquire status you need to know only the IP address and UDP port number of the Q330. Note that by default, a Q330 response to this type of status request is enabled. As a security measure, you may want to prevent it. This setting (Res. QDP Ping) is in the Willard Configuration\Interfaces form.

Start the application. The first time, there is, of course, no station list. The initial blank form contains "placeholders" for many displayable items.

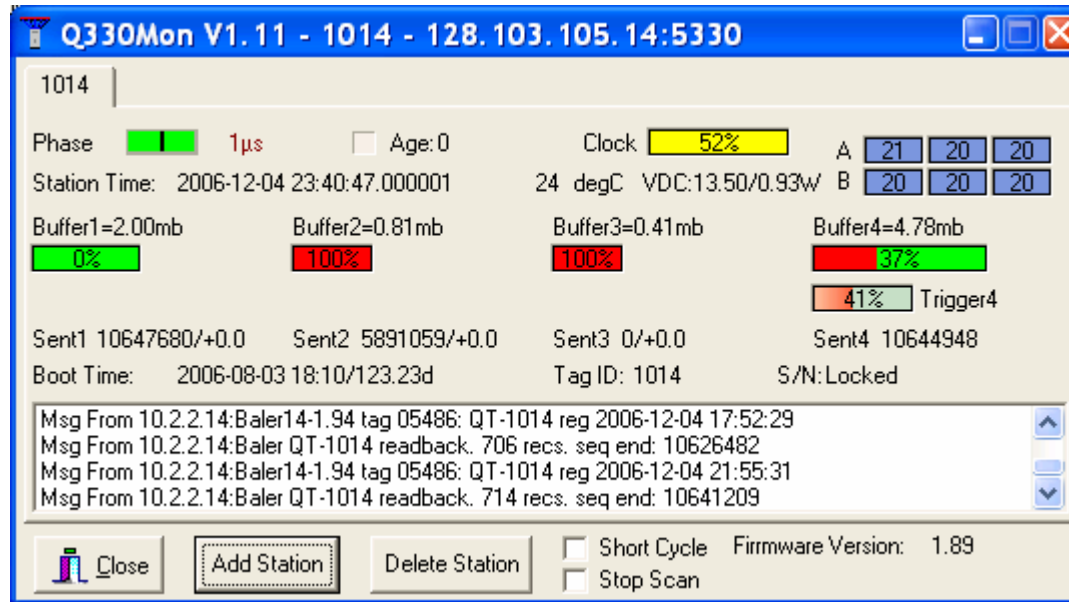


Click "Add Station"

Fill in a station name, and the IP address of the Q330 you want to monitor. Usually the default UDP port 5330 is correct.

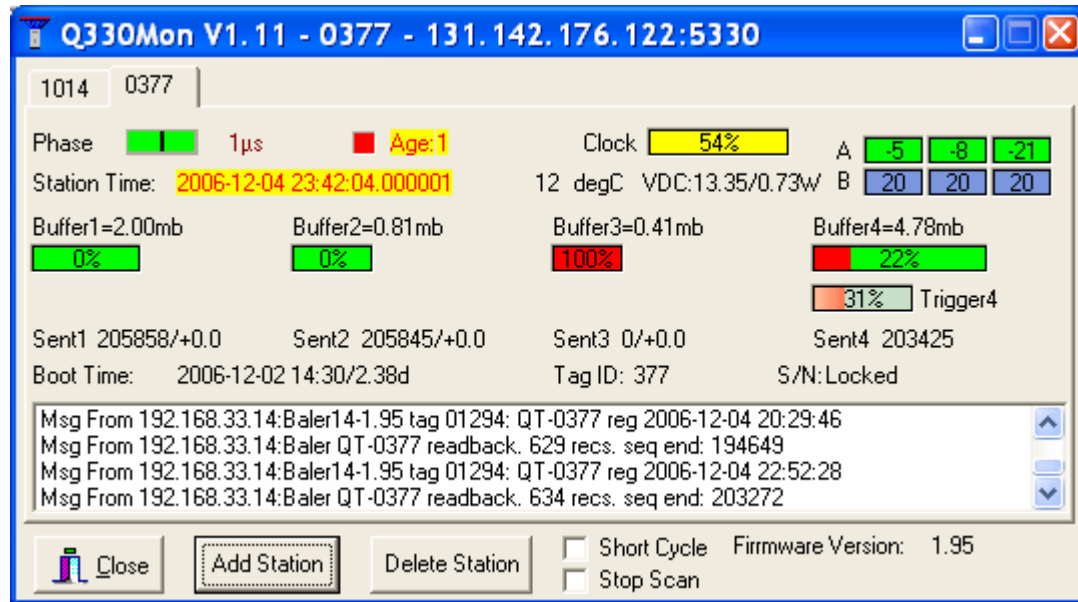


The application will begin to fill in data within a few seconds if connectivity exists, showing timing, data port buffer status, and sensor boom positions if a sensor is installed. In the example below, the result is shown for a Q330HR with cycled GPS, one DP and a Baler connected, and no sensor plugged in.



IMPORTANT NOTE: WHEN YOU FIRST ENTER STATION DATA, MON330 MAY ATTEMPT TO CONTINUOUSLY POLL THE SELECTED STATION. YOU WILL NEED TO EXIT THE APPLICATION AND RESTART IT. ON SUBSEQUENT STARTS OF THE PROGRAM, AFTER STATION DATA HAVE BEEN ENTERED, THE POLLING WILL PROCEED AT THE NORMAL RATE OF ONE STATION EVERY 10S. SEE NEXT PAGE:

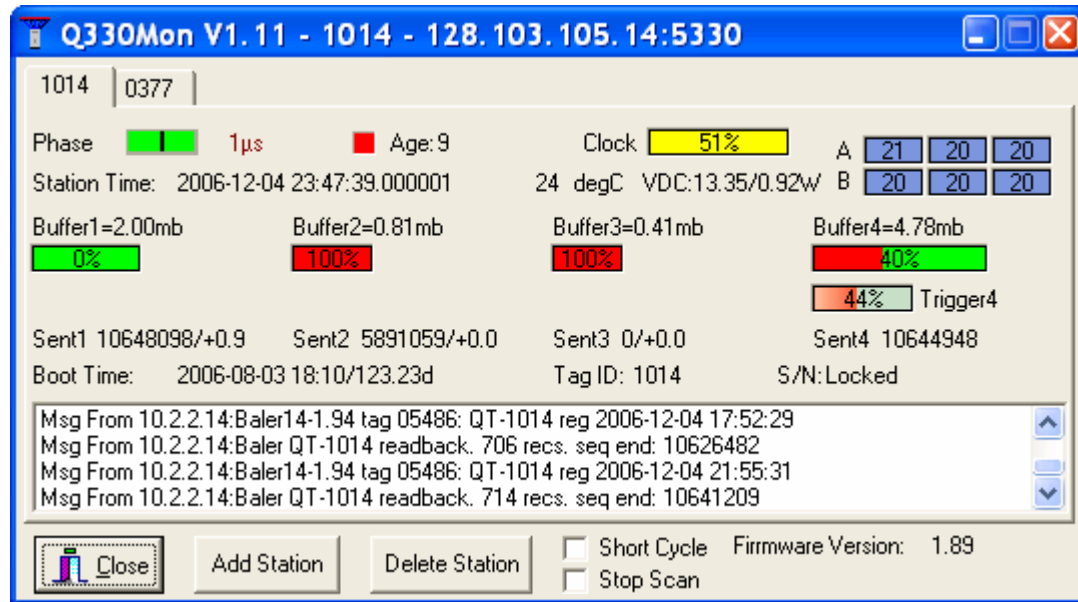
Continue adding a second station. As described on the previous page, after entering the first two stations, you will need to exit the application, and restart it in order to establish the normal polling cycle. Otherwise, you may see the application update repeatedly and rapidly, with the “Age” since update appearing as below.



Some typical scenarios as seen by mon330.

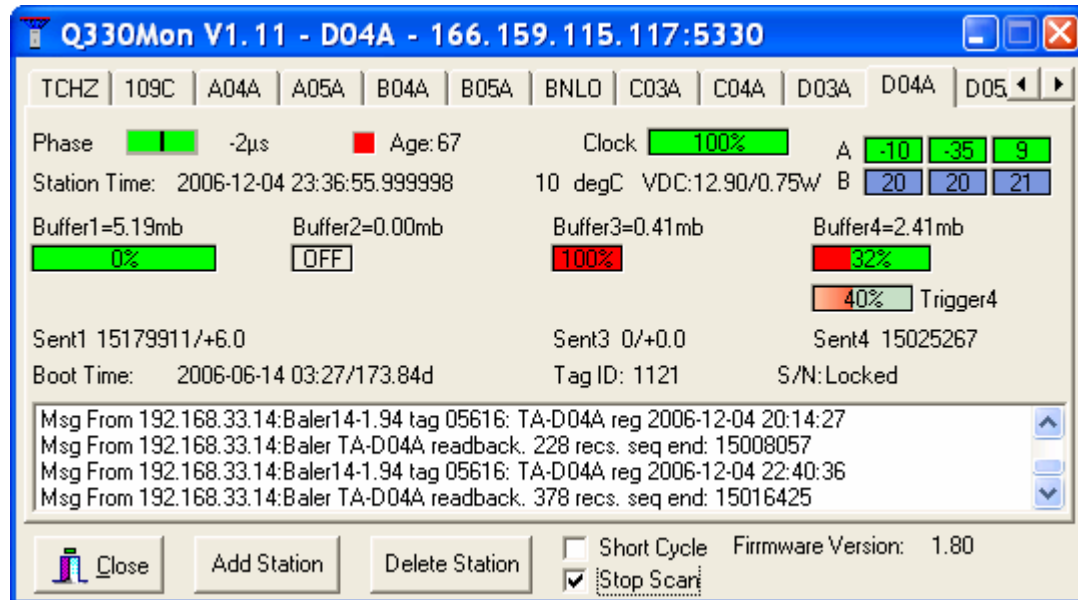
After you add the first two stations, then exit, and restart the application, you may continue to Add stations as desired. A station will be polled every 10s, so the interval for each individual station increases as new stations are added. This keeps network traffic constant as a large number of stations are polled, and limits the number of status requests reaching remote Q330's when a number of Mon330-type applications are requesting data from a number of Q330's.

Here a typical "normal" station display appears. All operating parameters are nominal.



There is no fundamental limitation to the number of stations the application can track, and no additional system resources are required when a new station is added. Network traffic remains constant, and network utilization at an individual station is reduced as new stations are added, because the list is polled round robin at a fixed interval. When new information arrives, the tab switches to that station. If you want to stop the display scanning (but not the status collection) check the “stop scan” box to review what’s presented. The display will announce in color loss or lack of recent signal, and will show if a station has rebooted within the past 24hrs.

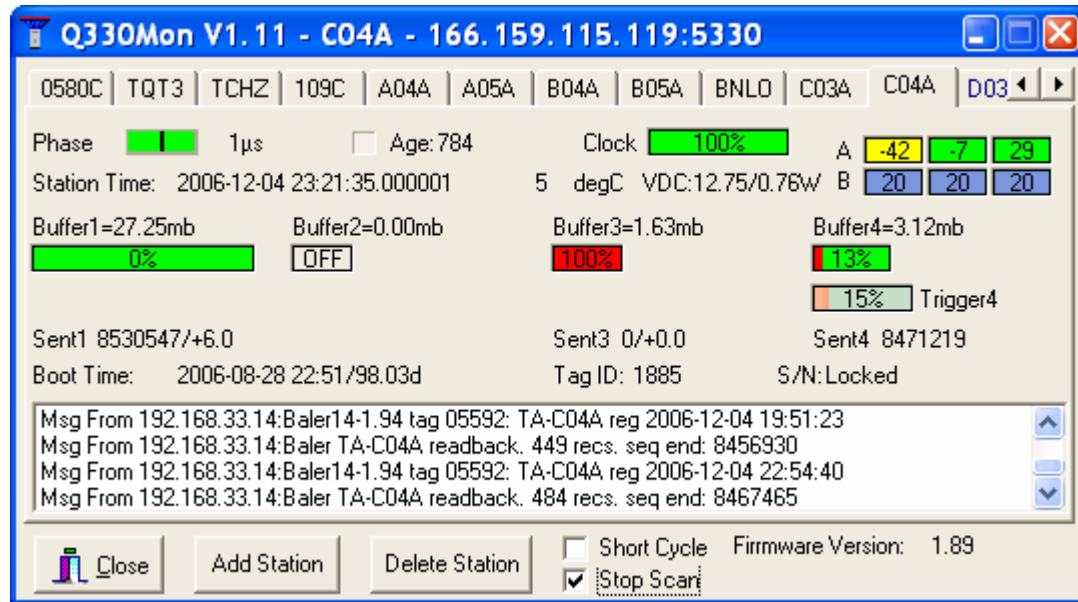
Here’s quite a quick and revealing check. The “Age” of the information is 67s since the last poll. This station D04A, Q330 TAG #1121, has been running 173 days since the last reboot on 2006-06-14. Clock is OK at 100% quality, since on this station the GPS runs in a continuously powered mode. Sensor boom positions (group A) are within limits. The Baler data buffer 4 and the telemetry buffer 1 are being maintained below full. Both the Baler and the telemetry receiver, Antelope in this case, have processed a roughly equal number of packets since boot, around 15,000,000+ packets, or just about 1pkt/s average over the interval. The power consumption of this Q330, which is providing continuous real-time telemetry and on-site recording, is 750mW with the GPS continuously powered.



Mon330’s station database can be updated using Configserver as well.

Here’s another example. This Q330, TAG #1885, is equipped with 32MB packet memory. In this case, Mon330 shows that 27.25Mb of that total available memory is allocated for a telemetry buffer on data port 1. At the typical rate of data generation for the configuration of this station (transmitting 3 channels at 40sps and various low-rate channels), the buffer provides roughly 2 days residence time.

In the message panel, you can see regular “registration” and “readback” message sequences from the baler (tag #05592, with baler firmware version 1.94) showing that at roughly 3 hr intervals, the baler is registering and writing about 400-500 MSEED records. These messages provide a quick visual confirmation not only of baler revision status, but also that data are actually being confirmed by the baler as having been stored and verified on disk.



Here, station operation appears normal, except that as an advisory, mon330 highlights the time of the last reboot if it is within the preceding 24hrs. In steady-state operation, reboots that were not commanded (for example following a firmware upgrade), are usually an indication of a power problem at the site.

The screenshot displays the 'Q330Mon V1.11 - H02A - 166.159.115.120:5330' window. At the top, a menu bar lists various station units: D05A, E03A, E04A, E05A, ELFS, F03A, F04A, F05A, G04A, G05A, H02A, and H03. The main display area shows the following information:

- Phase:** 0µs, Age: 742
- Clock:** 100%
- Station Time:** 2006-12-04 23:38:45.000000
- Temperature:** 11 degC
- VDC:** 12.75/0.74w
- Phase A:** 10, -20, -5
- Phase B:** 20, 20, 20
- Buffer1:** 5.19mb (0%)
- Buffer2:** 0.00mb (OFF)
- Buffer3:** 0.41mb (100%)
- Buffer4:** 2.41mb (31%)
- Trigger4:** 38%
- Sent1:** 77582/+7.0
- Sent3:** 0/+0.0
- Sent4:** 74054
- Boot Time:** 2006-12-04 02:05/0.91d
- Tag ID:** 817
- S/N:** Locked

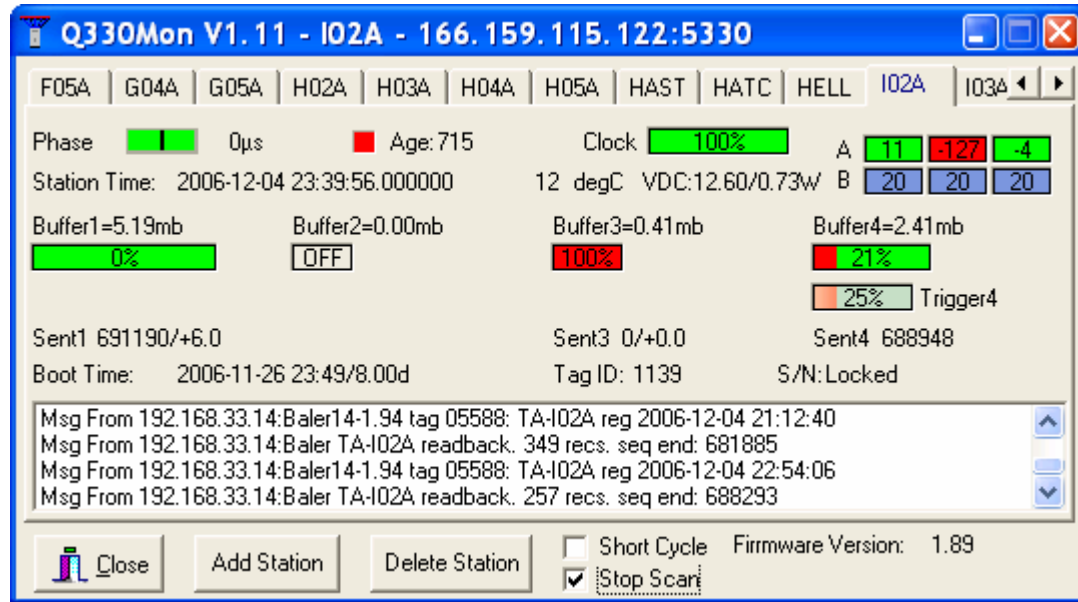
A log window at the bottom shows the following messages:

```

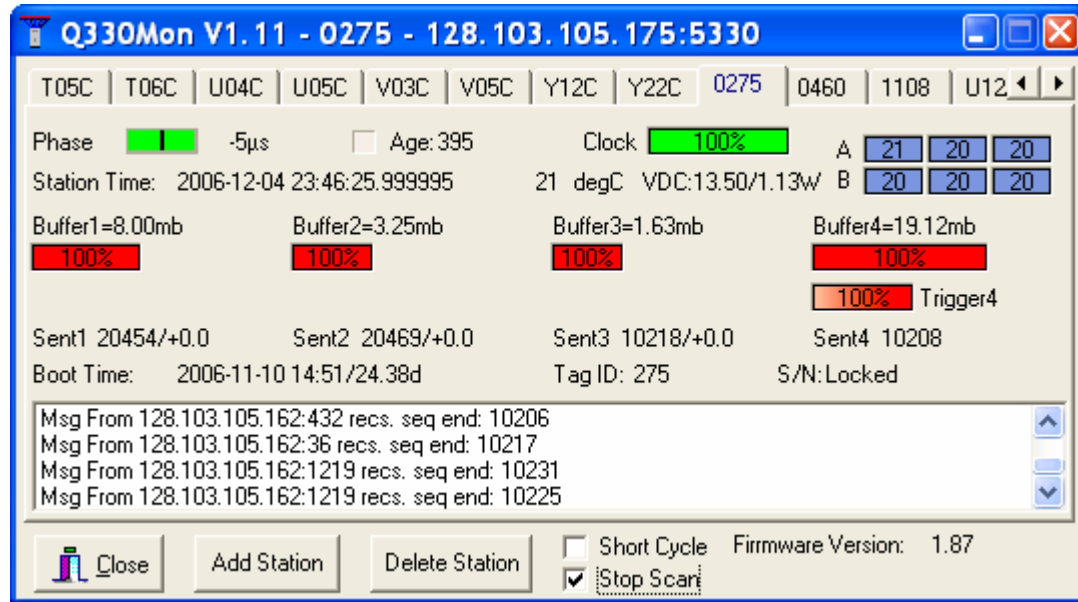
Msg From 192.168.33.14:Baler14-1.94 tag 05325: TA-H02A reg 2006-12-04 22:24:59
Msg From 192.168.33.14:Baler TA-H02A readback. 357 recs. seq end: 73266
Msg From 192.168.33.14:Baler14-1.94 tag 05325: TA-H02A reg 2006-12-04 22:31:05
Msg From 192.168.33.14:Baler TA-H02A readback. 57 recs. seq end: 74008
    
```

At the bottom of the window, there are control buttons: Close, Add Station, Delete Station, Short Cycle (unchecked), Stop Scan (checked), and Firmware Version: 1.89.

Here, mon330 shows that the sensor A boom 2 position (-127) is at the limit, and that therefore although data acquisition is operating normally, the data are not useful because the sensor requires adjustment.



In this example, the Q330 operation is normal, but no one is acquiring data from this Q330! All the data port buffers are 100% full.



Here, this station has an apparently mostly normal indication, except that the Clock Quality is only 10%. See the discussion of Clock Quality in the MSEED APPENDIX. This indicates that no GPS time has been acquired recently, and the accuracy of the time is likely to be poor.

The screenshot shows the 'Q330Mon V1.11 - TQT3 - 67.143.137.78:5330' window. The menu bar includes: 0113 | MEMB | 0505 | 1011 | 1014 | HRVX | RAMR | DSN3 | 0192 | 0580C | TQT3 | TCI. The main display area shows the following data:

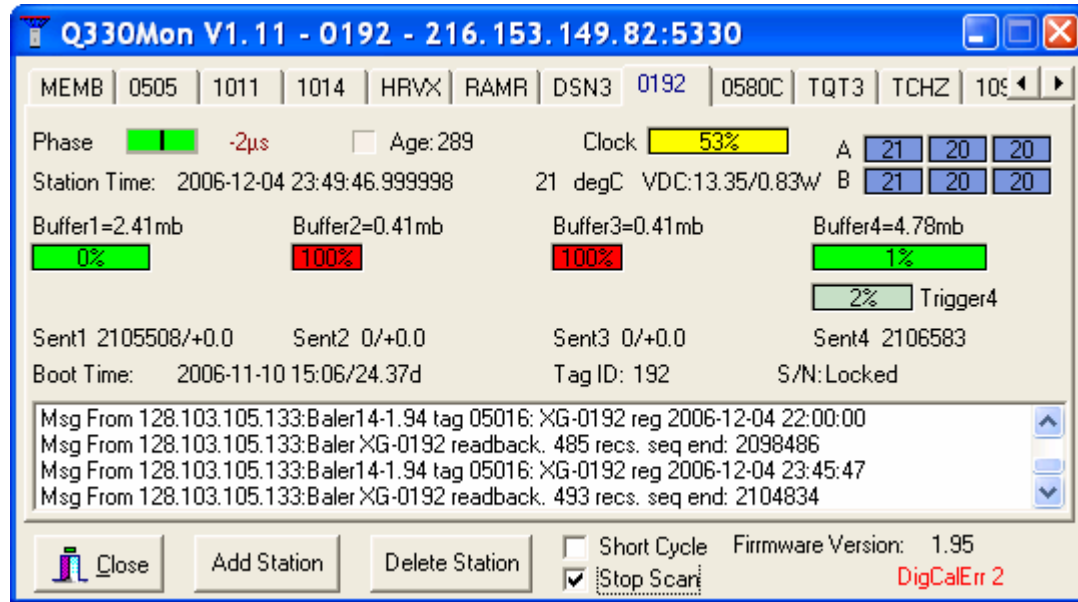
- Phase: -4µs
- Age: 236
- Clock: 10%
- A: 20 20 20
- Station Time: 2006-12-04 23:50:05.999996
- 27 degC VDC:14.40/0.99W B: 20 20 20
- Buffer1=0.81mb 100%
- Buffer2=0.00mb OFF
- Buffer3=5.19mb 100%
- Buffer4=2.00mb 47%
- 52% Trigger4
- Sent1 0/+0.0
- Sent3 820012/+0.0
- Sent4 3904129
- Boot Time: 2006-10-20 18:07/45.24d
- Tag ID: 582
- S/N: Locked

The message log contains the following entries:

- Msg From 10.2.2.14:Baler14-1.94 tag 05490: TA-TQT3 reg 2006-12-04 19:01:59
- Msg From 10.2.2.14:Baler TA-TQT3 readback. 286 recs. seq end: 3891476
- Msg From 10.2.2.14:Baler14-1.94 tag 05490: TA-TQT3 reg 2006-12-04 22:10:07
- Msg From 10.2.2.14:Baler TA-TQT3 readback. 292 recs. seq end: 3902761

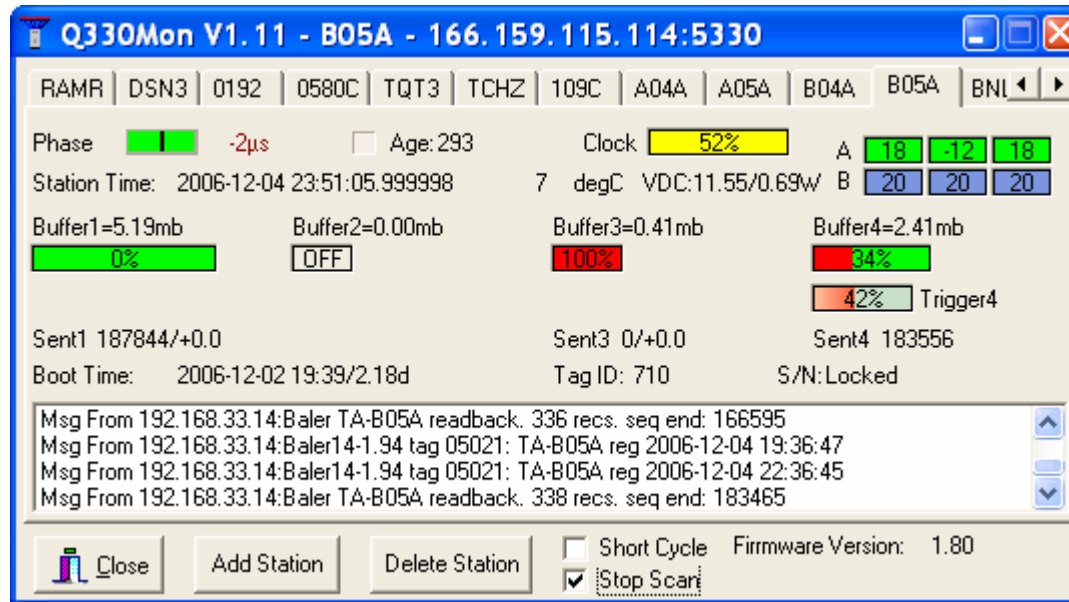
At the bottom, there are buttons for 'Close', 'Add Station', and 'Delete Station'. On the right, there are checkboxes for 'Short Cycle' (unchecked) and 'Stop Scan' (checked), along with 'Firmware Version: 1.81'.

Here, in the lower right corner (the “fault annunciation” area) shows in RED an indication that the digitizer self-calibration failed on channel #2. This indicates that the data are not reliable from this unit, and it should be returned for repair.



Here, a mostly normal indication from a station with a power-cycled GPS. With power-cycling enabled (the default), the GPS quality will typically remain within roughly 40% to 100%, indicating high-quality time accuracy.

Note however, that the primary power is 11.55VDC. This may indicate that the battery supply is nearing exhaustion.



And lastly, what happens if you lose connectivity to the station? The Age will increase and will be highlighted to indicate that information is not current. In the example below, the age of the most recent update is 13662s.

The screenshot displays the 'Q330Mon V1.11 - D05A - 166.159.115.103:5330' window. At the top, a navigation bar includes tabs for 109C, A04A, A05A, B04A, B05A, BNLO, C03A, C04A, D03A, D04A, D05A, and E03. The main display area shows the following data:

- Phase: 0µs (green bar)
- Age: 13622 (red text, highlighted)
- Clock: 100% (green bar)
- Station Time: 2006-12-05 09:52:06.000000 (yellow text)
- Temperature: 10 degC
- VDC: 11.85/0.75W
- Buffer1: 5.19mb (0% green bar)
- Buffer2: 0.00mb (OFF)
- Buffer3: 0.41mb (100% red bar)
- Buffer4: 2.41mb (26% green bar)
- Trigger4: 32% (orange bar)
- Sent1: 750815/+0.0
- Sent3: 0/+0.0
- Sent4: 747249
- Boot Time: 2006-11-26 17:21/8.85d
- Tag ID: 1127
- S/N: Locked

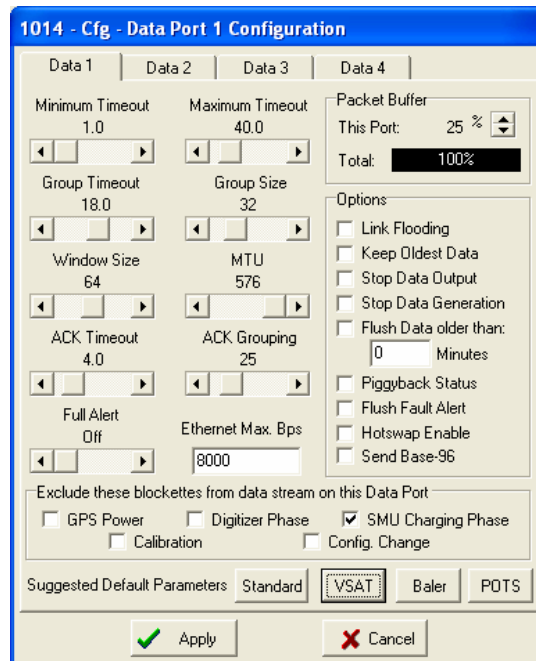
A message log at the bottom shows three entries from 192.168.33.14: Baler14-1.94 tag 05010: TA-D05A reg 2006-12-05 05:32:16, 2006-12-05 08:48:22, and 2006-12-05 08:48:22. The interface also includes 'Close', 'Add Station', and 'Delete Station' buttons, and checkboxes for 'Short Cycle' (unchecked) and 'Stop Scan' (checked). The firmware version is 1.89.

Pecos Installation and Operation

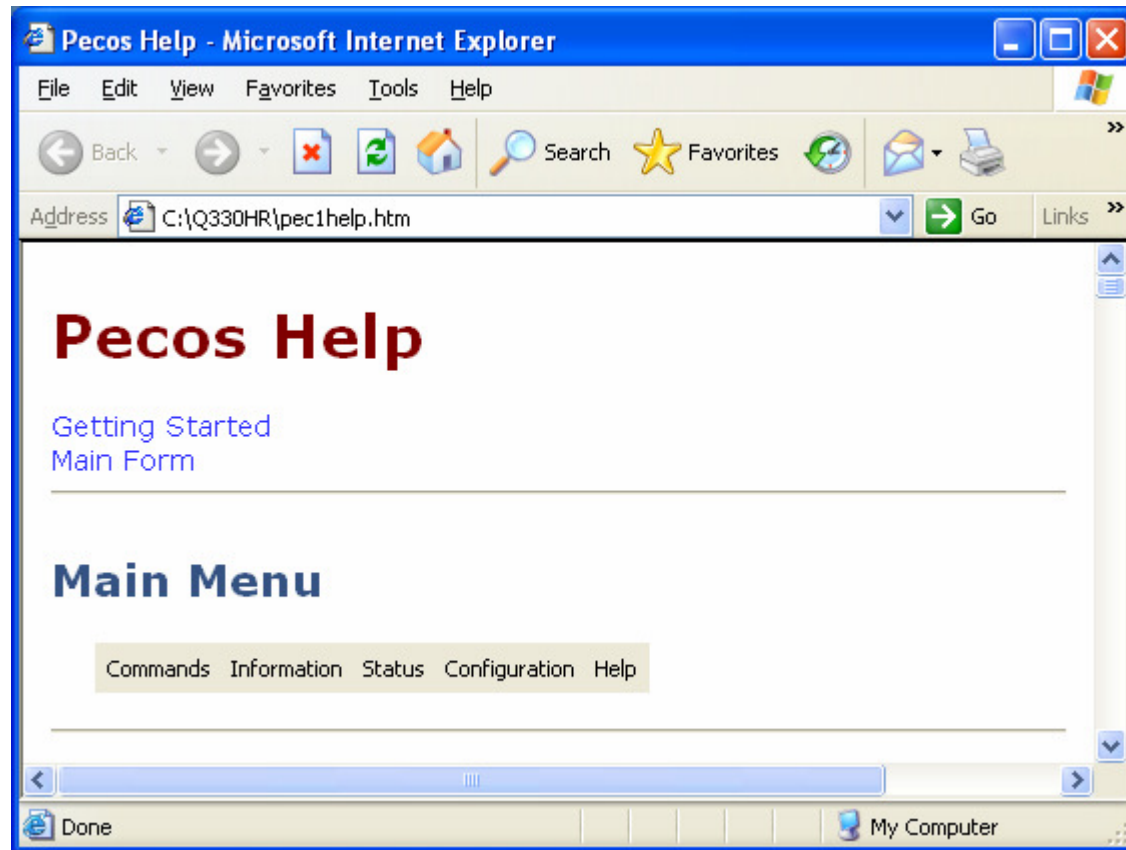
What is Pecos? Pecos may be thought of as a virtual Baler for Windows. Pecos stores data identically as a Baler, and provides an identical means of data access. While it is not intended as a high-reliability primary means of data collection, it can be very helpful to provide a quick and simple means of data collection for engineering purposes, or as an Auxiliary acquisition system, such as at GSN A/M sites. No special hardware, drivers, or complex installation is required. Furthermore because Pecos operates exactly like a Baler, Token sets for Baler recording can be developed and tested quickly in an interactive environment using Pecos before fielding. It is highly recommended to set up a Pecos, possibly even before dealing with the physical connection of a Baler, to establish a first waypoint in Q330 operations. On a PC system that is dedicated to operation of Pecos, robust long-term unattended operation is easily achieved.

At present, you cannot use BalerAdmin to retrieve data from Pecos. This is because part of BalerAdmin’s negotiation with a remote station is to “turn on” power to the Baler and to test access to the Baler using an administrative mode, which Pecos does not support. As a result, although the data formats and mechanism for actually retrieving data are identical between Pecos and a Baler, BalerAdmin will fail using a Pecos target. That will be resolved in a future version of BalerAdmin.

For operation with Pecos, the “VSAT” communications parameters are normally used on all links to optimize link utilization efficiency.

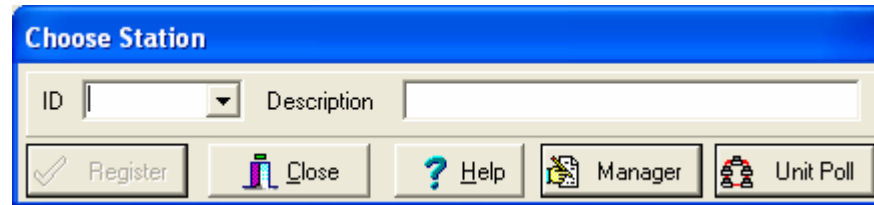


To configure Pecos, a similar “Pecos Station” configuration must be built, also on the PC, using Pecos’ built-in Manager. Launch Pecos. Again, the first time a browser help window will be launched. You should review this before proceeding, especially the “Getting Started” section.



When you have reviewed the help, close the browser and type in the Station ID and data port for the configuration you want to build. Note that it is possible to record from multiple ports from a single Q330HR, using separate “Pecos Stations”. First, we’ll configure a Pecos for DP1, configured for seismological channel names.

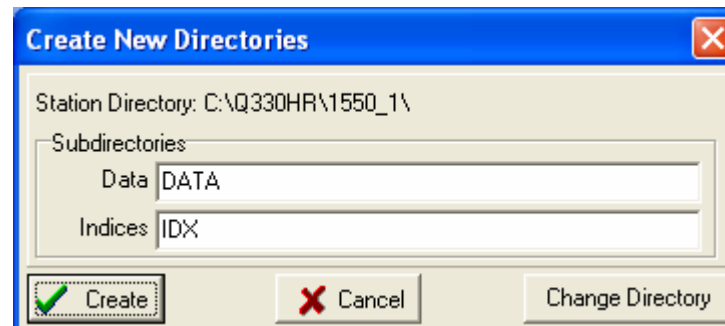
Select Manager.



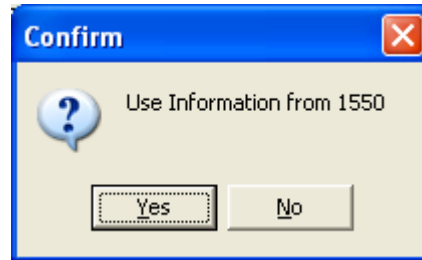
In the ID box, type in the station ID and underscore 1, e.g. 1550_1 in this case, and a description of the configuration, and Create



You'll be prompted for the directory names that will be used to store the actual MSEED data. If you do not want the data stored in a subdirectory of the Pecos home directory, select a new directory elsewhere, such as on another partition. Network drives are not recommended because of unreliable connections that may cause failure of the Pecos application. For the present example, we'll use the home directory. Select Create.

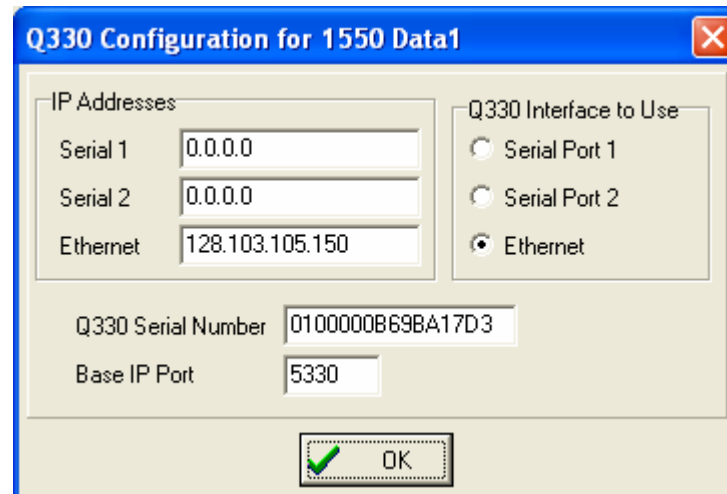


Next, you'll be asked



Pecos scanned the Willard configuration information and recognizes that you are building a Pecos configuration to talk to a data port on a Q330 for which you've already built a Willard configuration, saving the need to manually enter the Q330's electronic serial number and IP again. Generally you would say Yes.

The Pecos address form is then displayed with the needed values preloaded. You may make changes as required and say OK



The next form is used to configure the amount of fixed storage space on the PC’s disk used by Pecos to record the MSEED data in circular files. The default is 2048Mb (2G) of “Disk Allocation”. For a lab test station, you may want to reduce this. Note that the allocation size cannot be changed later without deleting recorded data, so plan ahead. In this case, we will set 512 Mb. Also, check “Continuity” to allow data to be spanned without gaps between Pecos runs, provided that the Q330’s buffer has not been overrun. Pecos may also act as a “NetServ”, i.e. LISS server. We’ve used the formulas in the IP Resource Planning table to arbitrarily assign TCP port numbers to the Web and NetServ listeners. Select Allocate Disk

Pecos Configuration for 1550 Data1

Pecos Interface
 Winsock (network) Direct Serial
 Modem

Serial Interface Options
 RTS CTS CTSTime 0 19200

SeisPOC
 Enable Cycled

Disk Allocation
 MegaBytes to Allocate 512

General Options
 Verbose Continuity Retrieve Buffers 200
 Registration Messages Recording Buffers 200
 Serial IP 10.172.53.5
 Min. Timeout 6 Max. 10 Flush Interval 10

Time and Date Formatting
 Date yyyy-mm-dd Time hh:nn:ss

Web Server
 Port 15501 Always Override WebServer Advertisement
 IP Port

NetServ
 Base Port 15506 Number of Servers 3 Sync Time: 30
 Client IP Address Ranges 128.103.105.0-128.103.105.255

OK Allocate Disk

While working, you'll see a progress bar...

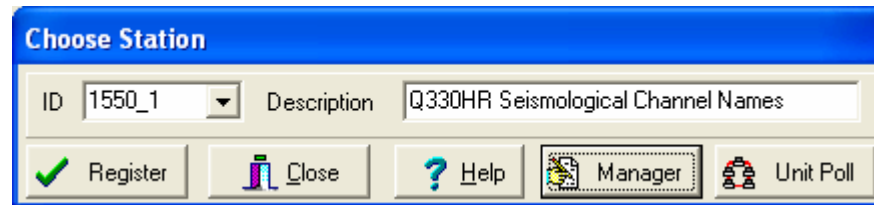


When done, select OK.

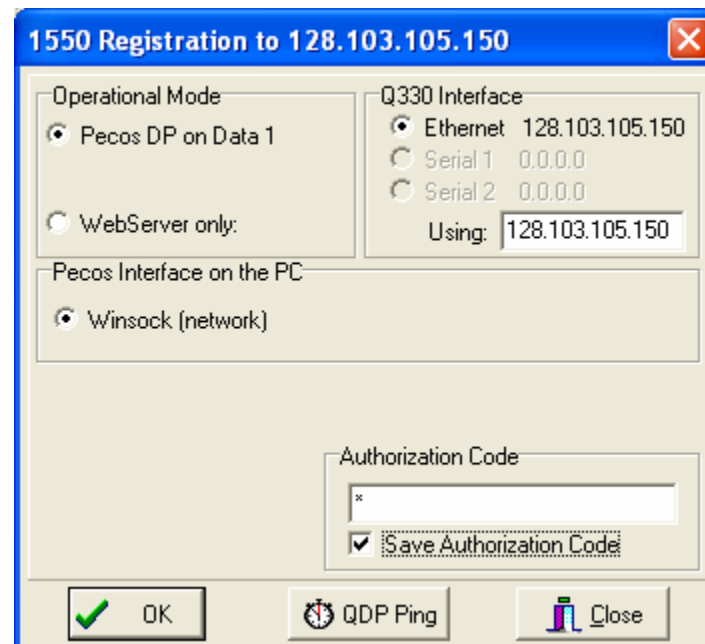
Back at the Pecos Station Manager form, select Update and Close



...and now Register using the ID just built



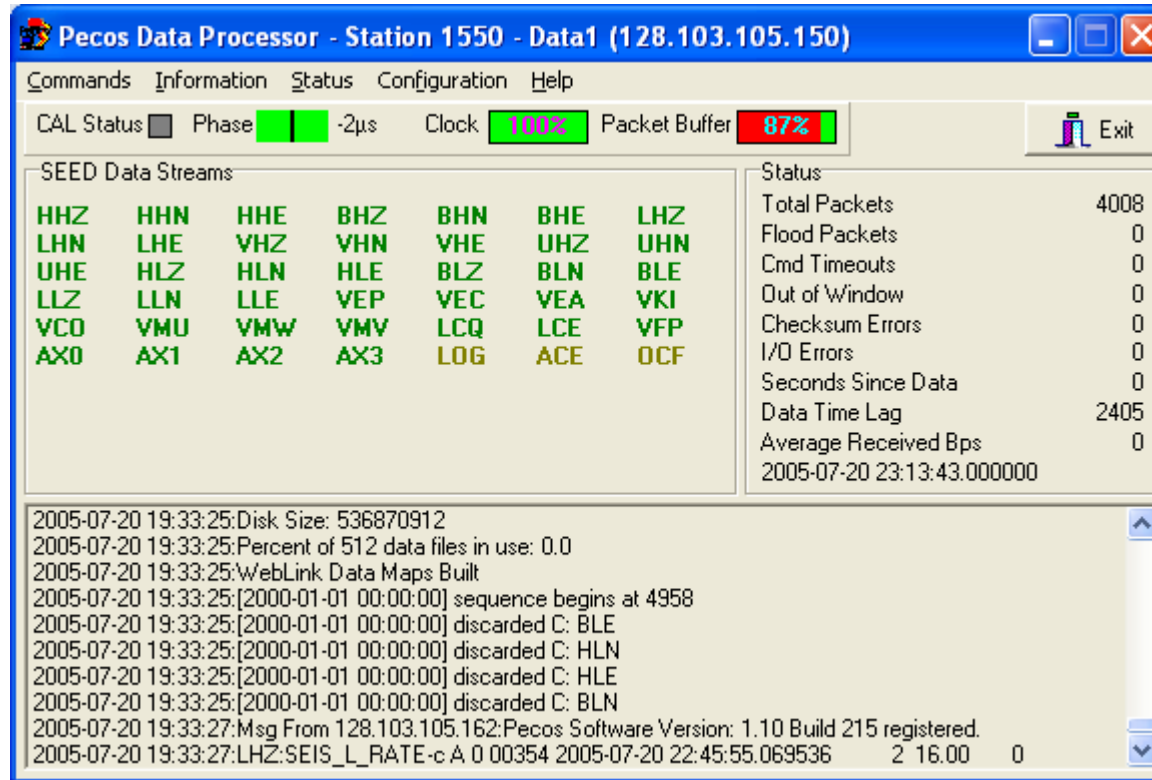
You'll be prompted the first time for the Authorization code. Enter 0 and check Save



Select OK, and Pecos will attempt to register and begin collecting data from data port 1

Note that the next time you start Pecos, you will proceed directly to Register, because the Pecos station and application settings have already been built. The above two forms are therefore where a new recording session would begin.

Initially, Pecos will create a message log burst and begin emptying the stored packet buffer in the Q330, which should take a few seconds on a Ethernet connection.



The messages above indicate that some data recorded prior to time acquisition were discarded. Pecos is now recording data on data port 1.

Sneak Preview of Multi-Station Pecos – Pecos2

A new application is in development and will be released during early 2007 to replace Pecos. The new application is called “Pecos2” and features configuration and web-service compatibility with Pecos, but is capable of simultaneously handling multiple stations. In addition, a wide array of new state-of-health information pertaining to communications performance is available from Pecos2, as well as improved handling of dynamic IP addressing. Pecos2 can operate as the basis of a mini network center for uniform data collection from a group of remote Q330’s within a single process. Consult Quanterra for availability.

Operational Status

CAL Status Phase **0µs** Clock **55%** Packet Buffer **17%** Mass Positions
 A
 B

Latest Data: 2006-11-12 19:29:20.000000 Boot Time: 2006-11-10 20:26/1.99d

Data Latency: 38m25s GPS State: Off due to PLL Lock Temperature **17**
 Time Connected: 4m51s GPS Fix: Off, last fix 1D Voltage **13.05**
 Total Data Gaps: 0 GPS Age: 50m18s Current **64**
 Status Latency: 9s PLL State: Hold Tag ID: 1108 S/N: 0100000A1BA29B02

Accumulated Statistics

Interval	Gaps	Boots	In Bps	Out Bps	Com Atmpt	Com Succ	Packets	ComEff	PDCs	NewIP	DutyCyc	TPut	MissData
Minute	0	0	556	20	0	0	127	97.5%	0	0	100.0%	1.00	0
Hour	0	0	199	6	3	3	2747	26.4%	2	0	60.1%	0.65	0
Day	0	0	282	12	5	7	93660	92.5%	6	2	95.8%	0.97	0

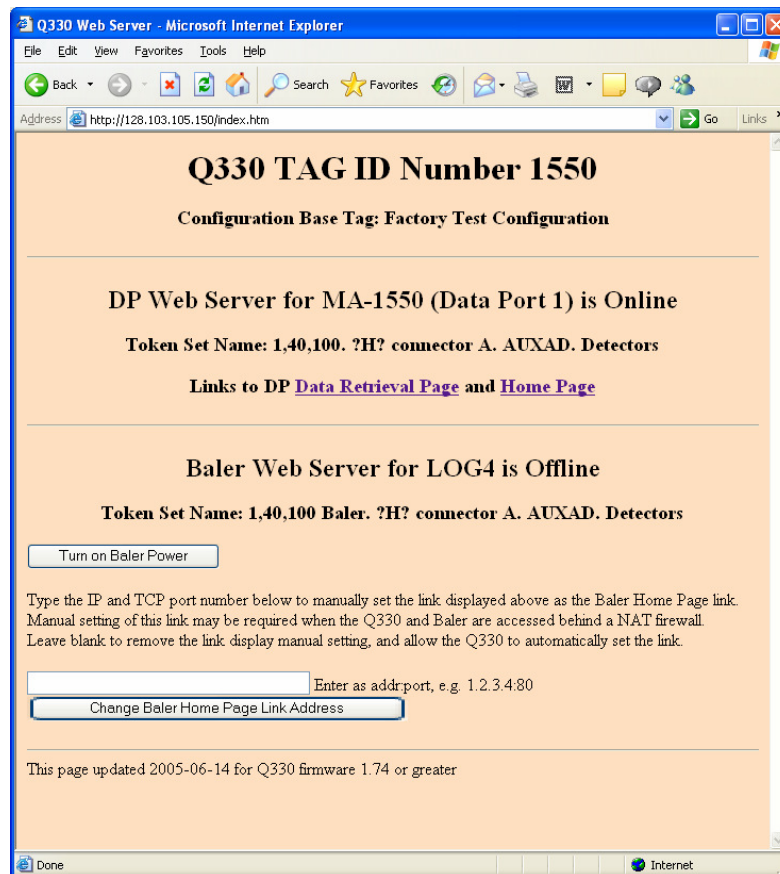
2006-11-12 20:02:53:{607} Physical Port: Ethernet
 2006-11-12 20:02:53:{609} Channels Enabled: 123456 Preamps ON channels:
 2006-11-12 20:02:53:{609} Channel Sensitivities (uV per count):
 2006-11-12 20:02:53:{609} 1:2.3840 2:2.3840 3:2.3840 4:2.3840 5:2.3840 6:2.3840
 2006-11-12 20:02:53:{610} Digitizer Calibration Results:
 2006-11-12 20:02:53:{610} 1:-157529,2.190% 2:-155143,1.190% 3:-156059,1.274%
 2006-11-12 20:02:53:{610} 4:-155411,1.766% 5:-153954,0.804% 6:-154168,0.850%
 2006-11-12 20:02:53:{710} Webserver advertising 216.153.149.86:11081
 2006-11-12 20:02:53:{107} Sending DT_OPEN
 2006-11-12 20:02:54:{112}[2006-11-12 19:23:57] Sequence resumes: 169026 to 169026

HRVX_1 1601_1 1108_1

Start All Stop All Add Station Remove Station Station Manager SeisPOC Close

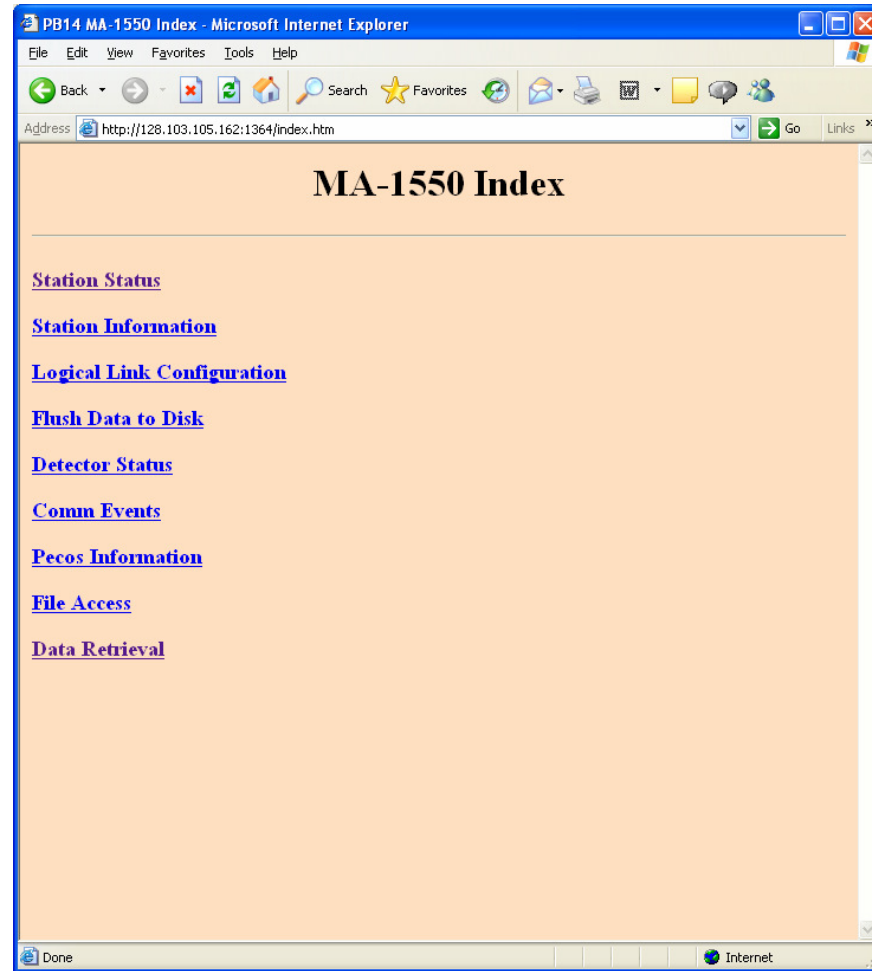
Extracting MSEED data files from Pecos

To extract data from a DP connected to the Q330, open a browser pointed to the Q330's root web server port (configured in Q330 Configuration|Global Setup). The procedure is exactly the same as extracting data from a Baler, except that Pecos is already running, and, of course, does not need to be turned on, like a Baler.



The page shows a DP connected to Data Port 1 (the Pecos we've just built). There is a Baler configured on Data Port 4, but not currently connected to the Q330.

Click on the “Home Page” hyperlink, and you will be viewing Pecos’s internal webserver.



Select Data Retrieval. Enter the channel names you want and time span, and select Download Data

Seed Name(s) ??-??? Record Limit

Starting Time 2005/07/20 Ending Time +86400

Filter by Station Name

Download Data Data Availability Into Binary File

Messages Timing Detections Calibrations List Data Avail.

Notes

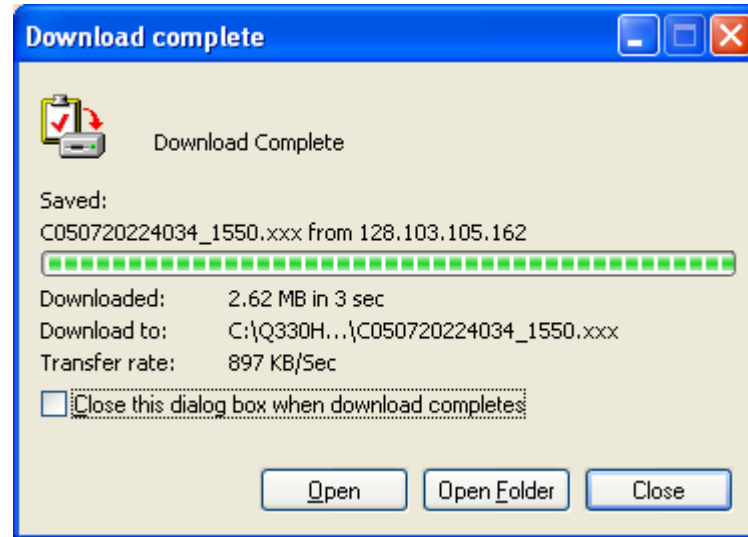
- Current default file naming template is "C*D*T_*S.*C" [Change It](#). The template is used to create a file name for Downloads and Binary Data Availability if no file name is specified. This file name will be used as the default file name on your system
- Seed Name defaults to "LOG" for messages and "ACE" for timing. Seed Name can be a list of names separated by spaces. The name(s) can also contain the ? wildcard which will match any character, such as "BH?". Location codes are separated from the seed name by a hyphen, such as "PS-VBT". Names you don't want included can be specified at the end of the list by prefixing the name with a tilde, "??~LOG" would be all names except LOG.
- Record Limit, if not blank, is the maximum number of SEED data records to extract listings or data from.
- Date format is "year/month/day hour:minute:second". Years lower than 2000 have 2000 added to them. Missing fields assume the beginning of the time interval, "0/8/19 10" is the same as "2000/8/19 10:00:00".
- Starting time may be in the form of -seconds and is interpreted as that many seconds before the current time.
- Ending time may be in the form of +seconds and is interpreted as the many seconds after the starting time.
- If the Station Name is left blank then data from any station stored on the Baler14 will be returned. Only specify a station if you think there might be data from multiple stations.

Current DP Time is Sun, 20 Jul 2005 20:29:02 GMT

[Pecos Index Page](#)

You will be prompted with a usual browser file save dialog.

Select Save and drill to the Cimarron C:\Q330HR\DOWNLOADS\FOURK directory. Again, if you are using another browser, configure the browser to save the downloaded file in this directory.

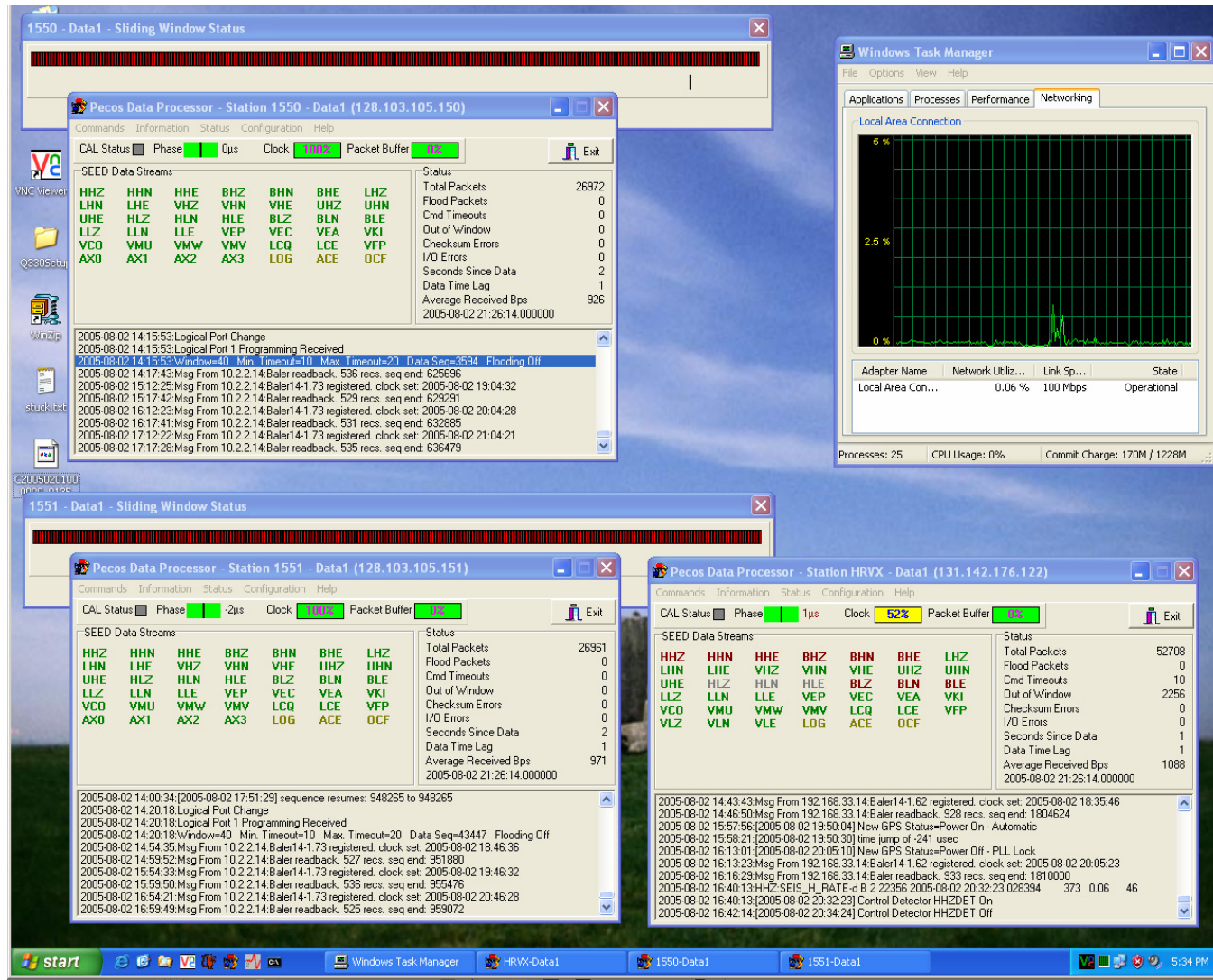


You're now ready to view the data using Cimarron, or any other review tool.

Building a Pecos Station for Data Port 2

Similarly a Pecos station may be built for data port 2 to record the engineering channel names in a separate buffer. A typical modern PC with at least 512Mb of RAM can run 10-20 Pecos programs without degradation. The only requirements are that you don't run out of disk space, and that you assign unique TCP port numbers to Pecos's various servers, as outlined in the IP Resource Planning section.

In this example, the WXP Task manager shows that three 6-channel 100sps Pecos's require virtually no CPU, typical for an average PC.



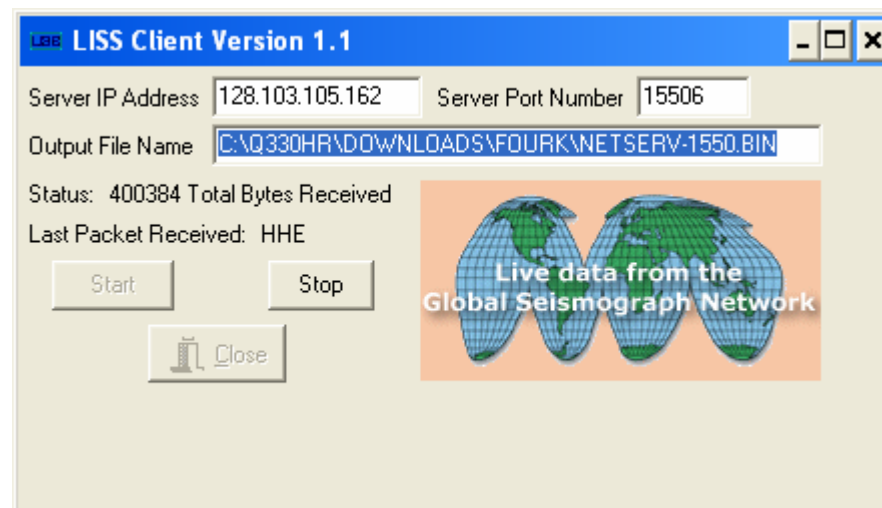
LISS Client Demo

With Pecos running, and assigned a TCP port number for NetServ service, you can connect to it with a LISS client to receive the channels that have been configured in the tokens to be exported to LISS. Included in the distribution package is a very simple demonstration LISS client that simply writes all received data into a binary MSEED file.

To run it, launch the application, and enter the IP address of the computer running Pecos, and the NetServ TCP port number for the selected station. Enter a complete pathname to a file into which to write the data. Note that when the program starts, the defaults may be blank, or point to some other path.

If you make the output file in the DOWNLOADS\FOURK directory, it will be simple to use Cimarron to plot and verify the contents of the file written, just as if you had extracted the file from Pecos or a Baler.

When the information is entered, press Start, and the client will show the byte count increment as packets are received. Note that whenever Pecos is not running, or when Pecos is not currently registered with the Q330, a LISS connection will not be available.



FOR MORE INFORMATION ON SETTING UP A LISS SERVER

For more detailed information on configuring and testing Pecos as a LISS server, an application note is available on the www.q330.com website describing the procedures to set up and test your system: <http://www.q330.com/Download/Secure/AppNotes/LISSClient.pdf>

When a LISS client makes a connection to Pecos, it will be logged in the message area.

Pecos Data Processor - Station 1550 - Data1 (128.103.105.150)

Commands Information Status Configuration Help

CAL Status Phase Ops Clock Packet Buffer Exit

SEED Data Streams							Status	
HHZ	HHN	HHE	BHZ	BHN	BHE	LHZ	Total Packets	2058
LHN	LHE	VHZ	VHN	VHE	UHZ	UHN	Flood Packets	0
UHE	HLZ	HLN	HLE	BLZ	BLN	BLE	Cmd Timeouts	0
LLZ	LLN	LLE	VEP	VEC	VEA	VKI	Out of Window	0
VCO	VMU	VMW	VMV	LCQ	LCE	VFP	Checksum Errors	0
AX0	AX1	AX2	AX3	LOG	ACE	OCF	I/O Errors	0
							Seconds Since Data	1
							Data Time Lag	1
							Average Received Bps	943
							2005-07-26 20:41:58.000000	

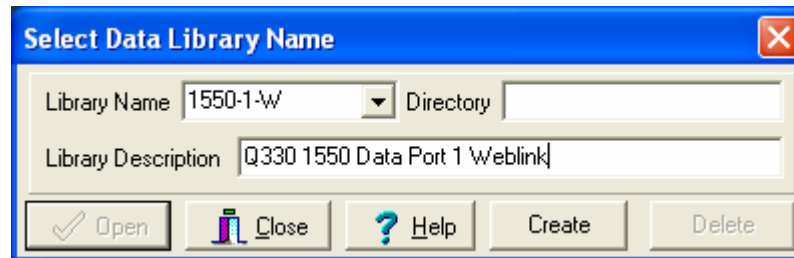
2005-07-26 16:45:15:Packet Buffer Used: 570984
 2005-07-26 16:45:15:Physical Port: Ethernet
 2005-07-26 16:45:15:Pecos Software Version: 1.11 Build 223
 2005-07-26 16:45:15:Disk Size: 536870912
 2005-07-26 16:45:15:Percent of 512 data files in use: 55.3
 2005-07-26 16:45:15:WebLink Data Maps Restored
 2005-07-26 16:45:16:[2005-07-26 20:25:09] sequence resumes: 29020 to 29020
 2005-07-26 16:45:16:[2005-07-26 20:26:54] Control Detector LHZDET On
 2005-07-26 16:45:17:Msg From 128.103.105.162:Pecos Software Version: 1.11 Build 223 registered.
 2005-07-26 16:46:15:Netserv Client 128.103.105.162 connected

Setting up a Weblink to Pecos or a Baler

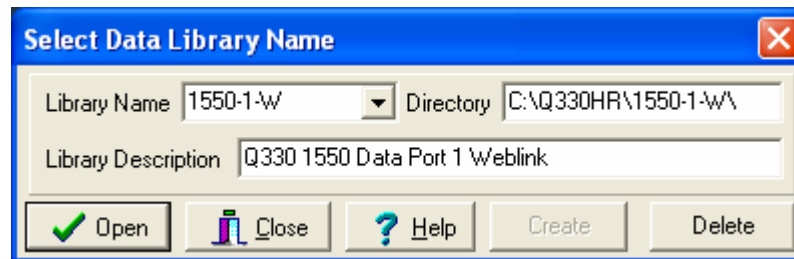
We've built the Cimarron DOWNLOADS Library to use with 4K files that we actually extract into permanent archives. Cimarron also has the Weblink mode for "near real time" reviews of data that Pecos, or a Baler, is recording. This mode allows you to review data just by selecting and plotting without having to explicitly extract a data file. The Weblink function is therefore somewhat analogous to the built in "g p" plot function in MSHEAR "retrieve", except with vastly expanded capability. Because Weblink uses TCP protocols, Cimarron may be used to plot data from a Pecos running on another computer, or even across a WAN. Balers can also act as a server for a Cimarron Weblink connection, when attention is paid to powering up the Baler when required.

To build a Cimarron Weblink connection to the Pecos we've just built, the Cimarron Manager needs to be run, like Willard and Pecos.

To configure a Cimarron Library to use Weblink to communicate with our running Pecos, start Cimarron, and in the Library Name, enter a name that will be used to reference this connection. By default, we use the <station ID>-<data port number>- < letter W>, e.g. 1550-1-W. As with Pecos, when you start typing, Cimarron starts searching for a match. If it finds one, it will be displayed. Note that Cimarron will prevent you from using a directory already used by Willard or Pecos.

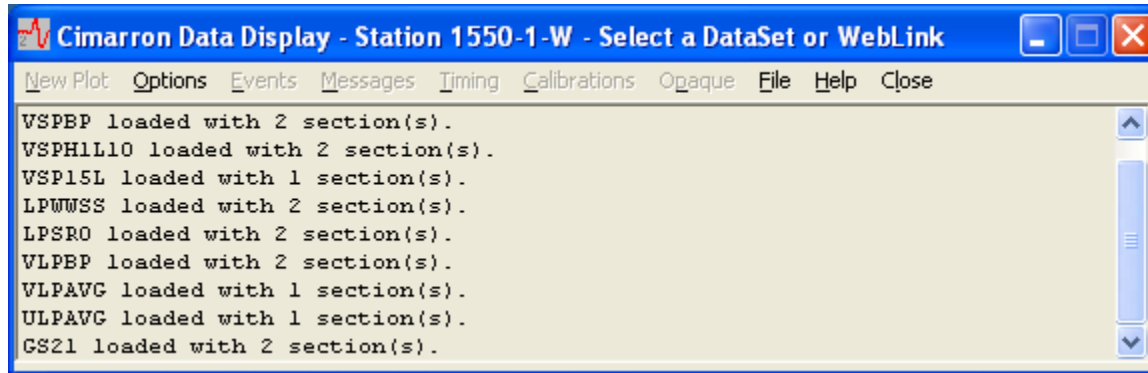


Select Create

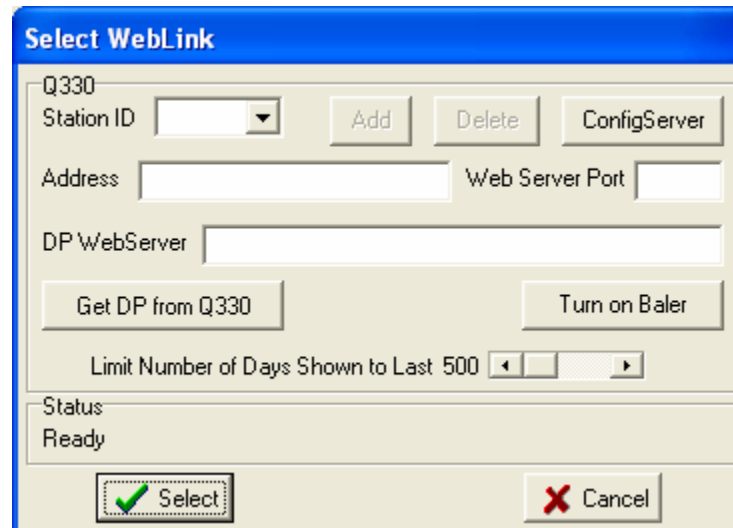


Now select Open

The Cimarron main form will be presented.



Now to configure the Weblink connection, select File>Select Weblink



Type in the Pecos Station ID for the selected data port, and select Add

The screenshot shows a dialog box titled "Select WebLink". It contains a "Q330" section with a "Station ID" dropdown menu set to "1550_1". To the right of the dropdown are "Add", "Delete", and "ConfigServer" buttons. Below these are "Address" and "Web Server Port" text boxes. A larger "DP WebServer" text box is below that. There are "Get DP from Q330" and "Turn on Baler" buttons. A "Limit Number of Days Shown to Last 500" slider is also present. At the bottom, the "Status" is "Ready". The "Select" button (with a green checkmark) and "Cancel" button (with a red X) are at the very bottom.

When you select Add, the button “Get DP from Q330” will become active. This provides a means to contact the Q330 to find who is connected to its Data Port 1. However, we will enter Pecos’ TCP web server port that we have configured on your computer, in this case 15501, which adheres to our IP Resource Planning formula for creation of a unique port number related to the Pecos acquiring data from Q330 tagID 1550.

Next, set the “DP WebServer” to the IP address of your computer running Pecos, and the port number we assigned. Note that a full URL must be specified, as in, for example, <http://128.103.105.162:15501>. Entering the full URL to an IP address of an actual Ethernet interface can be used to Weblink to another computer running Pecos. If you want to limit access only to the same computer that is running Pecos, you can use the computer’s IP loopback address, as below. The TCP port is the same. Pecos listens on both the actual Ethernet interface address, and the IP loopback address.

In addition, you may want to adjust the “Limit Number of Days” to something like 10 to look back for data. Otherwise, when looking back through a large collection of recorded data, it may take a long time just to present the day and hour selection list. Typically a Weblink connection is used to review recent or near real time data. In this case, the limit is set to 6 days in arrears. In the example below, we are weblinking to a Pecos on the same machine on which Cimarron is running. This is specified using the loopback address 127.0.0.1. The address of another computer running Pecos may also be used. In our offices, one PC is dedicated to run various Pecos (and Pecos2) processes; all other systems in the office point to this server.

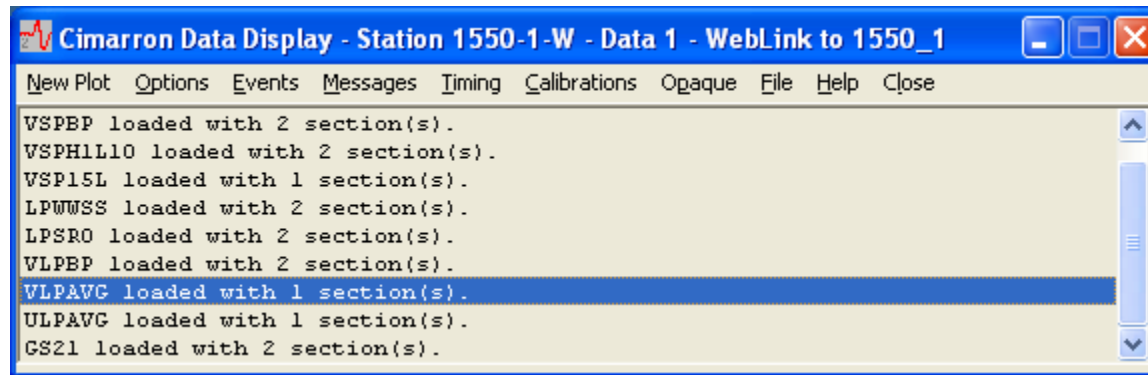
The screenshot shows a dialog box titled "Select Weblink". It contains the following elements:

- Station ID: 1550_1 (dropdown menu)
- Buttons: Add, Delete, ConfigServer
- Address: 128.103.105.150
- Web Server Port: 80
- DP WebServer: http://127.0.0.1:15501
- Buttons: Get DP from Q330, Turn on Baler
- Limit Number of Days Shown to Last: 6 (with left and right arrow buttons)
- Status: Ready
- Buttons: Select (with a green checkmark), Cancel (with a red X)

Note the distributed nature of Weblink. Pecos may be running on another computer. If Cimarron’s “DP WebServer” configuration points to that computer, you will be able to extract real time data from the Pecos running on that computer. The service is somewhat analogous to configuring an X windows client to display on a particular computer’s X server.

Note that Cimarron may also Weblink to a Baler if the Baler’s address is specified. If Cimarron fails to connect, it may ask to turn on the Baler, requiring a one-time entry of the Q330’s S/N and Authorization Code to be able to send a power-up command to the Baler. Using Weblink to a Baler allows seeing samples of the Baler’s data in near real time without bothering to explicitly extract files.

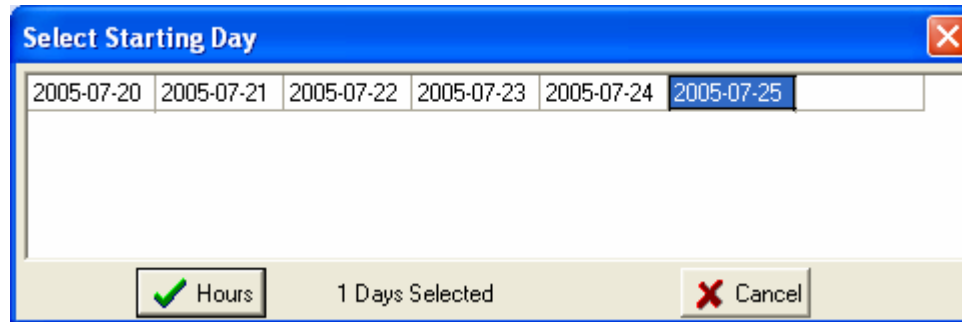
Click Select, and you are ready to view via Weblink data acquired by Pecos.



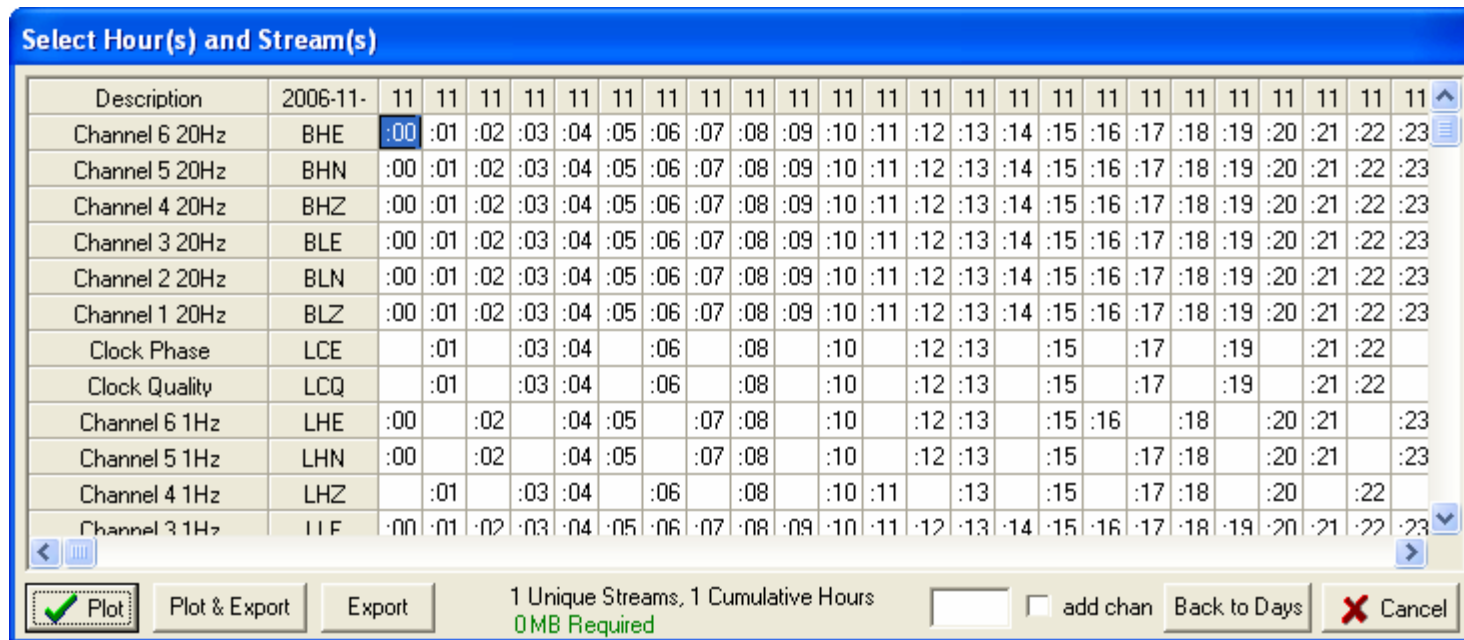
Try "New Plot". A status bar should display showing the live connection to Pecos.



.... Followed by a "day" selection menu. Because we just began acquiring, only today will be available. In the example below, Pecos has been left running for several days to acquire some data for display purposes.



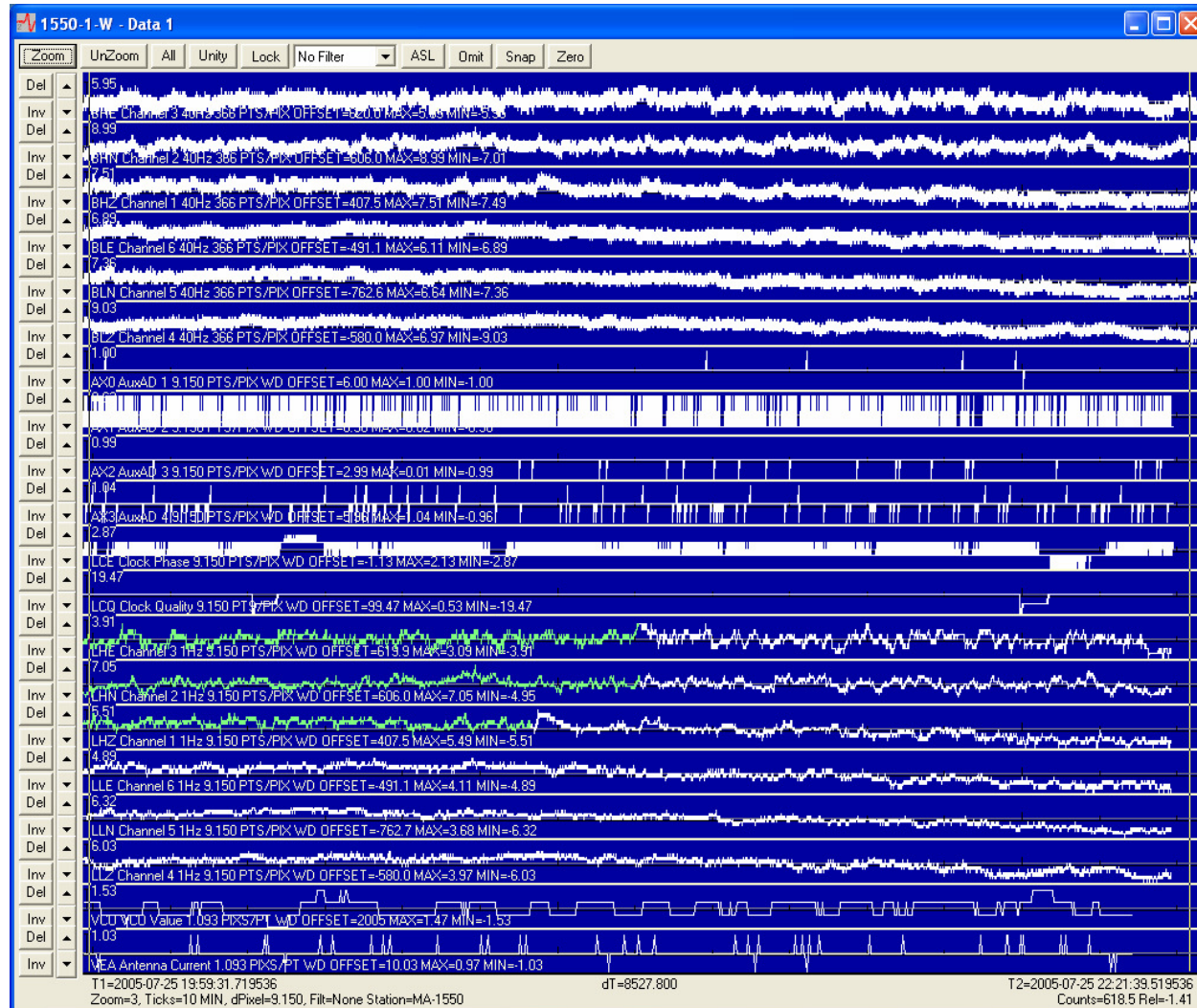
Left click and drag the mouse to select the days you want. Non-contiguous day selection can be made by holding down the CTRL key while you left click on the day(s) you want. After working, the “hour” selection menu will be displayed:



Similarly, select the hour/channel combinations you want, and “Plot”. The data will be retrieved from Pecos in near real time.

Note that you may use the “Export” function to coalesce the selected times and channels into an MSEED output file if desired.

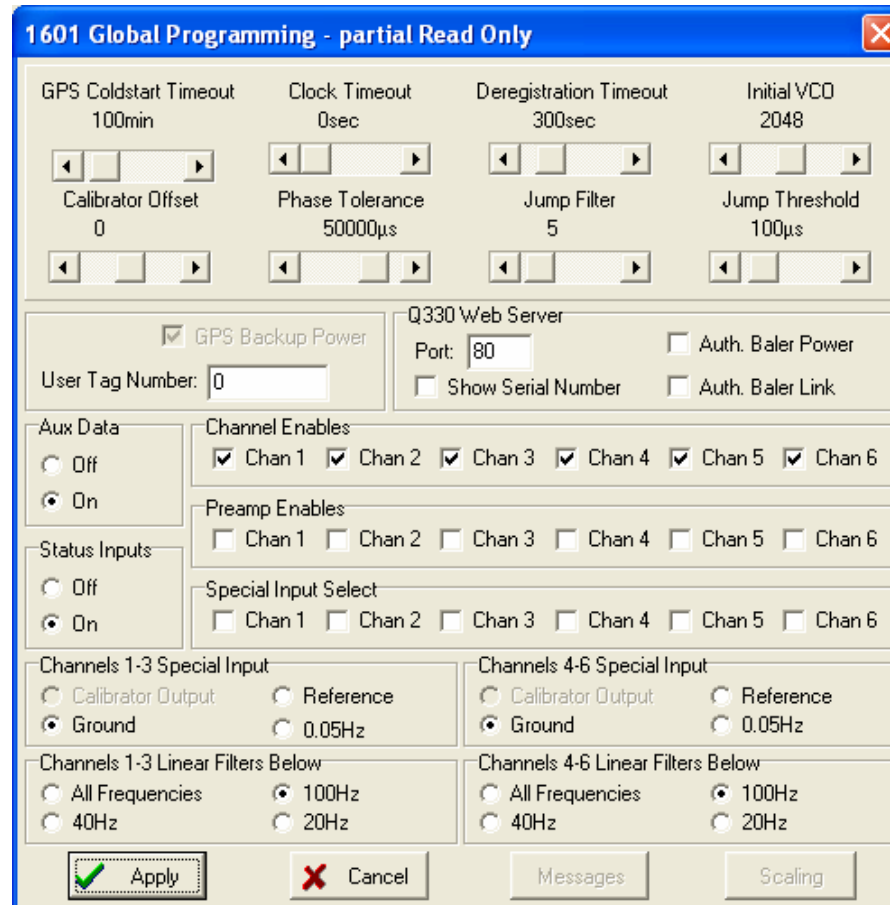
Data plotted via weblink to Pecos



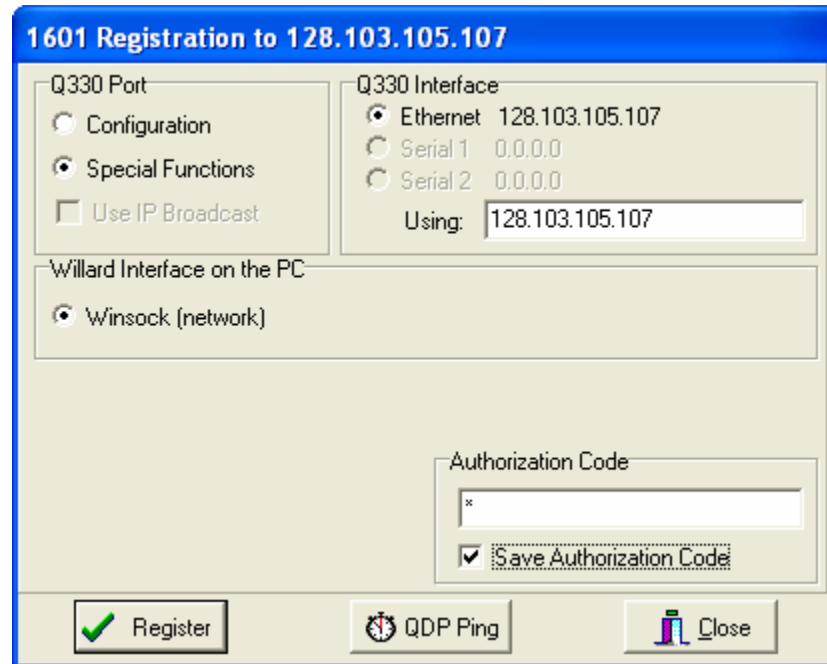
Viewing and Setting AUXAD sampling configuration

The Q330HR comes standard with a 16-bit 8-channel “Auxiliary” A/D, using the expansion site within the Q330. This board is software configurable by channel for single-ended vs. differential, and for gain from a full scale of +/-50V differential to +/- 1.6V. The AUXAD is shipped in a standard configuration for 4 differential channels, and a full scale of +/- 12.6 VDC. Quanterra recommends application in the default configuration.

To view the AUXAD sampling configuration, register with Willard normally, and in the Configuration|Global Setup make sure “Aux Data” is enabled as shown below on the left side of the form. If this control is OFF, no AUX data will be generated.

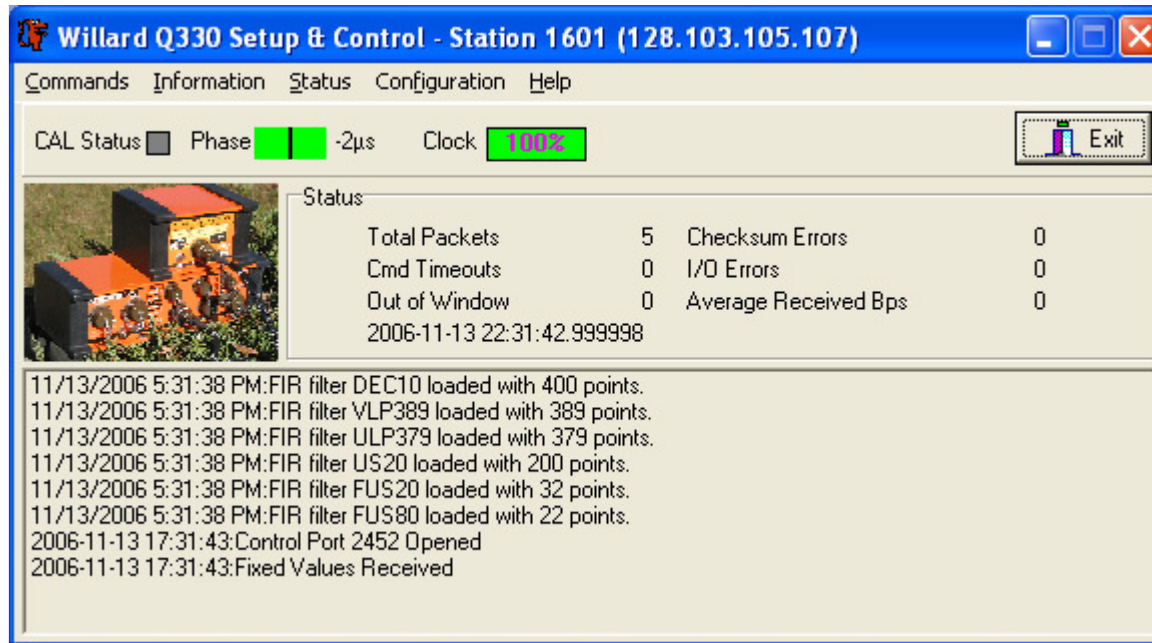


The AUXAD is configured from the “Special Functions” port on the Q330, in order to add a measure of security against inadvertent change of the setup. To access this, start Willard and register on the “Special Functions” port of the Q330. This is required to be able to configure the AUXAD board. The configuration of the AUXAD is written into the flash memory on the AUXAD itself. The Special Functions port is used only to communicate with and configure CNP (Controller Network Protocol) via a “tunneling” mechanism.

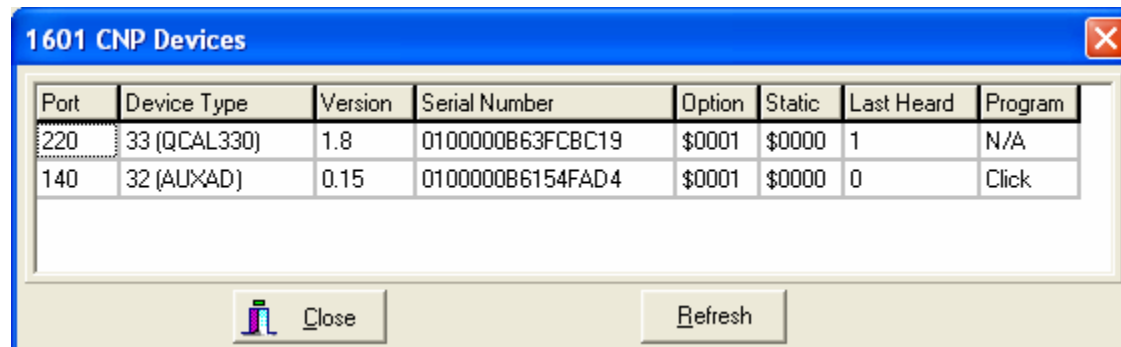


Press Register.

When registered on the Special Functions port only a limited amount of information is read from the 330, and available menus are abbreviated.

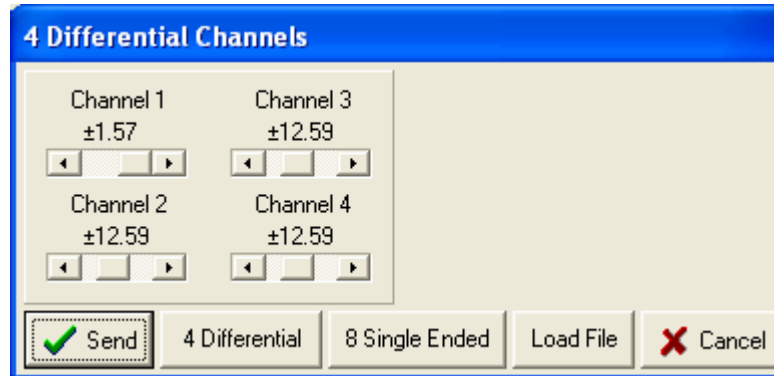


Select “Information\CNP Devices”. If the AUXAD board is alive and functioning, the result will show the AUXAD having been discovered, and report its unique S/N and software version.



To configure the AUXAD, which is necessary only at time of manufacture or to change the configuration, left click on the “Click” area under the “Program” column. WARNING: Do not select this unless you intend to change the AUXAD sampling configuration, and take note of the gain setting after any changes.

A form will be presented showing the present configuration. The factory default is:



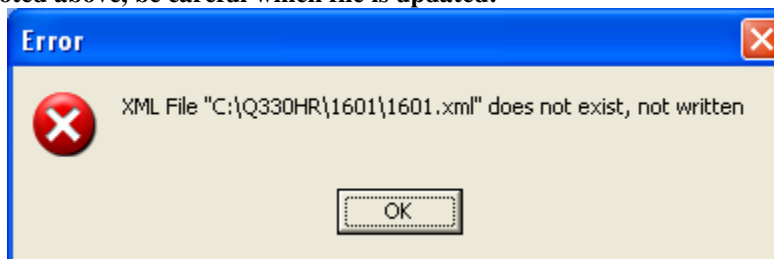
The configuration may be set to 4 differential or 8 single-ended, and the gain may be adjusted per channel in differential mode from +/-1.6VP-P to +/-50V P-P, corresponding to AUXAD preamp gains from 32 to 1. **IMPORTANT:** single-ended mode operates at +/-50V P-P only because of the 1/2-scale bias voltage.

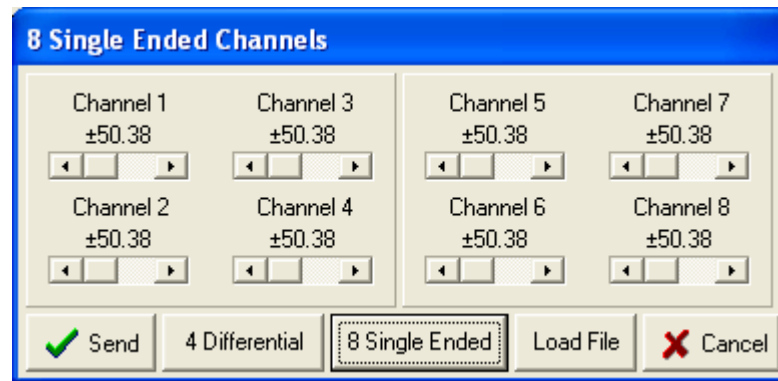


When the configuration is selected, it must be “Sent” to the AUXAD board. When “sending”, Willard will record the configuration setting in the station’s XML configuration file. Willard will update only the pertinent <auxadcfg> section in the file.

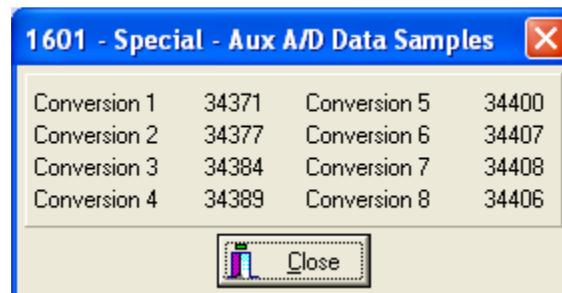
For test purposes to trouble-shoot any suspected internal problem, it is helpful to temporarily configure the AUXAD for single-ended operation. In this case, the reference-derived bias network on the input of each channel defines a voltage at the input of each channel that should be approximately 34350 counts when there is nothing connected to the AUX input connector. This internal check essentially provides a self-test function. For the self-test, configure in this mode. When prompted for an XML file name when saving, provide a name other than the actual unit’s XML configuration file so the operational configuration setting for the AUXAD in the XML file is not overwritten.

You may see a dialog box such as below. When the AUXAD configuration is updated, Willard looks for an XML file into which to record this change. If no file exists, you will see this error. As noted above, be careful which file is updated!





..and select Status/Aux A/D Status which will display a form as below:



You may see the numbers varying slightly. This indicates live conversions. Numbers in the range of 34400 are the expected value.

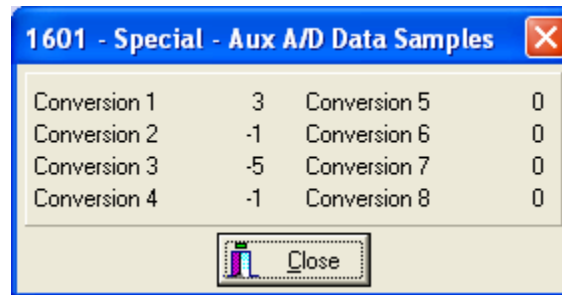
IMPORTANT NOTE: In single-ended mode, gains other than 1, i.e. +/- 50.38VDC full scale, cannot be used.



Now restore the configuration to the default by selecting “4 differential” and adjust gains as required. In the example below, Differential input 1 has higher gain.



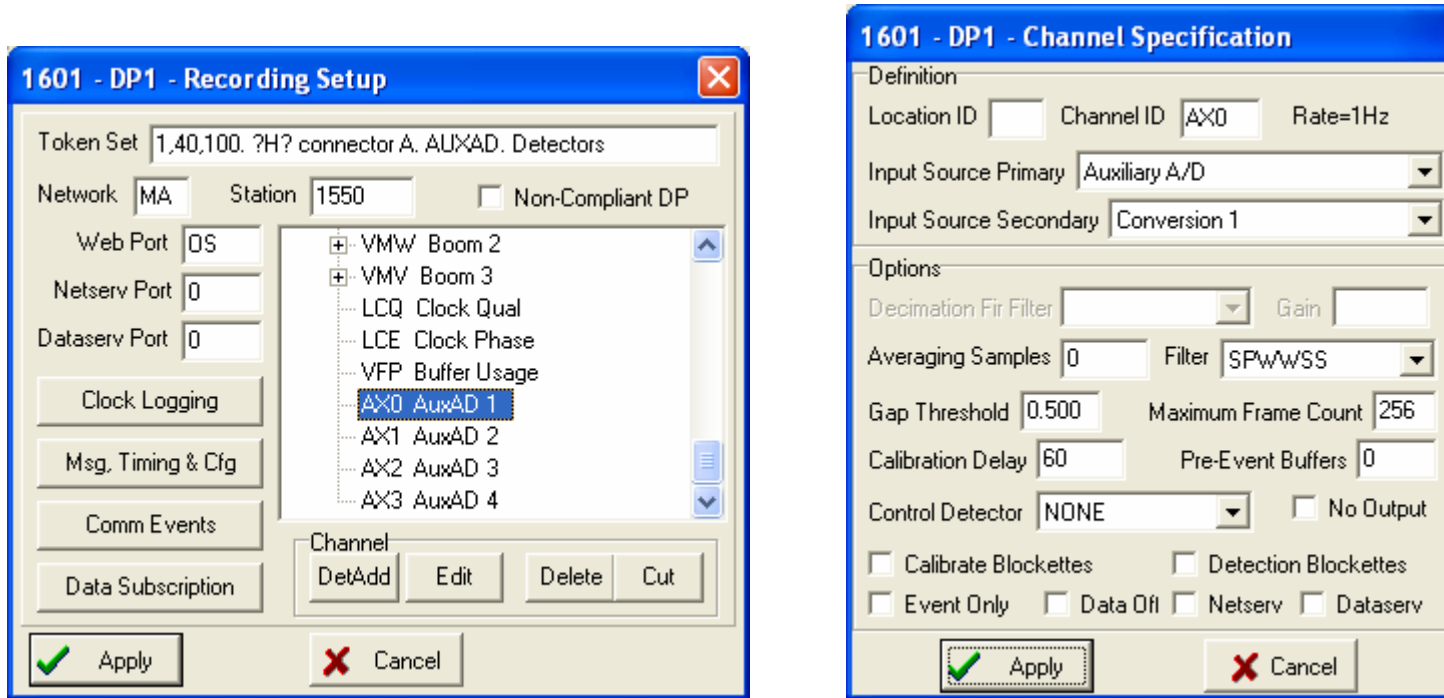
...and the displayed data will change to something like below, with 4 active “conversions” and a small offset, probably in the range of +/-10 counts: This is the normal AUXAD condition when no input signals are connected to the Auxiliary connector.



Programmed in this mode, the differential inputs are seen between AUX0/1, AUX2/3, AUX4/5, and AUX6/7 on the AUXILIARY connector. It is possible to operate in a single-ended mode with separate inputs to each of the AUXx pins, however internal low-pass filtering connects AUX0-AUX1, and so on in pairs, so that if signal inputs vary, there will be undesired coupling between adjacent channels. DC values may be measured as single ended. Clearly, from the point of view of CM rejection, the standard differential mode is preferred and is the default.

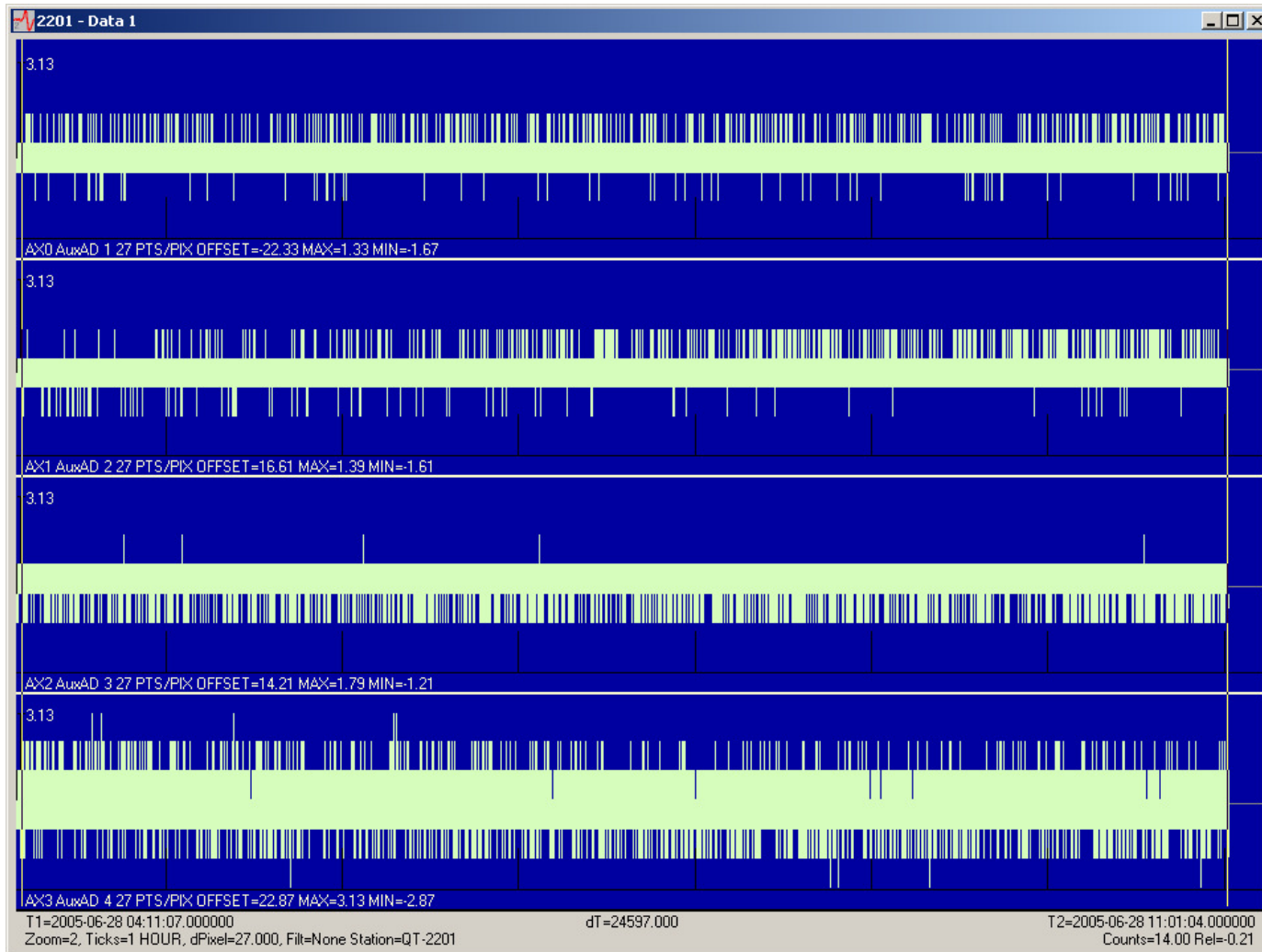
The same Aux status form is available in the non-Special Function Willard and Pecos status menus.

In the default Q330HR tokens, channels AX0-AX3 are defined for the resulting 1sps data.



...and so on for AX1, AX2, AX3 for a total of 4 differential channels.

Typical AUXAD performance of a 7-hour run at a gain of 16, i.e. +/- 3.16V P-P FSR is shown below. At this gain, i.e. 96uV/count, noise is about 35uV rms.



APPENDIX – Loading Q330 firmware modules

Overview

In this section we discuss loading firmware into the Q330. Have no fear! This is a fast and painless procedure. You should always keep your Q330's current. Proper operation, compatibility with data collection systems, and data integrity depend upon using up-to-date firmware in the Q330. That's why we made it easy to update.

Q330 modules and firmware versions

The Q330 internal software is divided into several independent modules. The memory space available for modules is about four times the size of the complete set of modules currently in use. The software is designed to allow new modules to simply be added to the Q330 flash program memory area, without worrying about the existing modules. When booting, the Q330 will select the latest self-consistent set of modules comprising a complete software version. Typically a self-consistent set of about 13 modules are required to comprise a complete version. If all modules comprising a version cannot be located at boot time, the Q330 will automatically revert to the prior complete version.

Appending new modules in the flash program area works until the flash memory area is filled. If the memory space is nearly full, an option allows for some old modules to be erased prior to loading new modules.

Q330 "BASE" firmware version

In addition, the Q330 reserves one complete set of modules in memory (called the "BASE" module set) that cannot be erased or replaced with Willard. In the event that all program modules are erased, the Q330 will always reboot with the BASE version. This is essentially a failsafe feature. A special application, the *flash330.exe* loader program, is required to install the BASE version. The *flash330.exe* program requires physical access to the Q330's serial CONSOLE interface. This is a security feature to insure that alteration of the BASE version is impossible except for an operator with physical access to the Q330.

Q330 firmware version designations

It may help to know about software version and revision numbers. Q330 system software is identified by a major version followed by a revision number. For example, the version and revision numbers as of this writing are:

System software 1.101 using Q330 modules 103.0

Willard program 1.99

Pecos program 1.36

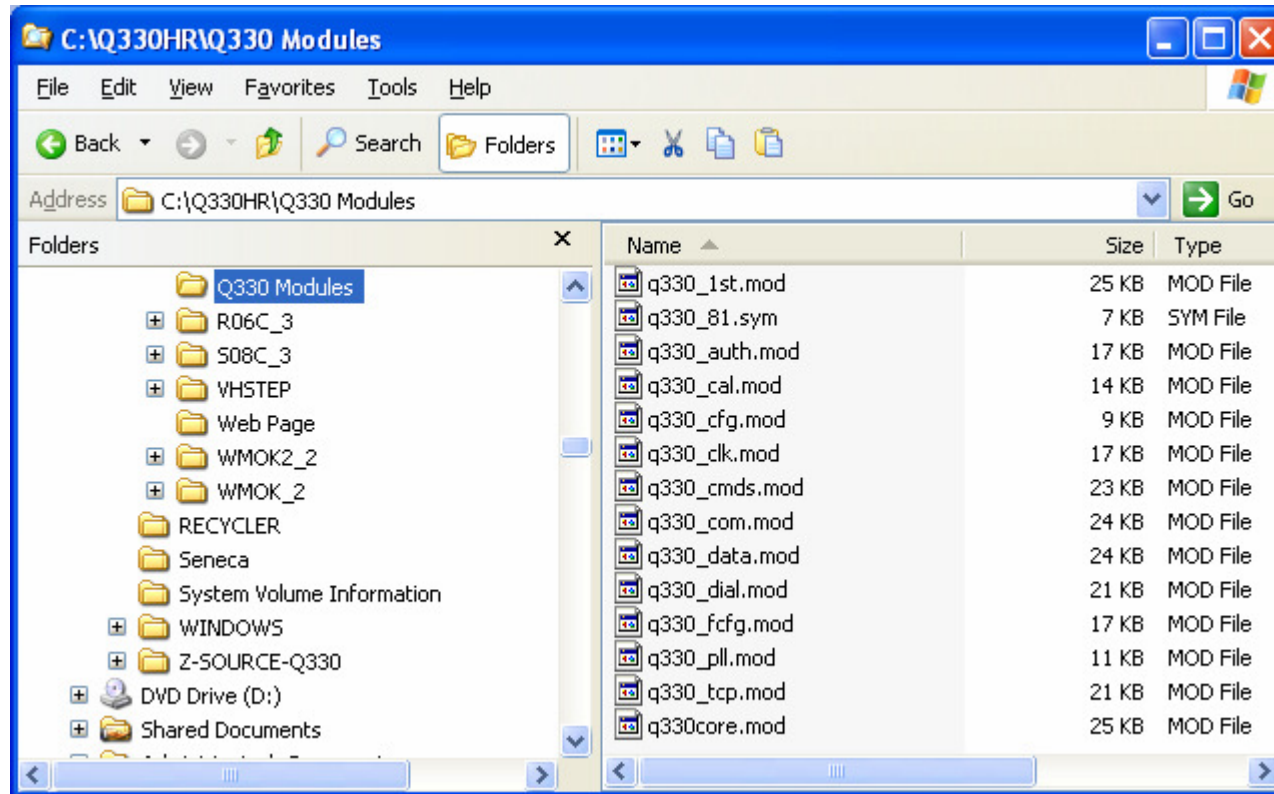
Associated programs that interact with Q330's such as Willard and Pecos share the same major version code, but the revision level increments as necessary for each program independently.

NOTE: When the system software version changes, this represents a potential compatibility in data structures. In such a case the loading of new modules requires attention to the proper sequence: load new Q330 modules, reboot the Q330, and then use the latest Willard to make any new adjustments. A new Willard will always be able to communicate with a Q330 running older software. It is important to use the latest Willard with the latest Q330 software, because an older Willard may inadvertently delete important parameters needed by the latest Q330 software.

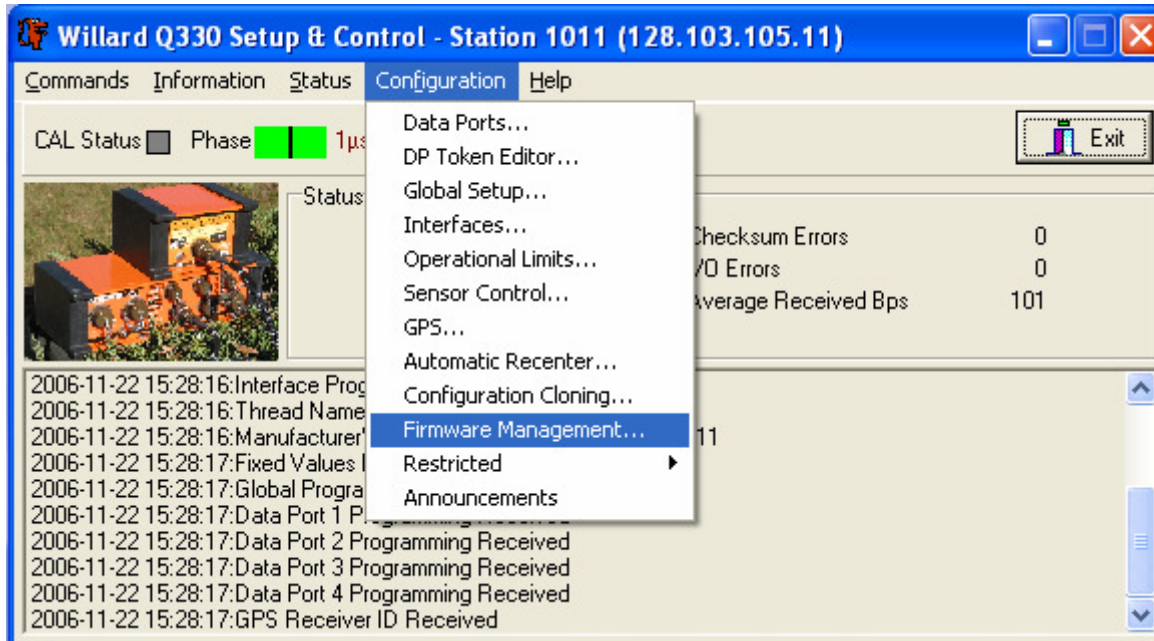
Step by step procedure for Q330 firmware update

1) Extracting the Q330 modules:

The Q330 modules are delivered as a ZIP archive from the www.q330.com website, extract the archive into an empty directory on your PC. In the distribution package, the “C:\Q330HR\Q330 Modules” directory is used by default. If you are loading updated modules, we recommend you rename the old directory and create a new empty directory by the same name to hold the new modules.

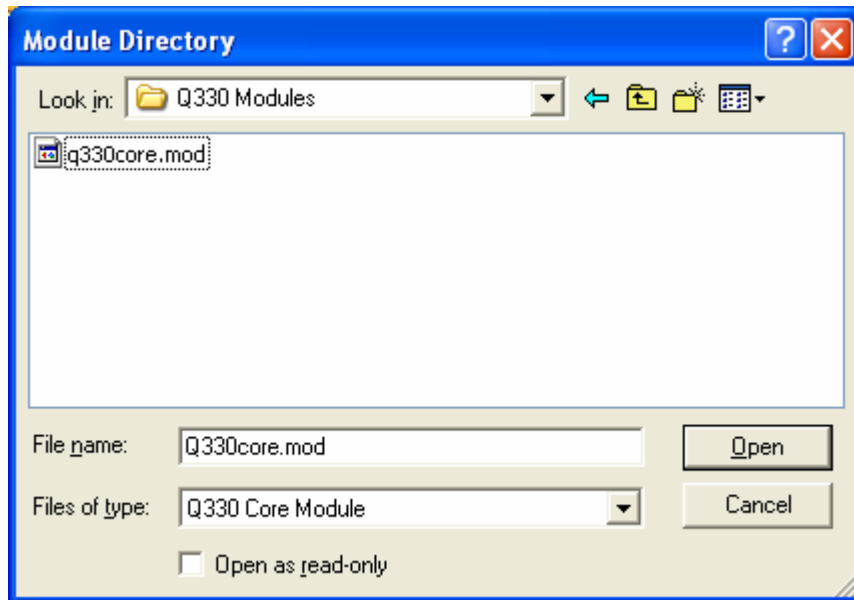


2) Launch the Willard application on your PC and register with the Q330. You may use a “console” cable and connection, or any other “remote” means, including over the Ethernet from remote locations. From the factory, we routinely update firmware on Q330’s installed at remote locations worldwide.



4) Select “Configuration | Firmware Management”

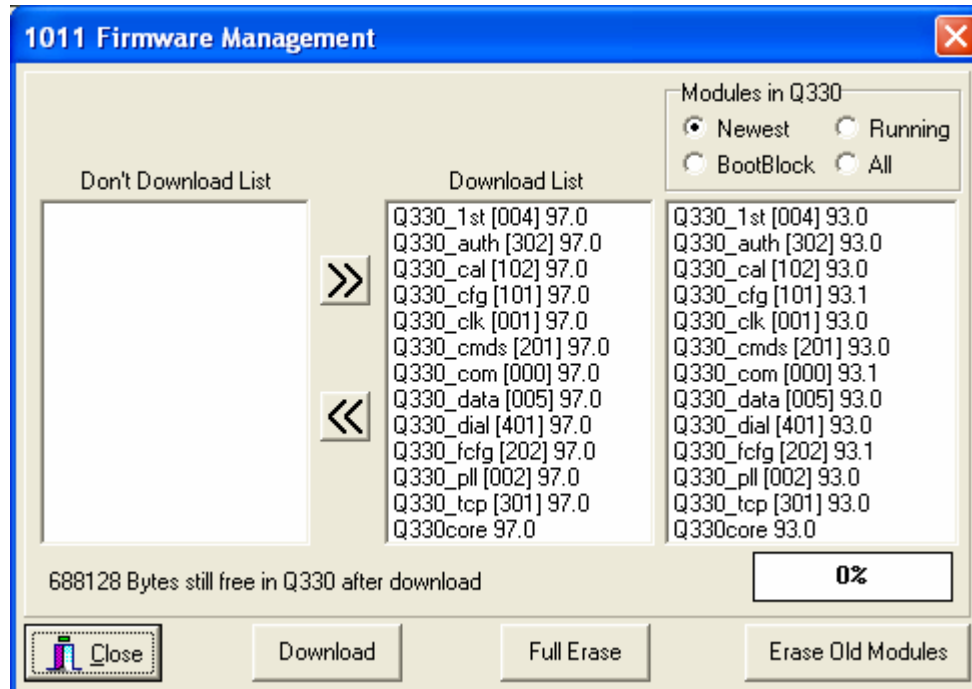
5) Browse to the directory that includes the new modules, for example:



The program is looking for a directory containing the “root” file named Q330core.mod.

6) When you have browsed to this directory, press “Open”.

7) Willard will now present a selection form showing three columns, containing a list of modules that will be omitted (normally this column is blank), a column of modules that will be downloaded (from the files in your firmware directory) to the Q330, and a third column showing a list of the modules now in the Q330. If Willard finds that the modules in your firmware directory are more recent than the ones in the Q330 (in the example below, the directory contains modules with revision level 97.0, while the Q330 contains modules at revision level 93.0), then the “Download List”, the middle column, will be populated with the new modules. If Willard finds that the Q330 is already at a higher or the same revision level, the “Download List” will be empty. Typically, since you will update a Q330 with firmware that is newer than the firmware in the Q330, the form will appear something like that below.

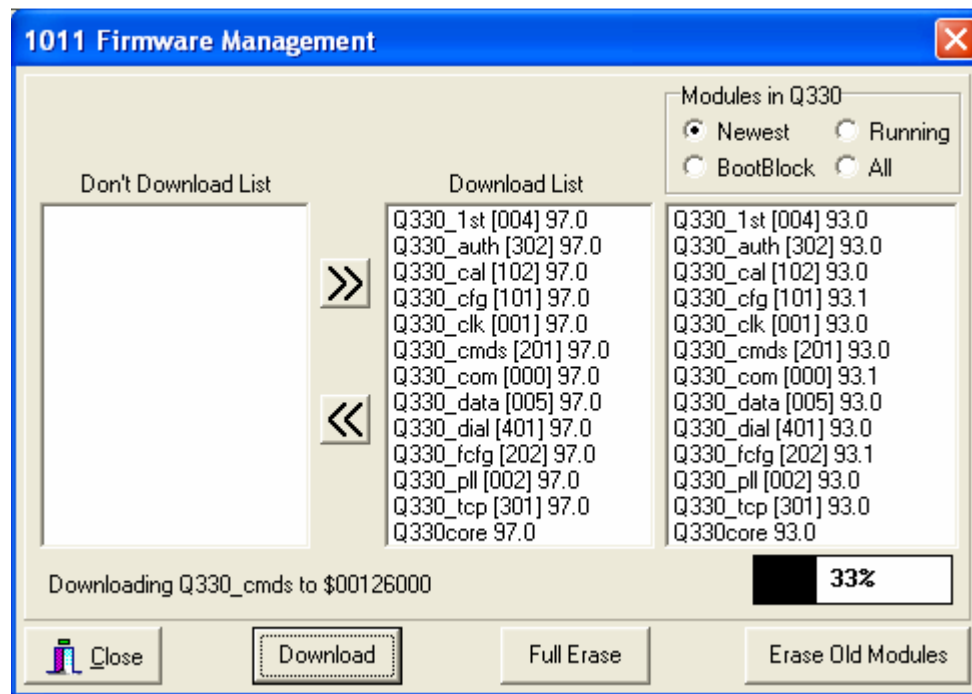


The options available are:

- **Download:** the typical selection, just add new modules. This option will not be available if there is insufficient free memory available to hold the new modules.
- **Full Erase:** remove all existing modules, don't send any new modules (reverts back to reserve "BASE" module set). Reversion to the BASE set would be necessary only in rare circumstances. **IMPORTANT:** This is not normally recommended.
- **Erase Old Modules:** This will erase only the oldest set of modules in the Q330, to make room for new modules. If the Q330 has insufficient space available when you first reach this form, you would typically use this option to make some space available.

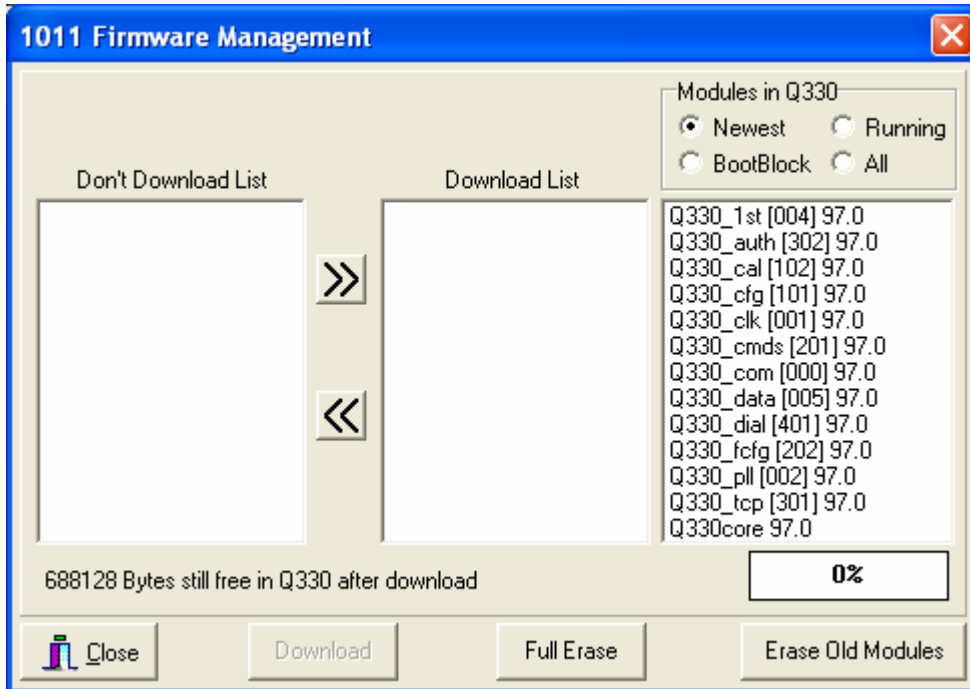
Typically it is necessary now only to press "Download" to install the new software.

DO NOT SHUT DOWN THE Q330 OR CLOSE THE WILLARD CONNECTION UNTIL THE PROCESS COMPLETES.

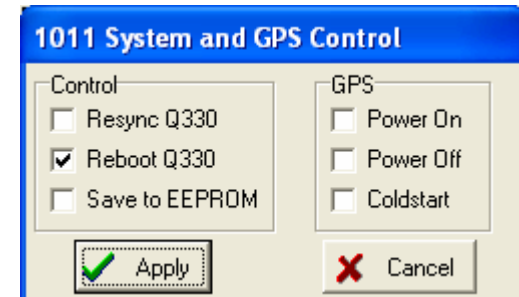
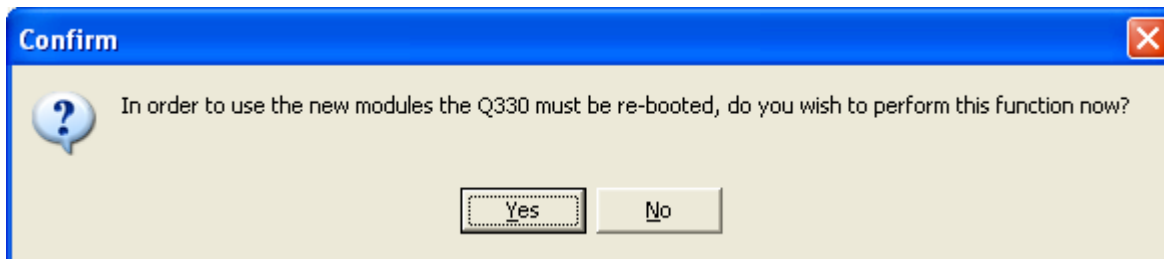


IMPORTANT: This form may appear differently if you are updating a Q330 that contains firmware prior 1.87. In this older Q330 firmware, the "Erase Old Modules" function is not present, and if insufficient space is available, a "Full Erase" is necessary to make space for a new download. Once updated, the Q330 will include the "Erase Old Modules" function.

After the download is completed, the new modules will be shown as “Modules in Q330”.



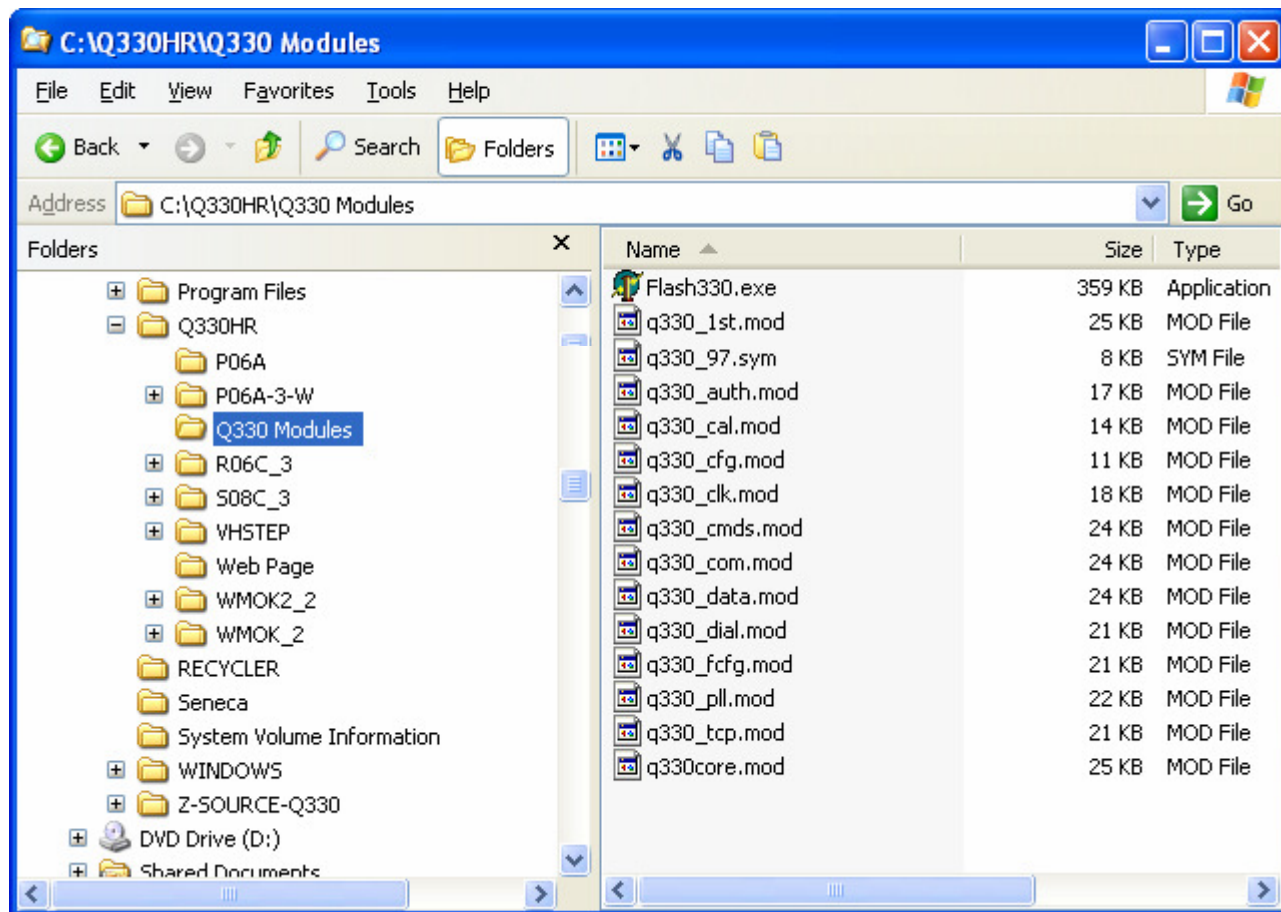
8) When you Close, a dialog box will advise that you should reboot the Q330, select “yes” and click Apply.



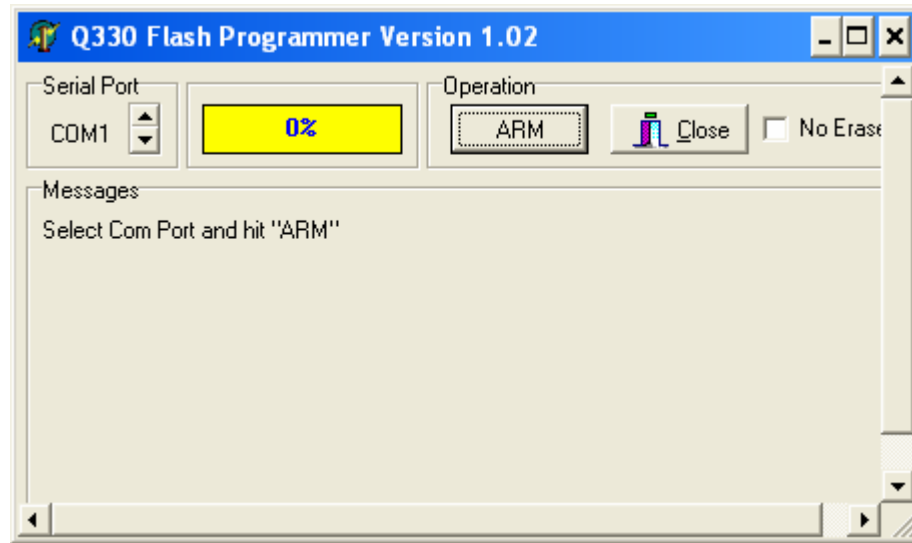
BASE Flash Loading Procedure:

As mentioned above, the “BASE” firmware version is the failsafe version with which the Q330 will reboot if the Q330 cannot find a self-consistent set of modules comprising a complete version. This situation may arise through a fault, or if the user erases all normally-loaded firmware modules.. The *flash330.exe* application allows an administrator to load a set of Q330 modules into memory, regardless of any parameter settings in the Q330 or your PC. Every time the Q330 reboots, it makes a special check on the CONSOLE serial interface for the presence of a special dialog to initiate the flash330 download procedure; if no *flash330.exe* application responds to the Q330 on the CONSOLE interface within the first few seconds after power-on, the Q330 proceeds with a normal boot using its flash firmware modules.

On the CD that came with the Q330, the program *flash330.exe* is located in the “Q330 Modules” folder, together with the current set of Q330 modules. It is also available on the www.q330.com website, either individually or in various kits. The “Q330 Modules” directory should contain both *flash330.exe* application and the Q330 firmware module files, similar to the following:



- Disconnect power from the Q330. This process works ONLY from a power-up to the Q330.
- Connect the PC COM port to the Q330 Console interface using the 109476 or equivalent cable.
- Run the *flash330.exe* program. The program will appear as below:



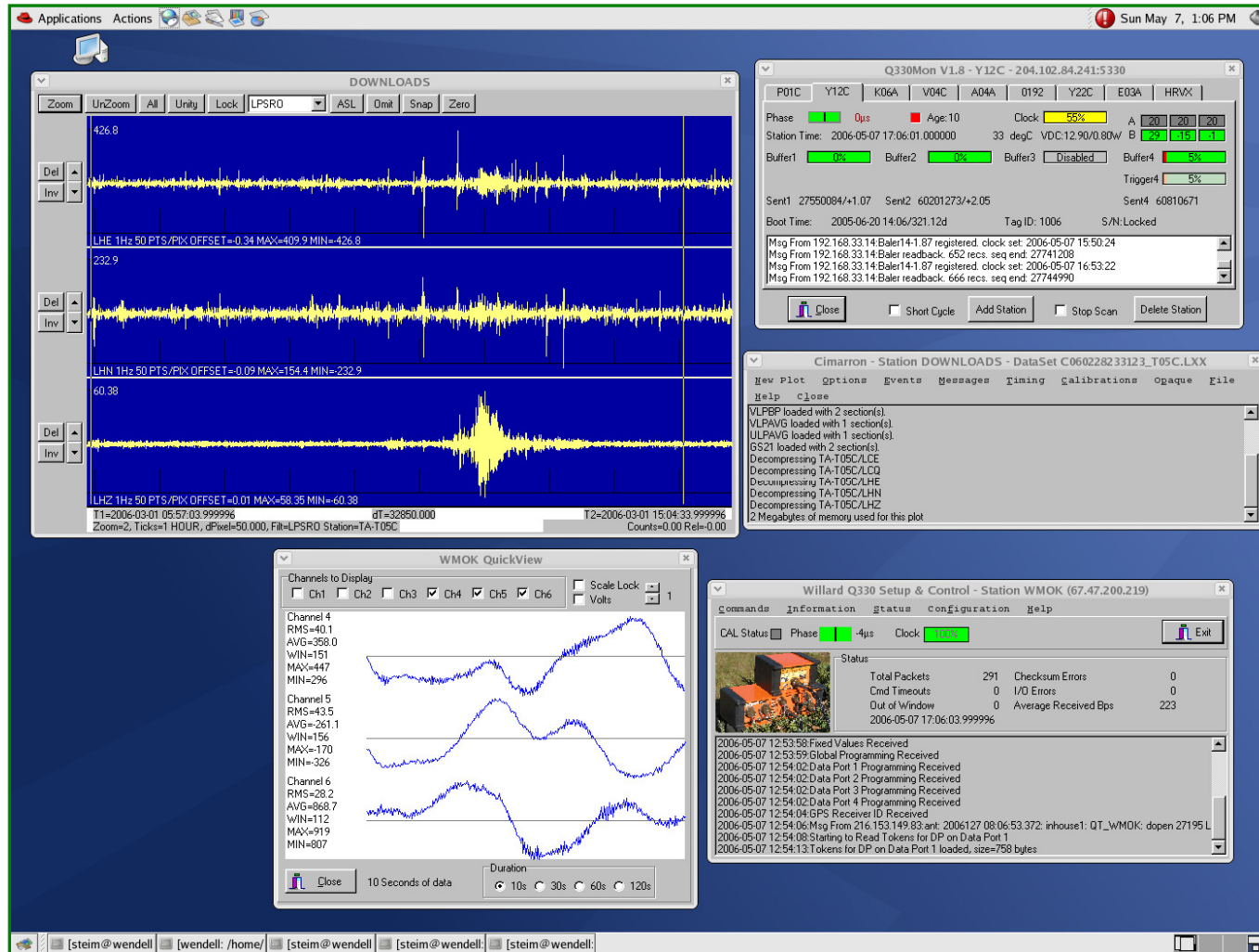
- Select the PC's COM port you are using
- Select "ARM". The program should report that it finds 13 modules.
- NOTE: The *flash330.exe* application must be located in the same directory as the modules
- Apply Power to the Q330.
- *flash330* should report that the Q330 is alive, erase the flash memory, program the 13 modules into flash memory and then the Q330 will reboot.
- Close the flash330 program, and proceed.

NOTE: The Flash330 loader installs the module set as the "BASE" module set that cannot be erased by Willard. The flash330 procedure can be used to install the BASE version to which the Q330 will revert when an Erase is done. It may be necessary, for example, to install a minimum revision level as the BASE version if certain communications features are needed in the firmware to communicate with the Q330 at a remote location.

APPENDIX – Quanterra Administration Tools under Linux

WINE

Quanterra’s tools run without modification on an Intel Linux platform (32 or 64 bit) under wine. The applications may be run from a shell command line invoking the application name, such as “wine willard.exe”. In a system with wine installed, operation is nearly equivalent to native windows operation. The screenshot below shows a number of tools (Cimarron, Willard, Mon330) simultaneously in use on a Redhat Enterprise Linux64 system.



APPENDIX – Q330 Front Panel LED Status Indicators

This section discusses a few points regarding interpretation of the Q330's diagnostic panel LED's. These are quite helpful to obtain a quick operational or trouble-shooting check without the use of any specialized interfaces, other than a look. The following is a topical summary of various LED indications.

You may not have studied the panel. The LED's are grouped into two main areas, STATUS and FAULT. Essentially, any permanent illumination of RED LED's in the FAULT area are cause for concern, with few exceptions (enumerated below).

Boot

When power is first applied to the Q330, there is a particular sequence that indicates a successful initial boot, after which communications will be possible. The sequence is:

1. Apply Power to the Q330
2. The DATACOMM,BOOT,ANALOG illuminate.
3. About 1-2s later the DATACOMM and BOOT should extinguish.
4. The SYSTEM light will flash several times, and then the SYSTEM light will illuminate solid RED, and the GPS SYSTEM will illuminate.
5. If the Q330 is connected to an active Ethernet LAN, the LAN LINK OK light will illuminate, and the LAN DATA light will blink showing network traffic.
6. After another few seconds, the ANALOG LED will extinguish.
7. Within about 1minute or less, the SYSTEM LED will begin to blink either RED or GREEN.

Possible boot failures:

- The DATACOMM,BOOT, ANALOG do not extinguish, or the BOOT LED blinks.
- The CPU LED illuminates, or blinks quickly (1-2 per second) in a pattern to indicate a fault code number
- The SYSTEM LED never begins to blink.

A warning condition is signaled when the BOOT remains illuminated, but all system functions appear normal. This indicates that a prior firmware upload to the Q330 did not complete, and you should erase and re-upload firmware. The Q330 is likely not to be running the version of firmware you may expect, because it was necessary to revert to a backup copy. This situation may arise if you begin uploading firmware to the Q330 and abort prior to completion.

The DATACOMM LED may blink slowly (5s) during operation. The DATACOMM is a programmable indicator that may be associated with the fullness of a particular port's data buffer in the Q300. Therefore whether it blinks during operation depends on user programming and does not necessarily indicate a fault.



Whenever a DP (such as a Baler) registers with the Q330, the Q330 will flash a particular combination of LED's for 5s to visually acknowledge the operation. The same visual acknowledgement is done when an ICMP "ping" is sent to the Q330. Why do we do this? This function was added to enable visually picking a specific Q330 in a room full of them, in response to a network command. The "ping" sequence LED's are SYSTEM(GREEN),DATACOMM,BOOT. Be careful not to confuse this sequence with a reboot scenario, in which the SYSTEM LED will not illuminate, and the ANALOG will.

Power Fault Indication

You may have noticed that there is no power switch on the Q330. Did we forget it? No. The Q330 contains a controller to constantly evaluate the presence and quality of applied power, and to check whether the ambient temperature is within the operating limits of the Q330. If any condition is violated, the controller will refuse to power up the Q330, or will shut it down quickly if it is already running. How do you tell that the controller is unhappy with, for example, the power applied? The PRIMARY POWER FAULT LED will blink if the controller finds the applied voltage outside the allowable Operating Limit (programmed in the Q330).

OK, you say, I applied power to the Q330, there was some blinking, and now not only the PRIMARY POWER FAULT, but also all other LED's are dark on the Q330 – it acts inert. What happened? The most likely explanation is that there was a brief, transient interruption of power (see the lengthy discussion of power requirements elsewhere in this document), and now the controller sees no fault (the LED is dark), but it is waiting for a safe period of a few minutes before attempting to power up the Q330. You may remove power from the Q330 and wait for the PRIMARY POWER LED to stop blinking, then reconnect power in order to avoid having to wait for the automatic attempt to reboot.

System Status

The SYSTEM STATUS Led serves several purposes. Any time the Q330 is running in steady-state, it should blink slowly (every 5s) either GREEN or GREEN followed by RED. Blinking means the digitizer is running. The presence of GREEN means that at some point, GPS time was acquired. Therefore the absence of either blinking or any GREEN color is a fault condition.

CPU Fault

You're unlikely to see this one. If the Q330 begins to run, and should crash for some reason, this will blink for several minutes until the controller notices the crash and performs a power cycle on the main CPU. While we have been able to produce obscure software errors that induce a crash, persistent CPU fault indications usually signifies a hardware problem.

Other STATUS indicators

The LINK and DATA LED's on the Ethernet are standard indicators. If they are not illuminated, the Q330 has powered down its internal Ethernet interface. Note that if you plug the Q330's Ethernet into a switch while the Q330 is already running, up to 100s may be required for the Q330 to detect the type of network and enable the Ethernet interface.

GPS SYSTEM STATUS indicates that the GPS Engine is currently operating. Typically unless continuous GPS is programmed, this LED will be dark most of the time. A GPS FAULT indication means that the antenna cable is shorted.

APPENDIX – Q330 Connectors

Revision history:

2001/06/20 created

2001/12/18 reorder UVW to UWV mass pos, correct QNET Pin A to Rx-

2002/02/27 Added DB9 and DB25 definition to serial port

2002/09/23 added KMI part numbers

2002/10/26 put the part numbers on the right line, adjusted sensor conductor to match Willard options, removed baler serial port on PWR

Connector types

The connectors on the Q330 are Souriau 851 series.

See specifications from the manufacturer <http://www.connecttech.com/catalogs/851.pdf>

Connector kit

In addition to complete cable assemblies, a complete kit of mating connectors for the Q330 is available.

110904-01 (3 channel) 110904-02 (6 channel) Q330 Mating Connector Kits – These contain one each of all mating connectors for the Q330 front panel, except for the commonly available BNC connector for the GPS antenna. The 3 channel kit contains one sensor connector, while the 6 channel kit contains two.

Q330 Connector Pin List

These are the connectors on the Q330, the connector on the cable, or connectors in the connector kits, mate with those listed below.

Summary list

Sensor A	26 conductor	Socket	851-07A16-26S50-A7
Sensor B	26 conductor	Socket	851-07A16-26S50-A7
Serial Output	23 conductor	Socket	851-07A16-23S50-A7
QNET port	15 conductor	Socket	851-07A14-15S50-A7
Auxiliary	18 conductor	Socket	851-07A14-18S50-A7
Ext. GPS	14 conductor	Socket	851-07A12-14S50-A7
Console	10 conductors	Pin	851-07A12-10P50-A7
Power input	6 conductor	Pin	851-07A10-98P50-A7
GPS antennae	2 conductor	BNC	female bulkhead

Sensor Group A or B – CH1-3 on A, CH4-6 on B

26 conductor Socket 851-07A16-26SN50-A7

Mating Connector: 851-06EC16-26P50 KMI P/N:851557

Q330: 67.5Kohm input impedance at gain=1, 201Kohm input impedance at gain=30

Q330HR: 57.1Kohm input impedance at gain=1, 201Kohm input impedance at gain=20

Q330	EpiSensor		STS-2	CMG-3T			
A	1/4 +		Z +	Z +	B	Z +	A
B	1/4 -		Z -	Z -	G	Z -	B
C	Ch 1/4 gnd		sig pair shield	sig pair shield			
D	2/5 +		Y +	Y +	C	N +	C
E	2/5 -		Y -	Y -	H	N -	D
F	Ch 2/5gnd		sig pair shield	sig pair shield			
G	3/6 +		X +	X +	D	E +	E
H	3/6 -		X -	X -	J	E -	F
J	Ch 3/6 gnd		sig pair shield	sig pair shield			
K	Mpos 1/4			U	T	Zmassp	G
L	Mpos 2/5			W	U	Nmassp	J
M	Mpos 3/6			V	V	Emassp	L
N	MposRTN A/B			gnds	F	sig gnd	N
P	Calen A/B		calen	Calsw	K	Z,N,Ecalen	R,S,T
R	Genen1 A/B			autz	E	centre	U
S	Genen2 A/B			Sigsw	L	lock	X
T	Genen3 A/B			persw	R	unlock	W
U	CtrlRTN A/B			ret	S	l_sigrtn	Y
V	Calsig A/B		calsig	U,V,Wcal	Q,N,P	calsig	P
W	CalRTN A/B		calret	ccom	M	sig gnd	N
X	+3.3VID A/B						
Y	IDIO A/B						
Z	IDRTN A/B						
a	PGP			overall shield			
b	+12V A/B			+VIN	W	+12V	c

c	SRTN A/B			-VIN	X	gnd	b
---	----------	--	--	------	---	-----	---

Serial output ports (2 serial ports, 1 connector)

23 conductor Socket 851-07A16-23S50-A7

Mating Connector: 851-06EC16-23P50 KMI P/N:851736

RS-232C UDP framed SLIP, no CNP protocol

Pin	Function	DTE	
A	X1TXD Serial output port 1	DB9P-3	DB25P-2
B	X1RXD	DB9P-2	DB25P-3
C	X1GND	DB9P-5	DB25P-7
D	X1RTS	DB9P-7	DB25P-4
E	X1CTS	DB9P-8	DB25P-5
F	X1DTR Recorder Power Up	DB9P-4	DB25P-20
G	X1DSR	DB9P-6	DB25P-6
H	X1DCD	DB9P-1	DB25P-8
J	X1RI	DB9P-9	DB25P-22
K	X2TXD Serial output port 2	DB9P-3	DB25P-2
L	X2RXD	DB9P-2	DB25P-3
M	X2GND	DB9P-5	DB25P-7
N	X2RTS	DB9P-7	DB25P-4
P	X2CTS	DB9P-8	DB25P-5
R	X2DTR Recorder Power Up	DB9P-4	DB25P-20
S	X2DSR	DB9P-6	DB25P-6
T	X2DCD	DB9P-1	DB25P-8
U	X2RI	DB9P-9	DB25P-22
V	XGNDSP1		
W	OSPARE2+		
X	OSPARE2-		
Y	X2GNDSP2		
Z	PGP		

GPS antenna

Mating Connector: KMI P/N:10905-PL

BNC Male to RG-174/U 50 ohm coax, 15 feet nominal , up to 60 feet possible

BNC female

2 conductor 3 VDC bias for antenna present on the center pin. DO NOT SHORT.

Console Port

10 conductors Pin 851-07A12-10P50-A7

(compatible with Altus RS-232 port and 109476 cables)

Mating Connector: 851-06EC12-10S50 KMI P/N:851020

RS-232C UDP framed SLIP, no CNP protocol

This Connection overrides X3 access via IrDA or Power Port

(109476 is a null modem cable to connect console to COM1)

A	X3BDCD	DB9S-1	DB25-8
B	X3BCTS	DB9S-7	DB25-4
C	X3BRTS	DB9S-8	DB25-5
D	X3BDSR	DB9S-4	DB25-20
E	X3BGND	DB9S-5	DB25-7
F	X3BDTR	DB9S-6	DB25-6
G	X3BTXD	DB9S-2	DB25-3
H	X3BRXD	DB9S-3	DB25-2
J	PGP	shell	
K	X3BRI	DB9S-n/c	

Ext GPS Port

14 conductor Socket 851-07A12-14S50-A7

Mating Connector: 851-06EC12-14P50 KMI P/N:851735

A	X4TXD	GPS TX	exported from internal GPS
B	X4RXD	GPS RX	imported from external GPS
C	X4GND	GPS COM	
D	X41PPSOUT	RS-232	exported from internal GPS
E	X4PWR	engine power	<u>enable</u> signal
F	X41PPSIN	RS-232	imported 1PPS from external GPS
H	X41PPS+	RS-422	bidirectional 1PPS
J	X41PPS-	RS-422	bidirectional 1PPS
K	X4PRTN	engine power	<u>enable</u> signal return
L	PGP		
M	PGP		
N	PGP		
P	PGP		
R	PGP		

Auxiliary Port – AUXAD input

18 conductor Socket 851-07A14-18S50-A7

Mating Connector: 851-06EC14-18P50 KMI P/N: 851022

- A AUX0 + 1 |_ Differential 1
- B AUX1 - 1 |
- C AUX2 + 2 |_ Differential 2
- D AUX3 - 2 |
- E AUX4 + 3 |_ Differential 3
- F AUX5 - 3 |
- G AUX6 +4 |_ Differential 4
- H AUX7 -4 |
- J AUXGND – NORMALLY DO NOT CONNECT!
- K ISPARE1+
- L ISPARE1-
- M ISPARE2+
- N ISPARE2-
- P ACOK+
- R ACOK-
- S VMINBYP+
- T VMINBYP-
- U PGP

Power Input

6 conductor Pin 851-07A10-98P50-A7

Mating Connector: 851-06EC10-98S50 KMI P/N:851242

serial port is subordinate to connection at Console port or IrDA, CNP protocol supported

- A +12 VDC in (10-18VDC)
- B Common
- C X3TXD
- D X3RXD
- E X3GND
- F PGP

Q330 QNET Port

15 conductor

Socket 851-07A14-15S50-A7

Mating Connector: 851-06EC14-15P50 KMI P/N:851734

A	RX - (10BaseT)	
B	RX + (10BaseT)	
C	TX + (10BaseT)	
D	TX - (10BaseT)	
E	TRIGIN+	opto input to Q330 indicating an event
F	TRIGIN-	
G	MAINPON+	opto input to Q330 indicating turn on Q330 main power supply
H	MAINPON-	
J	ANPWRON+	opto input to Q330 indicating turn on analog power section
K	ANPWRON-	
L	ENETBPWR+	contact closure output to Baler requesting Baler power up.
M	ENETBPWR-	
N	+VBALER	available power supply for Baler
P	PGP	protective ground plane
R	PIR	available power supply return for Baler

Baler QNET Port

15 conductor

Socket 851-07A14-15S50-A7

Mating Connector: 851-06EC14-15P50

A	RX - (10BaseT)	
B	RX + (10BaseT)	
C	TX + (10BaseT)	
D	TX - (10BaseT)	
E	Serial DSR	used to request power up in serial mode
F	Serial GND	
G	Serial RXD	into Baler
H	Serial CTS	hardware handshake into Baler
J	Serial TXD	from Baler
K	Serial RTS	hardware handshake from Baler
L	ENETBPWR+	contact closure input to Baler indicating Baler should be powered
M	ENETBPWR-	
N	+VBALER	power supply input for Baler from Q330
P	PGP	protective ground plane
R	PIR	power supply return for Baler from Q330

APPENDIX – FAQ’s – Frequently Asked Questions

What are all these IP addresses?

A Q330 is a network-intensive device. It’s really a compact combination of a data acquisition system and an IP router having 3 network “interfaces”, i.e. one Ethernet and two Serial. Each interface in the Q330 may have a unique IP address. In addition, the Q330 contains the information required to setup the IP system in a Baler that, in general, may be attached to each of the Q330’s interfaces. Each Baler may have two network interfaces. Therefore these addresses alone comprise up to 9 IP addresses. In addition, numerous IP ports must be defined for their appropriate IP services. This sounds complicated, but in almost all applications, one need usually be concerned only with a few addresses and ports on the appropriate interfaces based on the resource requirements discussed in this document. The Q330 is a powerful and flexible networked system, however, and understanding its IP capabilities can unlock greater utility and security in your operation.

Where do I specify the Q330’s ‘netmask’ and ‘gateway’?

You don’t. The Q330 doesn’t need these parameters for its network interfaces. It discovers this information automatically. There is one exception, where “Announcements” are used. In this case, a gateway must be specified,, since there is no way for the Q330 to discover this information.

I typed the IP address I want into Willard’s registration dialog, but can’t talk. Why?

Using Willard (or any program) to talk to the Q330 requires that 1) Willard uses the IP address of the Q330 (except in broadcast mode as described in this document) and 2) that the Q330 has been configured to have the IP address that Willard will use to contact the Q330. They must both agree, or not communications is possible. Typing the IP address of the Q330 into Willard’s registration dialog when Willard launches defines the address used for 1). You must be sure that 2) is observed.

I get a ‘Port in Use’ error from Willard or Pecos. What’s that?

This means that another client is registered on the port (data or configuration) of the Q330 that you are trying to use. This can occur either when two users actually attempt to use a port simultaneously (since the Q330 allows only one user per port), or if your Willard or Pecos session crashes for some reason without graceful de-registration from the Q330, and you attempt to re-register immediately. You must wait until the other use of the port has terminated, or, in the case of a client crash and immediate attempt to re-register, you must wait until the Q330 times out your previous session, typically within 10 minutes.

Pecos or Willard’s ‘Exit’ button de-registers the session first, then closes the program window. Closing one of these programs using the Windows OS close window ‘X’ button (upper left corner of window) just closes the program window without de-registering. In

this case you must wait until the Q330 times out your previous session.

I get some 100xx error code from Willard. Why?

This is a Windows error code, and does not originate in the Q330. In fact, the “10000” error codes have nothing to do with the Q330 or Willard. They are typically the result of some error in the Windows Networking configuration on your PC.

What's an "Authorization Code"? ...and if I forget it?

The Q330's 16-digit numerical serial number and “Authorization Code” are required to authenticate login to the Q330. These two values are roughly analogous to a user name and password. The “Authorization Code” is set to the value ‘0’ at shipment. Authorization codes for all ports may be set using Willard, for which the authorization code for the configuration port must be known in order to register. This may be thought of as the “root” authorization code. If you have changed the configuration port authorization code and forget this, you must return the Q330 to the factory to be reset.

What am I supposed to do with the roughly 1 million parameters in the Q330 that Willard can control?

The short answer is to ignore most of them. You should understand the configuration requirements for setting up network communications, discussed in this document. You should also understand “cloning” and the ability to load a default configuration close to your desired setup. Most parameters can be left at their default values. As you gain more experience and understanding, you may be in a better position to make specific adjustments for special purposes.

So I want to talk to a Q330 and baler on the net. How?

Planning your network resource requirements based on the discussions in this document is the essential first step. Then set up your Q330 as described here using a simple console connection to the Q330. Incrementally advance to testing your Q330 configuration on your network.

Don't I need to set the 330's IP address before I can talk to it?

No. See the procedure described in this document for use of the console interface cable, or “broadcast” Ethernet registration. In most cases you may just plug your Q330 into an Ethernet and use communications over the Ethernet to configure the Q330 with your desired IP address.

How do I copy the setup from one Q330 to another?

Copying the entire state of one Q330 to another is done using “Configuration Cloning”, described in this document. Essentially one saves in an XML file the configuration of a “master” Q330 . and loads this into a “target” Q330. Note however, that a complete

copy also requires installation of firmware modules (also described in this document) which is independent from the configuration.

How can I look at a real-time view of digitized data?

Willard's "Quickview" capability (see the "status" menu) provides an auto-scaling view of the 6 main digitizer channels. Various time duration and scale options are available. You are looking at a limited-resolution version of the 40sps data.

How do a Q330 and baler decide to connect?

The method that a Baler and Q330 pair use to connect is designed to "bind" available devices together, in a manner similar to the binding of Bluetooth® devices. At Baler boot up, the Baler will cycle through a sequence of messages announcing it is running and looking for a connection. The sequence proceeds as follows:

- First send an announcement that the Baler prefers connection to a data "vacuum" application for offloading data from the Baler. This initial "VPREF" announcement allows a data vacuum to preferentially connect and control the Baler even though the Baler may be connected to a network where the Q330 to which it is bound may exist.
- Next, if no data vacuum application responds to the Baler's VPREF announcement, the Baler begins sending an announcement advertising that it is looking for a connection to a Q330.
- If the Baler has already been bound to a Q330, the Baler begins sending an announcement containing the serial number of the Q330 to which it is bound. Only this Q330, if present, will respond to the Baler's announcement. If the Baler has not yet been bound to a Q330, the Baler will send an announcement containing zero for the serial number. Any Q330 present on the network will return a response to the Baler's invitation in this case.
- If the Baler is bound, and the bound Q330 responds, or if the Baler is not bound and a single Q330 responds to the Baler, the Baler will immediately accept that Q330, register with it, and begin acquiring data from it. If the Baler is not bound to any Q330, and more than one Q330 responds to the Baler's announcement, the Baler will ignore all of them. This is to prevent an inadvertent binding, since the resulting binding would be random and probably unintended.
- If after sending the serial number (or zero if not bound), the Baler will begin sending an AVAIL announcement instead of the Q330 serial number. This signals any potential Q330 listening that although the Baler may be bound to a Q330, the Q330 to which it is bound has not responded. If a Q330 exists on the network that has not connected to a Baler within the preceding 8 hours, this Q330 will respond to the Baler's AVAIL announcement. This method of connecting allows a Q330-Baler pair that have been plugged into a network to bind automatically after a period of failing to connect. Such a situation may arise where a Baler-Q330 pair may be placed together on a network without having been explicitly bound after a reasonable period of time elapses, avoiding a situation where a Q330 and Baler may be physically operating, but not connecting because of an inadvertent failure to bind them.

- If after this sequence the Baler still receives no response to its announcements, the Baler shuts itself down and blinks an error code on the STATUS LED, awaiting the next boot up cycle.

What about more than one 330 or baler on a network?

More than one Q330 or baler pair may certainly exist on a common LAN, provided that appropriate pairs have been bonded prior to connection to the LAN. While this document describes bonding using a serial connection between the Q330 and Baler, they may also be bonded on their Ethernet interfaces. Because a LAN allows all Q330 and Balers to communicate with each other, however, inadvertent pairings are likely to result if binding is not done prior to connection to the LAN. It is very important to follow the procedures described in this document.

How can I find if there are Q330's on my network?

Use Willard to “poll” the network in broadcast mode. See the section in this document on using broadcast mode. Note that polling is available on the Q330’s Ethernet interface, and that if the Q330’s security settings have been modified from their factory defaults, the Q330 may not respond to polling.

How do I "bind" a Q330 and Baler together?

- Select the interface you will use for Q330-Baler connection. Typically in a stand-alone portable recording application, the Q330 will be connected to the Baler via Ethernet through just a QNET-QNET-80 cable. In the examples discussed in this document, the Q330 is connected to the Baler using the Serial2 interface.
- Select the cable set appropriate for the interface selection.
- Configure the Q330’s appropriate interface settings for connection to a Baler. Check for current firmware and update if needed.
- Prepare the Baler. In most cases, particularly prior to a long deployment, it is advisable to “clean” the Baler to be assured that the Baler’s data structures have been appropriately built. Upgrade firmware prior to “cleaning”. If data exists on the Baler that you do not want to erase, use one of the methods discussed in this document for erasing only the Baler’s binding information without doing a “clean” operation.
- Disconnect the Q330 & Baler from your LAN.
- Connect the Q330 and Baler using your selected cable set, power up the Q330, and power-up the Baler. The two should bind within a minute or two.

How can I tell if the Baler is baling?

- There are a variety of observations depending on the tools you have available. The first and simplest methods to check are the LED status indicators on the Q330 and Baler. When the Baler successfully registers with a Q330, it will send a PING command to

the Q330, which the Q330 will acknowledge visually by illuminating the Q330's STATUS, DATA COMM & BOOT LED's. Shortly afterward, the Baler's STATUS indicator will begin blinking GREEN once per second. One may have reasonable confidence that the Baler is properly connecting to the Q330 if this sequence is observed.

- If a PC or Palm device is available, the message that the Baler sends to the Q330 announcing its registration can be seen when the Baler registers. When the Baler de-registers after acquiring data from the Q330, the Baler will send another message confirming the number of MSEED records written to the internal media and confirmed after being read from the media. These registration and readback messages are good indications that the Baler is actually writing data to its disk. The messages below, for example, confirm the registration of a Baler S/N 05016 running firmware version 1.94, network-station code XG-0192, followed by a successful disk media readback of 499 MSEED records written to disk.

2006-12-26 17:02:38:Msg From 128.103.105.133:Baler14-1.94 tag 05016: XG-0192 reg 2006-12-26 22:02:34

2006-12-26 17:04:03:Msg From 128.103.105.133:Baler XG-0192 readback. 499 recs. seq end: 3999147

- With a computer available, however, the most reliable means of confirming that the Baler is recording the desired data it to retrieve a sample after some period of operation. You should check that the channels you expect are present, and that the data are complete.

Why doesn't the baler connect?

Some of the more common reasons for a Baler to fail to connect to a Q330:

- The Q330's interface is not configured for connection to a Baler. Check the Willard's "Configuration\Interfaces\Advanced" settings on your selected Interface.
- The Baler is already bound to another Q330.
- The Baler is not bound to any Q330, but more than one Q330 is responding to the Baler's announcement. Check your network for more than one Q330.
- A cable or network problem.
- The Q330 Data Port which you have configured for a Baler to connect has been shut off by allocating none of the Q330's packet buffer memory to it.
- If you are trying to connect the Baler to a data vacuum application (such as BalerAdmin), the application was not configured correctly prior to starting the Baler.

I pressed the Baler's ATTN button; the STATUS LED blinks GRN/RED, then a sequence of RED flashes. Why?

The Baler did not connect either to a data "vacuum" application or to a Q330. See the preceding FAQ.

How can I record some data in the lab on my PC?

The Windows Pecos program is intended for this, and is ideal and simple to set up. Pecos will soon be replaced by PECOS2, based on the new Lib330 multi-platform library. An open-source demonstration application Seneca is also available.

This baler really wants to be off. What's up?

The Baler's normal state is OFF. It is powered up in accordance with several possible request mechanisms (described in a later FAQ), and when it powers up, is informed by the server with which it connects (either a Q330 or "vacuum" application) whether it should remain powered, or whether, in the case of connection to a Q330, it should acquire the data in the Q330's buffer, and then shut down. In most cases, the Baler will power up, find it is in power-cycled mode, and then shut down. It will also shut itself off if some time period elapses after a power up with no connection established. So in most cases, the Baler is in the off, or IDLE, state.

What's a token?

A token is a concise, machine-readable description of the MSEED channels that will be recorded by a "DP" when it connects to a specific data port on a Q330. Tokens are stored in the Q330 so that any DP that connects to the Q330 can acquire data without having unique information stored in the DP. This is particularly important for an embedded DP such as Baler, which may be swapped. Storing the tokenized channel descriptions in the Q330 allows a DP to be changed, while guaranteeing uniform data generation. All the information to generate MSEED is self-contained within the Q330 for each DP. Use of tokens by a DP is optional. In some cases, for example in a large network where a uniform configuration across the network is desired, the DP may configure data acquisition and MSEED generation based on information stored only in the DP, avoiding the requirement to update tokens in each Q330. Balers, Pecos, and Mountainair-derived applications use tokens to specify MSEED channel generation.

Can I use the USGS's LISS protocol with the Q330?

LISS is an MSEED transfer protocol. The Q330 itself does not generate MSEED. MSEED is generated in a data processor (DP) acquiring data from a Q330. A variety of DP's capable of generating MSEED and acting as a LISS server exist for the Q330, including the Windows Pecos application (and soon Pecos2, capable of simultaneously supporting multiple Q330's), the Baler, and applications based on the new multi-platform Lib330. See the following FAQ. An application note exists for setting up Pecos as a LISS server. See <http://www.q330.com/Download/Secure/AppNotes/LISSClient.pdf>

I want to write my own applications to acquire data from a Q330. Where can I start?

See www.q330.com for Q330 communications protocols, the DP Writer's Guide, and Application Notes.

See <http://www.certsoft.com/Lib330/index.htm> for the open-source multi-platform library. This is a comprehensive package

allowing full utilization of the Q330's capabilities for data acquisition. The library is not targeted for administrative control of the Q330. The Qu@sar package of ISTI (<http://www.isti.com/q330/index.html>) allows the user to write custom administrative applications for the Q330 and Baler.

I can't find my data on the baler. Why?

It may not be there, or you may be asking for the channel names that were not actually recorded. The best way to find out what's on the Baler, is to use either the *files.htm* page on the Baler to show the MSEED channel names that are actually present, or perform an "availability" inquiry in the *retrieve.htm* page on the Baler using a "seednames" channel specification of ??-??? to learn what MSEED channels are actually present.

How do I look at baler data?

Balers generate ready-to-use FDSN MSEED V2.4. You may request the Baler to provide data in channel-demultiplexed files (one channel per request), or the Baler may provide all the channels you request in a single file. The output aggregation is controlled entirely by the form of your request. Once retrieved, the Baler's MSEED data may be viewed by a variety of programs, such as Cimarron, pql, seisplot, dimas, dbpick...etc.

How do I get data out of the baler?

The Baler produces high-quality MSEED data records, equivalent to those distributed, for example, by the IRIS DMC, ready for immediate consumption in user applications. The MSEED data are obtained from the Baler using a high-level HTTP request dialog, in which the user may request specific channels or groups of channels and time ranges. In addition, there are a number of interactive requests to view status of the Baler. When registered with a Q330, the Baler honors requests for data while it also simultaneously records data. When the Baler connects with a "data vacuum" application, such as at a service depot, the Baler responds only to data requests, since, of course, it is not recording data in that case. Data may be obtained through the HTTP dialog by issuing appropriately formed url requests from any HTTP-capable application (e.g. wget) or scripting language, such as PERL, specifying the requested data. Requests may also be issued interactively using any web browser. However, comprehensive management of data retrieval from a group of Balers is done far more easily and efficiently with a special application, BalerAdmin, that simultaneously manages power control of the Baler, retries in the event of communication loss with a remote station, and logging of all activities. In addition, BalerAdmin incorporates Baler address serving to allow operation in "data vacuum" mode to permit depot retrieval of data simultaneously from multiple Balers.

Is it necessary for the Baler to be operated with a "data vacuum" application to retrieve data from the Baler?

As discussed above, no, however the specialized BalerAdmin application, having the ability to operate as an automated "data

vacuum”, automates and simplifies data retrieval from multiple Balers, and automatically and transparently manages retries as required.

I asked for all MSEED channel from the Baler using a ??? selector, but did not get all my channels? Why?

The Baler interprets the ??? selector as matching all those channels that have no MSEED “location” code defined. If your Baler includes channel names with location codes, the “wild card” selector is “??-???”.

How do I swap a baler?

When you visit a site to swap a Baler, the recommended procedure is first to press the ATTN button on the existing Baler to allow the Q330 to offload data presently in its data buffer. Allow the Baler to power down. Then simply disconnect the existing Baler, and connect your new Baler that has either been “cleaned” or had its binding erased. Press the ATTN button and test that the new Baler connects.

When the baler is off, how do I turn it on?

The Baler is powered on as the result of a request to its “Device Management Unit” (DMU), a small microprocessor that monitors a number of possible request inputs. The possible mechanisms are:

- The ATTN button
- Closure on the ENETBPWR+, ENETBPWR- control pair on the QNET connector
- Assertion of the RS232 DSR pin into the Baler’s Serial port (on the QNET connector)

These inputs do not themselves apply power, and continuing to assert them does not unconditionally apply power to the Baler. Instead, asserting these inputs causes a request, which is considered by the DMU in the Baler, and if the DMU accepts the request after checking that the Baler’s power is acceptable, the DMU will attempt to power up the Baler’s main CPU. If, after some reasonable waiting period, normally several minutes, the Baler does not connect with a host, the DMU will power down the Baler. If the power request inputs remain asserted, after some waiting period, the DMU will power up the main CPU again.

When the Baler is connected to a Q330, the Q330 may assert these power request inputs via commands to Willard, or through a “Turn On Baler” button in the Q330’s Web Page. Exercise care in physical connections between the Q330 and Baler and configuration of the Q330 to prevent more than one power request reaching the Baler. Such a situation may arise using the standard Serial cabling to connect the Baler while configuring the Q330’s Advanced Interface settings to expect a Baler on both the Serial and Ethernet interfaces. In this case, the Baler will continuously cycle up and down.

Can't I just run a Baler in continuously powered mode?

The Baler may be run in continuously powered mode, however, there are some tradeoffs. The power consumption will be much higher, roughly 5W continuous, vs. roughly 50-100mW effective average power. In some ambient environments, the CPU's core temperature can be exceeded. The Baler operates without active CPU cooling of any kind. In a power cycled mode, there is insignificant core temperature increase. In continuous mode, at ambient temperatures exceeding 35-40C, the CPU core temperature may be exceeded. The BalerAdmin tool obviates the need for special handling of Baler power up requests when retrieving data, since the tool handles this automatically.

I used BaleAddr to assign a baler IP, but can't talk now. Why?

A brief review of the Baler's operation may be helpful to answer this question. In almost all cases, the Baler itself never has a permanent IP address. The Baler instead operates in a way analogous to a computer that receives its IP address from a DHCP server when it boots up (although the Baler does not use DHCP protocol). This manner of operation locates the information needed to assign the Baler's IP address in the address server supplying the address to the Baler. When the Baler connects to and acquires data from a Q330, the Baler receives its address from the Q330. When no Q330 is available to assign the Baler's address, another address server must assign the Baler's address. The "BaleAddr" application (so named, by the way because one of its principal functions is to give the Baler an address) is one such Baler address server application. In addition, BaleAddr also incorporates the ability to issue some commands useful for Baler maintenance. The important feature to understand is that the address assignment is transient. When the Baler shuts down, the session is closed. BaleAddr, therefore, does not set the Baler's address in some permanent way. BaleAddr is an address server responding to a Baler's request when it boots up. Very important: if you never see the "Baler OK" message in BaleAddr's message panel, the Baler never received the address assignment from BaleAddr.

Is it necessary to see the message "Baler OK" in BaleAddr when the Baler boots up?

Absolutely. If you do not see this message, the Baler did not "handshake" with the BaleAddr program.

BaleAddr shows the baler's S/N, "Setting Time" message, but no "Baler OK". What could be going on?

There are several possibilities. The messages you see are initiated by communications from BaleAddr to the Baler. The "Baler OK" message is initiated by communications from the Baler to the BaleAddr program. Therefore if the "Baler OK" message is missing, it is possible that communications is operating only in one direction. This may be caused by a cable problem, or a problem with your network hub/switch hardware. Address conflicts are also a possible cause. A Q330 responding to the Baler may also respond to the Baler before the BaleAddr program, effectively capturing the Baler away from BaleAddr. This is particularly a problem where a Q330 with firmware that is not current is present on your network, or the Baler is not running current firmware. Older versions of firmware were less tolerant of simultaneous presence of BaleAddr and a Baler on the network. In all cases, however, if you

don't see the "Baler OK" message, do not proceed, since the Baler has not properly negotiated with the BaleAddr program.

I clicked on "Link to Baler Home Page" and the browser timed out. Why?

The Q330's web page contains the "Link to Baler Home Page". When you follow this link, you attempt to communicate not with the Q330, but the Baler. Therefore a number of common situations may arise resulting in this link timing out in your browser. The Q330 makes this link visible in its web page only after the Baler registers with the Q330. It is possible, therefore, for the link to remain present in the Q330's web page after a Baler has shut down. The Q330's web page contains an automatic 40s refresh to attempt to maintain the web page in synchrony with the state of the Q330-Baler connection, however if you try to follow the link after the actual state has changed, you may dead-end on this link. Another possible cause of a dead-end is that the link does not actually point to the public address of the Baler. The Q330 sets the link in its web page based on the IP address used for Q330-Baler communications, however if the Q330-Baler is behind a firewall, the Q330 cannot know the external public IP. You can mouse over the hyperlink in the Q330's web page to see where it points. If this is not the actual public IP, you need to use the "Change Link" facility in the Q330's web page to manually set the public address where the Baler can be addressed. A further possibility is that the addresses are correct, but a system administrator has blocked access to the specific TCP ports used by the Baler. Check with your sysadmin.

Does the baler's IP need to be on the same network as the Q330?

Interestingly, no. The Q330-Baler communications uses "automatic host routing", allowing the IP addresses of the Q330 and Baler to reside on what one might consider to be totally separate "networks". Typically, a "network" in this context is defined by an IP address logically AND'ed with a "netmask". The Q330 and Baler do not require netmasks. There are several worthwhile side-effects of this feature. The factory default configurations loaded into Q330's typically define a Q330 and Baler's address on as 192.168.x.x. Since the Q330-Baler routing is automatic, if you want to restrict access to one of the Q330-Baler pair, you may give either one an externally-routable IP address, while allowing the other to remain on a 192.168.x.x address, which will not be externally routed. If you enable "NAPT" access to the Baler, the Q330 automatically handles IP address translation and routing, allowing the Baler's address to remain at the default 192.168.x.x.

How do I set the baler's IP?

See a preceding FAQ regarding use of BaleAddr to assign an IP to the Baler for additional details. Basically, the Baler's IP is assigned by a server every time the Baler boots up. Therefore when the Baler connects to and acquires data from a Q330, the Q330 assigns the Baler's IP. The IP setting is stored in the Q330's "Advanced Interface" settings on the Q330's physical network interface where the Baler connects. For example, if the Baler connects to the Q330 on the Q330's Serial 2 interface, the Q330's Serial 2 Advanced Interface settings contain the Baler's IP address. A "data vacuum" application contains its own Baler address server, and so

when used with such an application, the Baler's IP is configured within the "data vacuum" application.

I want to set up access the Q330/Baler's web server, but our network admin blocks TCP port 80. What to do?

The Q330 and Baler have independent web servers. The TCP port on which each of these listen must be configured. You may locate the web server of the Q330 and Baler on any TCP port required. We often use TCP port 5380 for the Q330's web server, and 5380 for the Baler, of course on the Baler's IP. In addition, the Baler's web server may be made accessible via NAPT on port 5354 at the Q330's IP address. If these ports are still unacceptable to a sysadmin, the Q330's "base" port, 5330, may be moved to any user-defined port number, as discussed in the "resources" section in this document.

What is NAPT and what's it good for?

NAPT is "Network Address Port Translation". This is a networking feature of the Q330 that allows the Q330 to automatically route packets addressed to the Q330's IP address and a specific port to the Baler. What is this good for? NAPT allows the Q330 and Baler to appear at a single IP address, and network interface, essentially hiding the details of network communications with the Baler as simply a request to a specific TCP port number of at the Q330's address. In fact, physically the Q330 is actually routing IP traffic to the Baler. The IP resource table in this document describes the ports used by NAPT access to the Baler.

What is Baler data offload speed?

The achievable offload speed depends primarily on which network interface is used from which to retrieve data from the Baler, and in what mode your connection is established. When a "data vacuum" application, such as BalerAdmin, is connected directly via an Ethernet LAN to the Baler's Ethernet interface, the offload speed will be in the vicinity of 380 kilobytes/sec. Note that this nearly saturates a typical 10 Mbit Ethernet. We therefore recommend connecting multiple Baler's to a data vacuum for simultaneous offload through a 10/100 (or faster) switch, allowing each Baler to transfer at its maximum speed. While network topologies will have some effect on effective speed, if you are not seeing at least 300Kbyte/s, your network needs to be reconfigured. When using NAPT access to the Baler, the Q330 is actually physically routing traffic to and from the Baler. The effective speed is therefore controlled by the interface to the Baler through which the traffic passes. Where the Q330's Serial 2 is used for connection to the Baler (at 115kbaud), the effective transfer rate will be around 8-9 Kbytes/sec. Obviously you would not want to retrieve Gb's of data at this rate. Such a transfer rate, however, is often the maximum capacity of many common radio links, and can be used effectively to transfer segments of data from a remote station.

Do I need to "wipe" or "clean" the Baler? What does it do?

The Baler uses an indexed data base in which to store MSEED data. This database needs to be initialized, much in the same manner as a disk needs to be formatted with an appropriate file system prior to operation in any system. In fact, there are several levels

of media preparation in a Baler: partitioning, formatting, and “wiping”, also called “cleaning”. The partitioning and formatting is done at the factory, and never needs to be done again unless media is replaced. Cleaning builds the specific database indices necessary for data storage, and tests that the entire media can be written and read to maximize the likelihood of a successful long-term deployment. Because the database is rebuilt during cleaning, any prior data recorded on the Baler is permanently deleted by this process. It is therefore essential to recover any data prior to cleaning. Cleaning also dissolves any binding with a Q330, permitting the Baler to bind immediately with a new Q330. When should you clean the Baler? The Baler should always be cleaned, using current Baler firmware and application tools, prior to a deployment. This assures that the proper database structures are built and the media is tested. You must be certain that the cleaning operation completes successfully (if not, repeat!), and that when you connect the Baler with a Q330 that the connection is successful and that a sample of data can be retrieved. Having completed these steps (update Baler firmware, clean, verify connection to Q330, retrieve a data sample), the likelihood of a successful deployment is very high.

How do I set up Event Detection?

The Q330 is a “data engine” in which data processing for event detection is not done. This job is the responsibility of downstream processing in a “DP”. The event detection system employed in the Baler (and Quanterra DP software applications such as Pecos) is powerful and flexible, allowing specification of several different types of detectors including Murdock-Hutt and Threshold detection, and allowing re-entrant operation in many frequency bands with user-defined pre-filters, cross-triggering, and voting. Event detection in the Baler is configured by specification of the appropriate tokens using Willard. A quick checklist for event detection setup is discussed in an Appendix.

Should I update Baler firmware?

You should always make an effort to maintain the Baler (and Q330) with current firmware. We have made the update procedure simple and virtually impossible to result in an unbootable device. Use of old firmware may cause operational difficulties and/or generation of invalid data. The www.q330.com website details the specific features of specific firmware updates. We can support only systems using current firmware.

When should I update Baler firmware?

Generally before attempting to retrieve a large amount of data following a field deployment, or prior to “cleaning” the Baler before a field deployment. Using current firmware to “clean” a Baler is highly recommended to maximize the likelihood of a successful deployment.

What does the baler button do?

The ATTN button is used to request the Baler’s “Attention”. to 1) request a power up 2) request a power down 3) request

power-up in a specialized “Learn” mode.

What is "Learn Mode" of the baler?

“Learn” mode is a special mode of the Baler in which control of certain limited administrative function of the Baler is possible using only a serial RS232 terminal emulator program. “Learn” mode is so named because in this mode, the Baler is capable of “learning” and selecting which of several possible Q330’s are present on a LAN. In addition, there is a special application of Learn mode in which the Q330 binding can be dissolved without any terminal or application support. Learn mode is described in an Appendix.

How am I supposed to know if GPS is working when the GPS is used in cycled mode and is not powered?

The Willard “Commands\System and GPS Control” allows you to apply power to the GPS receiver. It will power up, acquire time, and automatically shut itself off in accord with the programmed criteria. The GPS power-up command may be used at any time.

Is it important to maintain software versions?

Absolutely. While Quanterra’s policy is to maintain backward compatibility in Q330, Baler, and application support, the use of current software in deployed systems and applications support – especially Willard – is essential to provide proper equipment operation and data integrity. We usually release planned updates once or twice per year after extensive field test, in order not to burden users with frequent updates. Check the www.q330.com website frequently for updates.

What can I learn remotely about station operations?

Because the Q330 and Baler communicate using industry standard IP protocols, all administrative and data acquisition functions are available independent of whether a station is deployed at a remote site, provided that IP-compliant data communications are available. Willard may be used to probe station operations in depth. The Mon330 program may be used to observe certain critical operational status. Data may be retrieved from the Baler to take a snapshot of the end product. Essentially the entire station state and history can be examined from a remote site. The only functions not available to a remote user are those that require IP broadcast access to the Q330 or Baler. Specifically, two such functions are “Q330 polling” to find Q330’s on a LAN (this function is incorporated in Willard and Pecos), and access to a Baler in “vacuum” mode. The latter is a security feature to positively prevent any possibility of a remote user to delete recorded data.

Can I update Q330 s/w remotely?

Yes. Again, because the Q330 is an IP device, updating firmware remotely is identical to doing so remotely, except for the

speed of the transaction.. The process may take some time – perhaps as long as 20-30 minutes on a VSAT link because of the round-trip time – let it finish. If interrupted, the Q330 will still boot automatically with the last good firmware version installed, however the BOOT fault will illuminate continuously. The firmware must be erased and reprogrammed to clear this condition.

What happens if I erase the Q330 firmware using Willard?

The factory uses the “flash330” program to install a failsafe firmware set in the Q330. This failsafe firmware set cannot be erased by Willard. However, if you erase the current operational firmware, and then reboot the Q330 without installing updated firmware, the Q330 will boot from the failsafe firmware which may be far behind the present revision level. While you will still may be able to communicate with the Q330, results may be unpredictable because of potentially missing feature support in older firmware versions. A part of your operational plan should be at your service depot to maintain the failsafe firmware at a revision sufficient for minimally compatible operation in your deployment. You should also always include in your station preparation checklist that the Q330 is actually running the firmware version that you have installed. Always reboot the Q330 following a software upgrade and check that it comes up with the version of firmware you installed.

Can I update Baler software remotely?

Yes, we do this job routinely. We highly recommend that you use BalerAdmin for this job. Alternatively, the “reload” program may be used to download the “baler14.exe” file to a Baler for firmware upgrade. However, the “reload” program allows a user to download any file to a Baler. Such an operation is dangerous, because the Baler’s limited workspace may be inadvertently filled if the user accidentally downloads some other file. In this case, it may become impossible to update firmware on the Baler. For this reason, we prefer use of the BalerAdmin program, which allows download only of the “baler14.exe” file. Note also that the file sent to the Baler must be named baler14.exe. Furthermore, be extremely careful to transfer the baler14.exe file maintaining its integrity on various computers that you may use. We highly recommend that you retain the baler14.exe file inside the original ZIP files obtainable from the www.q330.com website. This will assure that the file integrity is maintained. If you download to the Baler a file named baler14.exe that is corrupt, the Baler will be unbootable and will require return to the factory for repair.

When I try to use “Reload” to update Baler firmware, Reload says "Requesting Login" forever. Why?

The most likely explanations are that 1) the Baler is not powered up (send a Willard Command|Baler Control|Turn On Baler command), 2) you are using the wrong IP address for the Baler (you should specify the Q330 IP and select NAPT, or use the Baler IP and select “Standard”), or 3) the required IP port numbers are being blocked in a firewall at the Q330-Baler site.

When I use Reload to try to update Baler firmware remotely, Reload says "No Authorization". Why?

Recall that the Baler itself normally contains no permanent configuration information – the Baler’s recording configuration

resides in the Q330 to allow a Baler to be swapped without reconfiguration. In a similar manner, the Q330 provides authorization security services for the firmware update function. Therefore you must be simultaneously logged into the Q330 attached to the Baler using Willard from the same source IP address from which you will be attempting to upload firmware to the Baler. The BalerAdmin application automatically takes care of this transparently. Access to the Q330 must therefore be available when attempting to update Baler firmware. The principle here is that if a user has access permission to the Q330, they certainly are permitted to update the Baler firmware.

Can I wipe a Baler remotely?

No. The wipe (clean) function is available only when the Baler is in “vacuum” mode, which in turn is available only where IP broadcast capability is available on the LAN segment where the Baler resides. This is a deliberate security feature essentially requiring that a user attempting to clean the Baler must have physical access to the Baler, since broadcast access is not available on a routed network. This security feature makes it impossible for a remote user to accidentally (or otherwise) delete all data on a Baler.

Can I attach more than one baler to a Q330?

Yes. Each network interface on the Q330 (one Ethernet, two Serial) can support independent connection to a Baler.

Can I record more than one Q330 on a baler?

No. A Baler can connect to and record the data from a single Q330. However, if you have recorded data on a Baler from one Q330, then later move the Baler to a different Q330, the resulting data from two separate Q330's will later be recoverable.

The Baler turns itself on, connects with the Q330, then turns itself off, cycling every few minutes. Why?

Probably the “Telemetry or Baler” option is selected on more than one “Configuration\Interfaces\Advanced” settings in the Q330, causing the Baler to receive turn on requests from more than one Q330 Interface.

What if I've bonded a Baler to one Q330, then plug it together with another Q330?

If the Q330 and Baler are running current firmware, and there are no other Q330's or Baler's on the LAN segment to which the single Q330 and Baler are connected, the Baler will connect automatically with the Q330 after 8-16 hours.

The Q330 shuts itself off sometimes, and the LED's are dark. Why?

The most likely cause is a fault in the power supplying the Q330. When the Q330 detects a power fault, it shuts down for a minimum ‘safe’ period before attempting to reboot. It will reboot only if after the safe period the power meets the Q330's power requirements. See the discussion in the APPENDIX Power supply and grounding performance considerations.

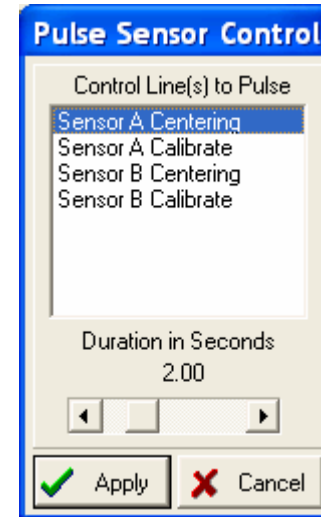
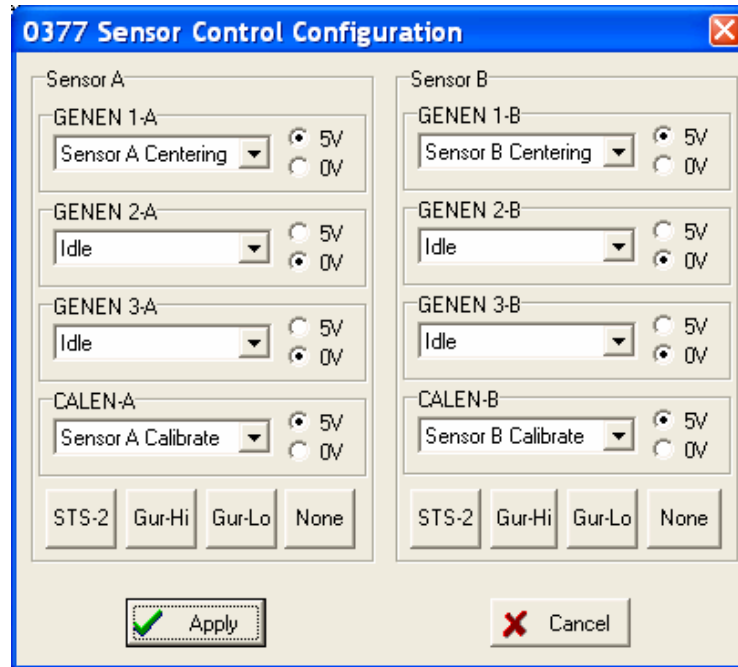
What about the Q330 volts per count calibration data like on Q680's?

Prior Quanterra generations, such as the Q680 and Q4120, have unique calibration data for each channel. The Q330, in contrast, self-adjusts to maintain gain identically within less than 0.5% on all channels. Therefore the nominal value for all Q330's is identical. The Q330 will signal a calibration error on any channel that it cannot self-calibrate accurately.

How do I recenter a seismometer attached to the Q330?

There are several requirements: 1) the sensor must have the ability to be recentered by a positive or negative-going voltage pulse from 0-5V, having a duration of 0.01-10s, 2) the cable to connect the sensor must include connection from the Q330's Output1 (A connector) or Output 5(B connector), 3) the Willard Configuration|Sensor Control Configuration must be set up appropriately to program the Q330's output control lines, 4) a Sensor Control command must be issued from Willard's Commands menu with the appropriate duration, and 5) the sensor's current requirements during centering must not exceed 250mA, the limit imposed by the Q330's sensor power output.

Willard's Configuration|Sensor Control Configuration and Commands|Sensor Control forms are shown below, configured for STS-2's on both the A and B Q330 connector. The Configuration is retained in the Q330's permanent settings when EEPROM is saved. A simple way to interpret the configuration information for each control output is to read the form as if "when the control output is in the state selected, the output voltage is as selected." For example, in the case below, when Sensor A is centering, the Output 1 is 5V; when Output 2 is Idle, Output 2 is 0V, and so on.



Do I lose time accuracy running the GPS in power-cycled mode?

Effectively no. Provided that the Q330 is located where ambient temperature variation is within the range for the timing PLL system to maintain GPS capture, the maximum time error accumulated during the 3hr GPS off period will typically be less than 1 millisecond. We typically always run GPS in power-cycled mode. The continuous GPS dissipation is around 300mW.

What temperature limitations are there on Q330 and Baler operations?

The Q330 and Baler will function across a wide range of specified temperatures. However, an important consideration, particularly in portable deployments, is often overlooked. Seismological observations require physical and electrical stability of the sensor and data acquisition systems at frequencies well less than 1Hz. Ambient temperature variations directly and strongly affect the operation of both. Useful observational results cannot be obtained where ambient temperature varies more than 1-2 degrees in a daily cycle. Beyond such a temperature excursion, a broad-band sensor and high-resolution A/D may comprise not much more than a very expensive digital thermometer. In addition to the direct effect on data acquired, rapid temperature changes affect the ability of the timing system to track the GPS reference, and may even degrade media lifetime. Thermal stability is a fundamental requirement for

observational broad-band seismology. See the APPENDIX on Quality Analysis Using Q330 State-Of-Health Data.

Can the Q330 act as an NTP client or server?

The Q330 cannot operate as an NTP server. Quanterra, however, has in development operation of the Q330 as an NTP client. NTP client operation will be intended for unusual applications where no possibility of access to GPS time is possible, while access to a low-latency IP network is available.

When should the Q330's preamplifiers be enabled?

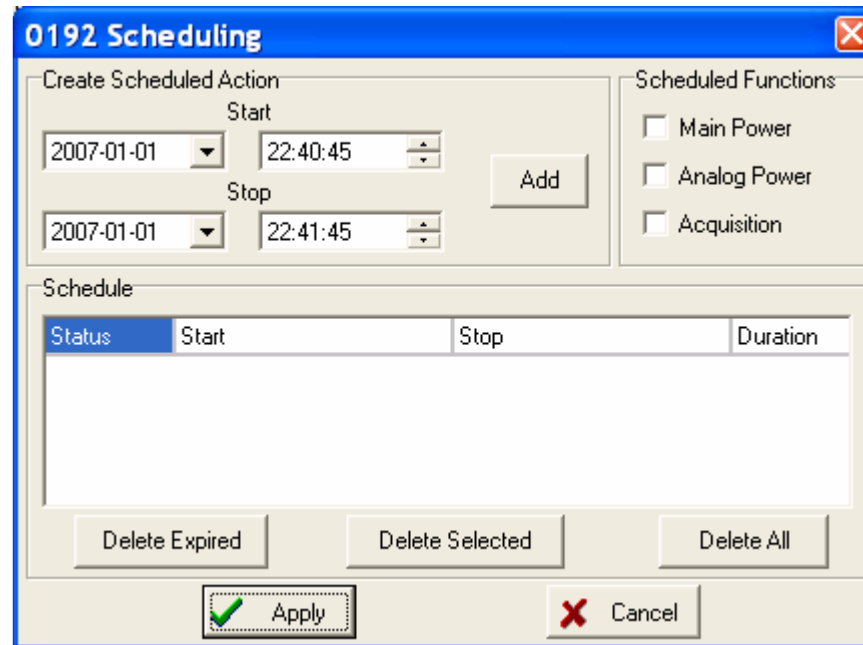
The Q330's internal preamplifiers have a fixed gain (30 for Q330, 20 for Q330HR) and are optimally impedance-matched for sensor sources up to about 100kOhms. The preamps are typically used with passive sensors such as geophones, or for special applications such as sensor comparisons where any possibility of noise of the main A/D must be eliminated. The clip level is reduced by a factor equal to the gain when the preamp is enabled.

What are the power requirements of the Q330?

The total power consumption depends upon configuration, including selection of the number of operational channels, whether preamps are enabled, whether Ethernet or GPS are powered continuously, and upon the programmed data rates for recording, since the Baler power-up duty cycle depends upon the rate at which the Q330's data buffer is filled. In a typical 3-channel configuration with cycled GPS, Ethernet, and Baler operations recording at 40sps and lower rates, the average power consumption for the Q330 and Baler will be about 600mW. A maximum power configuration might reach ~1.5W. The Q330HR typically requires around 2W.

What does it mean when the Q330's ANALOG FAULT front panel LED remains illuminated?

The ANALOG fault indicator illuminates whenever the isolated power system in the analog front end is out of tolerance. When the Q330 first powers up, for example, the ANALOG FAULT indicator is illuminated for a few seconds because the analog system has not yet been powered. When the Q330's startup sequence powers the analog system, the LED should go out. If it does not, there may actually be a fault in the ANALOG system. It is also possible, however, that either due to inadvertent programming of the Q330, or corruption of its internal data structures that a "schedule" has been programmed to shut off the analog power. To check for this possibility, enter Willard's "Expert" mode (in Willard's Help menu), and then select Configuration\Scheduling. A form like that below will be presented. Select "Delete All", then return to Willard's Commands menu, and select System and GPS Control, check Save to EEPROM and Reboot the Q330. This will erase any remnant schedules. If the ANALOG FAULT persists, return the Q330 for repair.



The Q330 doesn't respond and the CPU light blinks when I hit the web server, later it reboots. What happened?

The Q330 has crashed because of a corrupt web page stored in the Q330.. To correct this, you must re-import the web page using Willard's Configuration Builder mode. See the section in this document **Using Cloning to Migrate from older versions of Willard and Q330 firmware and Importing the Q330 Web page template.**

The Q330 is running, but Willard's QuickView shows no data. Why?

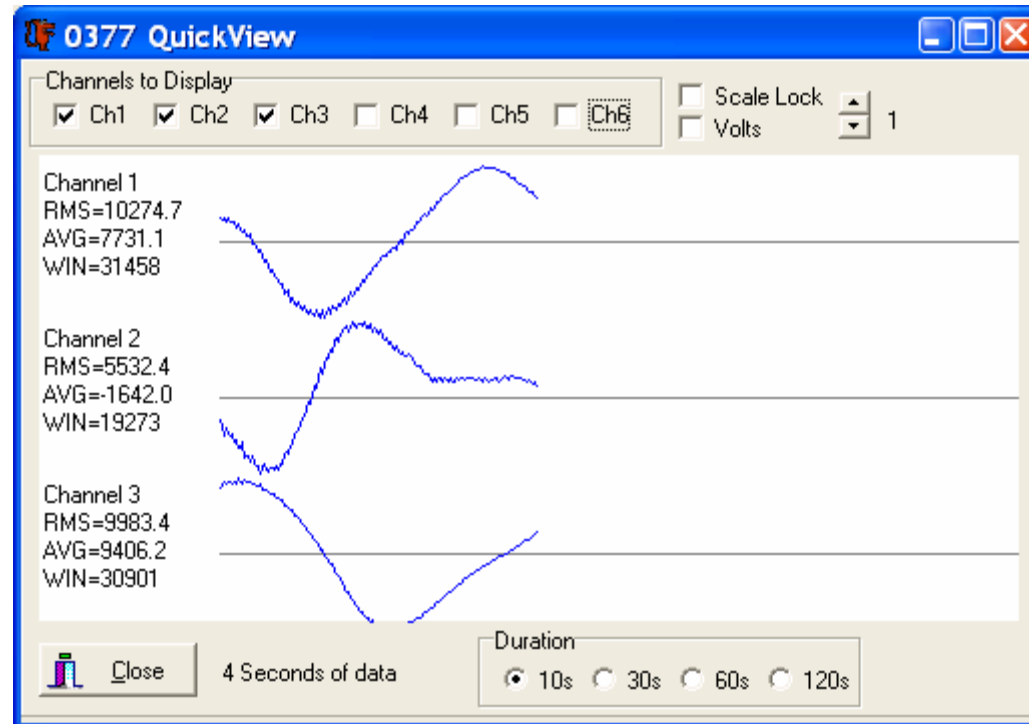
The channels may be disabled in the Q330's Global Setup. Also, if a channel is not used by any of the Q330's four Data Ports, the Q330 automatically stops processing the channel because there is no consumer. See the following FAQ's to check the Global Setup. Check the DP Tokens (Data Port 4) for the Baler to be sure that the channels are actually used.

How can I test remotely whether a glitch is in the Q330 or seismometer & cabling?

A simple command to the Q330 allows you to physically disconnect its input from an external sensor, and you may view the digitizer output only. This uses the "Special Input" capability. See the following FAQ.

Is there a way to check remotely, or without having to remove sensor cables, that the digitizer gain is correct?

Yes, the “Special Input” capability allows you to apply Ground and Reference Voltage inputs to the digitizer using electronic switching. To perform digitizer checks, start QuickView. In the case below, the sensor output appears:



With the QuickView panel open, select the Configuration|Global Setup. A form something like that below will be presented. Check the “Special Input” boxes on the channels you want to inspect, and below these boxes, select “Ground” as the Special Input source. Hit Apply.

0192 Global Programming - partial Read Only

GPS Coldstart Timeout 100min	Clock Timeout 60sec	Deregistration Timeout 300sec	Initial VCO 2048
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Calibrator Offset 0	Phase Tolerance 50000µs	Jump Filter 5	Jump Threshold 100µs
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

GPS Backup Power

User Tag Number:

Q330 Web Server
Port:
 Auth. Baler Power
 Show Serial Number Auth. Baler Link

Aux Data
 Off
 On

Status Inputs
 Off
 On

Channel Enables
 Chan 1 Chan 2 Chan 3 Chan 4 Chan 5 Chan 6

Preamp Enables
 Chan 1 Chan 2 Chan 3 Chan 4 Chan 5 Chan 6

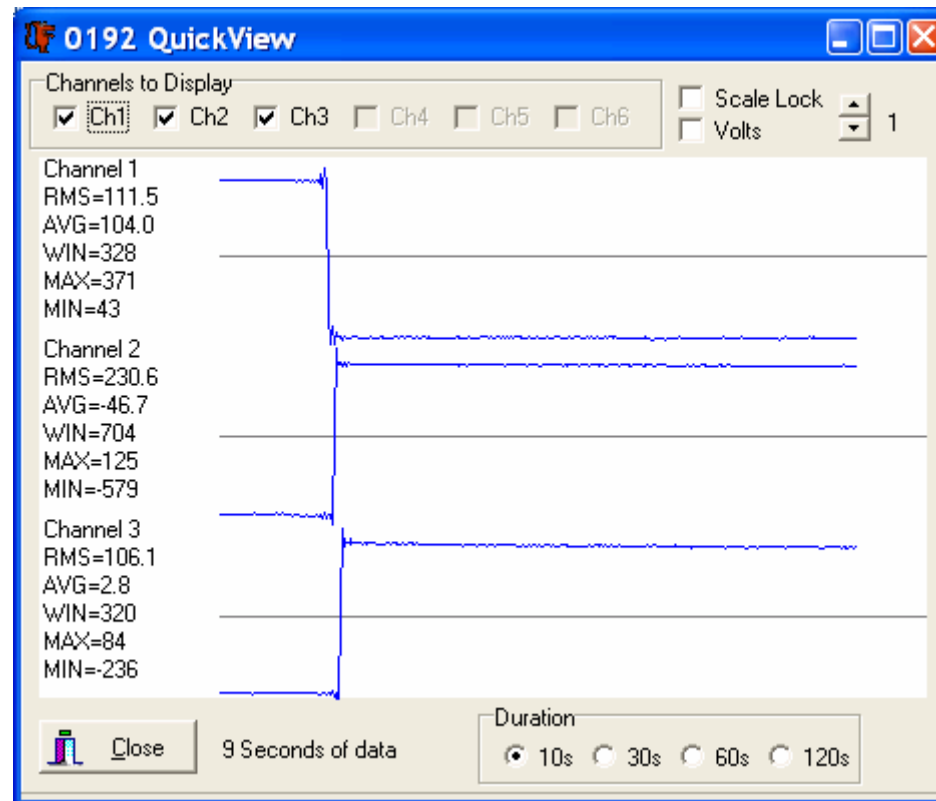
Special Input Select
 Chan 1 Chan 2 Chan 3 Chan 4 Chan 5 Chan 6

Channels 1-3 Special Input <input type="radio"/> Calibrator Output <input checked="" type="radio"/> Ground	<input type="radio"/> Reference <input type="radio"/> 0.05Hz	Channels 4-6 Special Input <input type="radio"/> Calibrator Output <input checked="" type="radio"/> Ground	<input type="radio"/> Reference <input type="radio"/> 0.05Hz
--	---	--	---

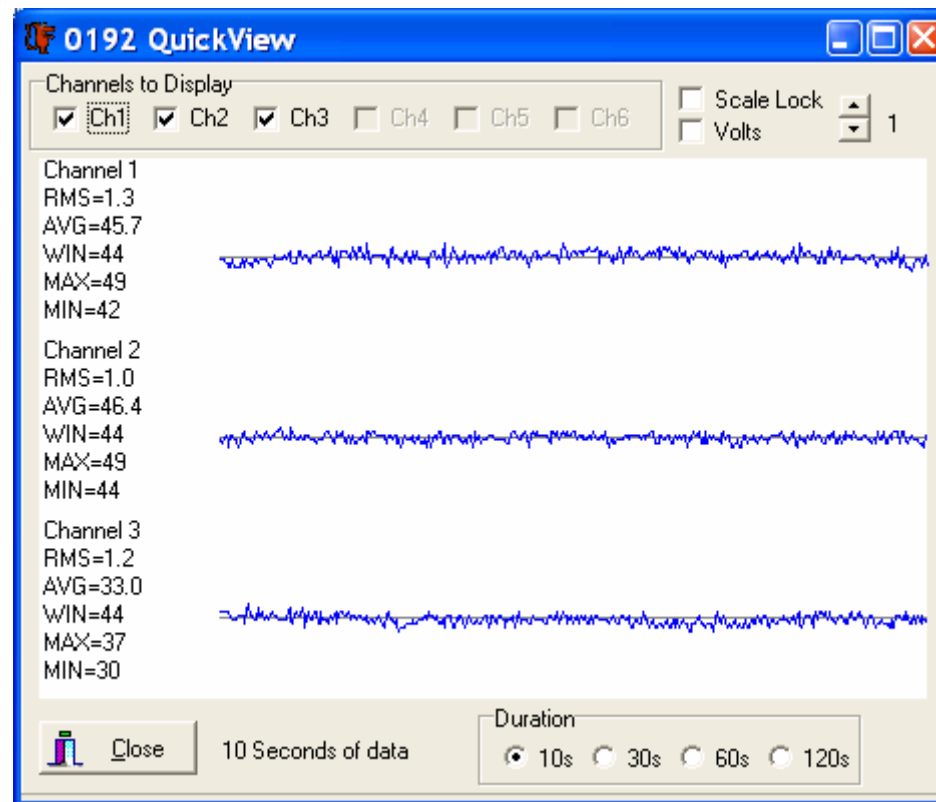
Channels 1-3 Linear Filters Below <input checked="" type="radio"/> All Frequencies <input type="radio"/> 40Hz	<input type="radio"/> 100Hz <input type="radio"/> 20Hz	Channels 4-6 Linear Filters Below <input checked="" type="radio"/> All Frequencies <input type="radio"/> 40Hz	<input type="radio"/> 100Hz <input type="radio"/> 20Hz
---	---	---	---

Apply Cancel

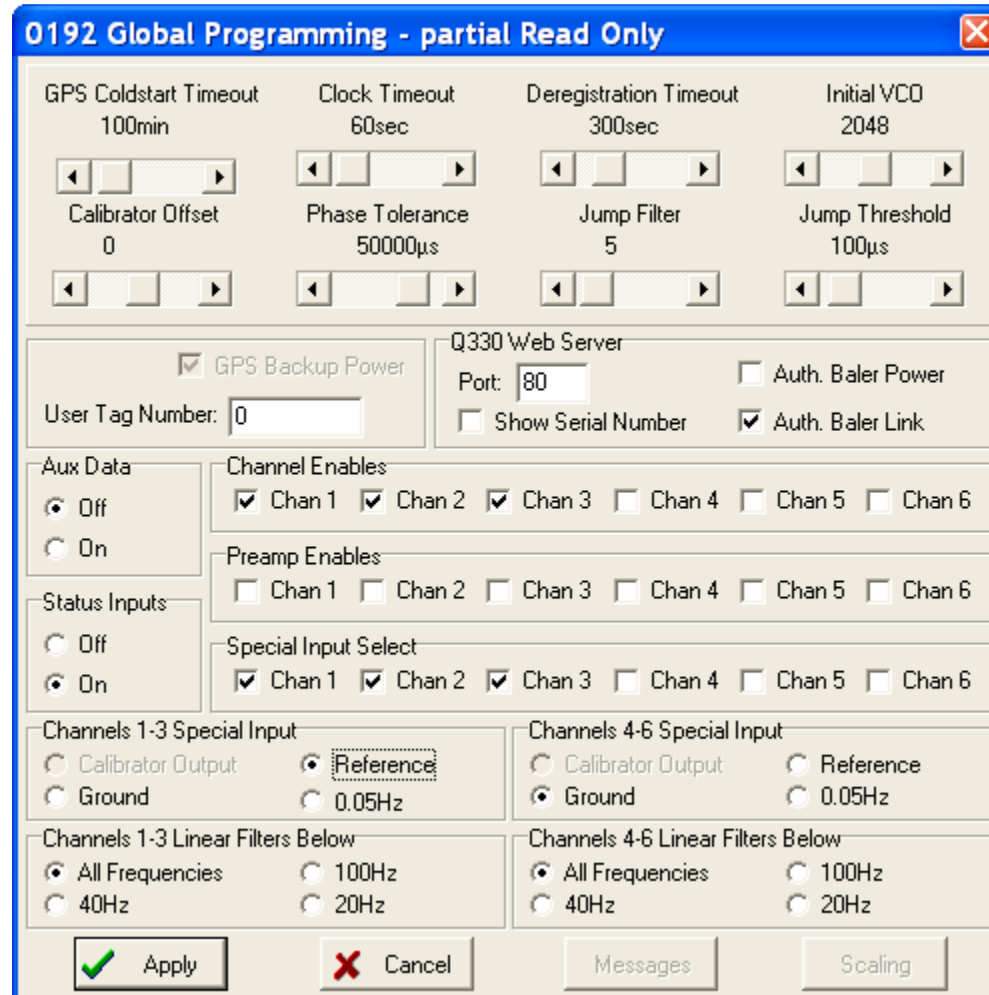
Immediately upon the Apply, the QuickView panel will show the external inputs to the digitizer removed, and a step as the internal Ground is applied to the digitizer.



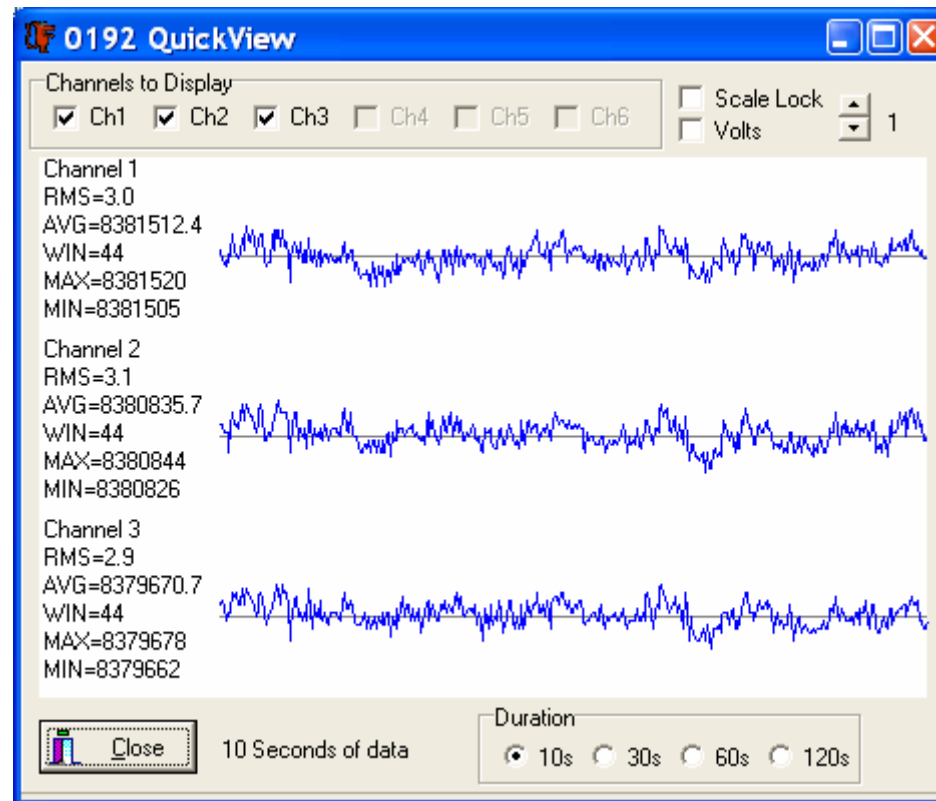
After the step dissipates, you will see the internal noise of the digitizer with a Ground applied to its input. Note that the actual noise as seen from an external connector is about 6dB less. The apparent noise floor is slightly elevated in “Special Input/Ground” mode for two reasons: 1) the Ground signal using Special Inputs is generated from an electronic switch that contributes some noise, and 2) when Special Inputs are selected, the internal preamplifiers are enabled. The latter feature actually allows a simultaneous check that the preamps are working normally. With the internal Ground Special Input applied, you should see something like that below with an “AVG” value fairly small, and RMS values 1-2 counts typically after thermal stabilization. Erratic signals, noise, or large offsets when the special input Ground is applied would indicate an internal problem in the digitizer.



Next, in order to check the digitizer’s gain with a large reference voltage applied, return to the Configuration|Global Setup form and select “Reference.”



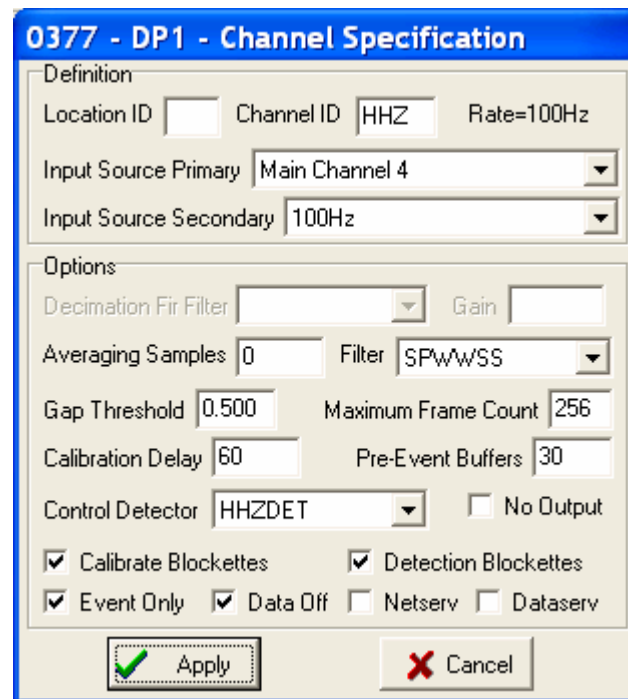
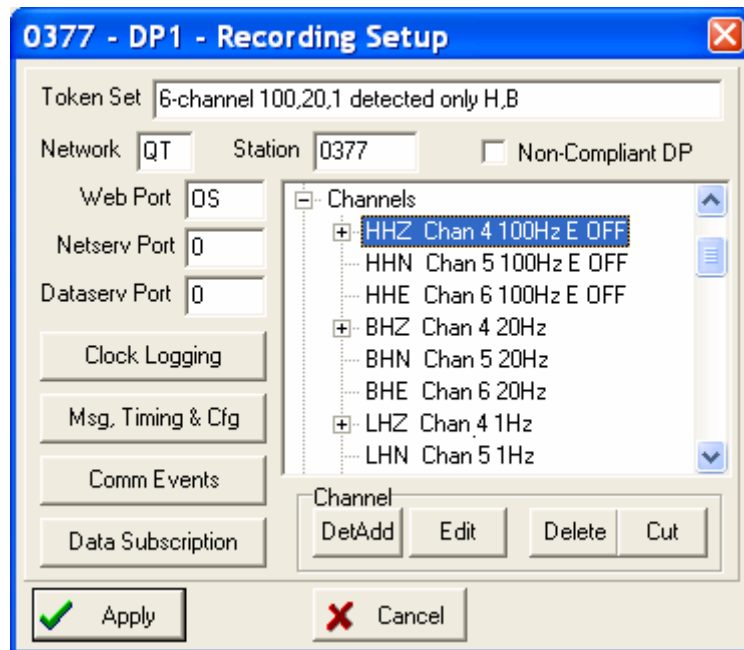
After the transient step dissipates, you should see something like that below, where (for a standard Q330) the AVG appears as 8.38×10^6 counts, and an RMS noise of 2-5 counts. Note also that the waveforms on Channels 1-3 (and separately 4-6) are similar, as you are seeing the electronic noise of the voltage reference. This test confirms the gain accuracy and noise in the presence of applied voltage. Return to the Configuration|Global Setup form and uncheck the “Special Input” boxes to return to normal operation.



These checks give a high confidence that the Q330 is operating correctly, and any aberrant signals, if present in your data, are likely originating externally to the Q330. There is a possibility that a problem exists in the small portion of the Q330's circuitry between the sensor connectors A & B and the internal A/D that is not testable using “Special Inputs.”

I have set up all the DP Tokens I want to include a range of possible channels, but for test purposes I want temporarily not to record certain channels. I don't want to re-enter all the Tokens. How to do this?

The token specifying generation of data for each MSEED channel may remain, but you may instruct the Q330 to prevent generation of certain channels, or you may instruct the DP (e.g. Baler) not to record certain channels. These facilities allow you to selectively control certain channels without having to maintain multiple configuration XML's or entering and deleting tokens to control specific channel generation. In the example below, the HHZ Channel tokens exist, but these channels have the "Data Off" box checked in the Channel Specification edit form. This stops data generation at the Q330. Note the channel is shown as "E OFF", meaning it is configured to record only events in the DP, and data generation is switched off. The "No Output" box allows the data to be generated by the Q330 and sent to the DP, but the DP discards the channel. The difference between "Data Off" and "No Output" is that in the former case, the data occupy no Data Port packet buffer space in the Q330. For telemetry links, therefore, it is preferable to use the "Data Off" option to temporarily control specific channels.



The message “DMU Fault: No Data Files” appears in the Baler LOG channel. Why?

When the Baler starts, it places a message in the LOG channel describing the last condition that caused the Baler to shut down. These messages correspond to the codes 2-8 described in the “APPENDIX: Baler Status Indication”. Condition #1 (not listed) is a normal shutdown. The “No Data Files” message may occur fairly commonly. As described in the APPENDIX, there are two possible causes:

- 1) The internal disk media has failed.
- 2) The Baler fails to connect to a host within the allowed time after boot up. This is a transient error. Cables and configuration should be checked and operations retried.

Since the LOG message is written onto the disk drive, cause #1 is improbable, since you would not be able to read the message if indeed the Baler could not read the disk. It is possible that the disk interface is intermittent, and when the Baler re-attempts to start it eventually succeeds and records the condition in the LOG channel. However, the more likely cause when this message is observed in the LOG channel is #2, i.e. that the Baler failed to connect with the Q330 and shut down after its power-up connection timeout. Any circumstance that prevents the Baler from connecting within the two minutes allowed by the Baler’s connection timer in the DMU will produce a similar scenario.

- 1) The physical media (serial or Ethernet) may be intermittent.
- 2) Ethernet hub or switch may be defective.
- 3) The Q330 Configuration\Interfaces\Advanced settings may be programmed incorrectly to connect to the Baler.

Check connections and Q330 settings.

I rebooted the Q330, and now the telemetry is working. I need to do this from time to time.

Rebooting the Q330 is very unlikely to have effect on its ability to telemeter data. We often see this situation described when an operator observes high data latency and intermittent data at the receiver. The operator usually states that after rebooting, the telemetry appears to function without problems for several hours, when the trouble begins anew.

What is happening in this situation has likely nothing to do with the Q330, but rather the throughput of the communications link. If the throughput is inadequate to support the volume of data you are attempting to telemeter, the Q330’s data buffer will begin to fill. Data will eventually be lost when the Q330’s buffer fills; this usually occurs in a few hours to a day or so depending on configuration. Although Q330 Data Port parameters may have some effect on the throughput the link can achieve, most likely is simply an inadequate underlying communications link from the Q330 to your receiver.

What is Cimarron’s “ASL” format output file format?

ASL format is a simple ASCII format developed originally by the Albuquerque Seismological Lab. It is widely useful because it is extremely simple, comprising a single ASCII header line describing the channel and time, followed by a number of samples separated by ASCII spaces. When you generate ASL output from Cimarron, the waveforms displayed between the cursors are written to ASCII files, one channel per file. If the “Omit” button is also depressed, the ASCII file is written, but without the ASL header line, i.e. only samples are written to the file. The file name comprises “Net_Sta_YYMMDDHR.Channel”, e.g. QT_0460_01262357.BHZ

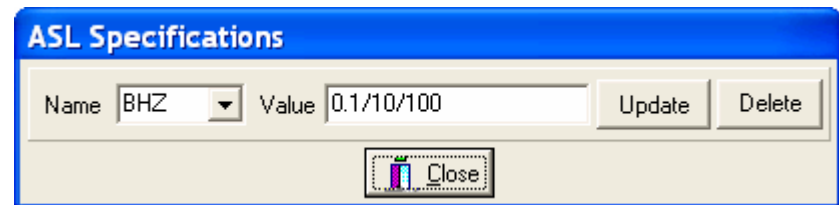
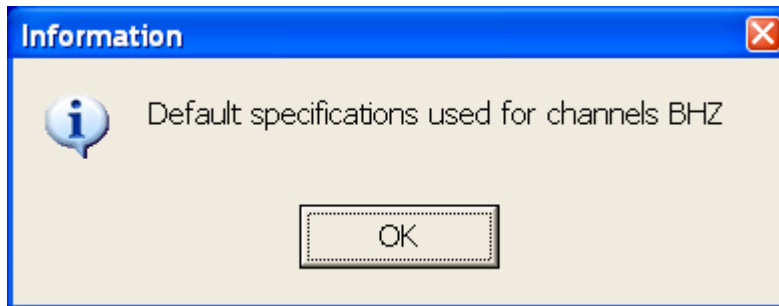
The header line comprises the following fields:

StationName	Channel	Year	DOY	Hour	Min	Sec	millisec	Rate(Hz)	#samples	Gain	Per	Response Name
0460	BHZ	07	26	23	57	42	119.538	20.00	2737	1.27E+08	50	GSNVBB1

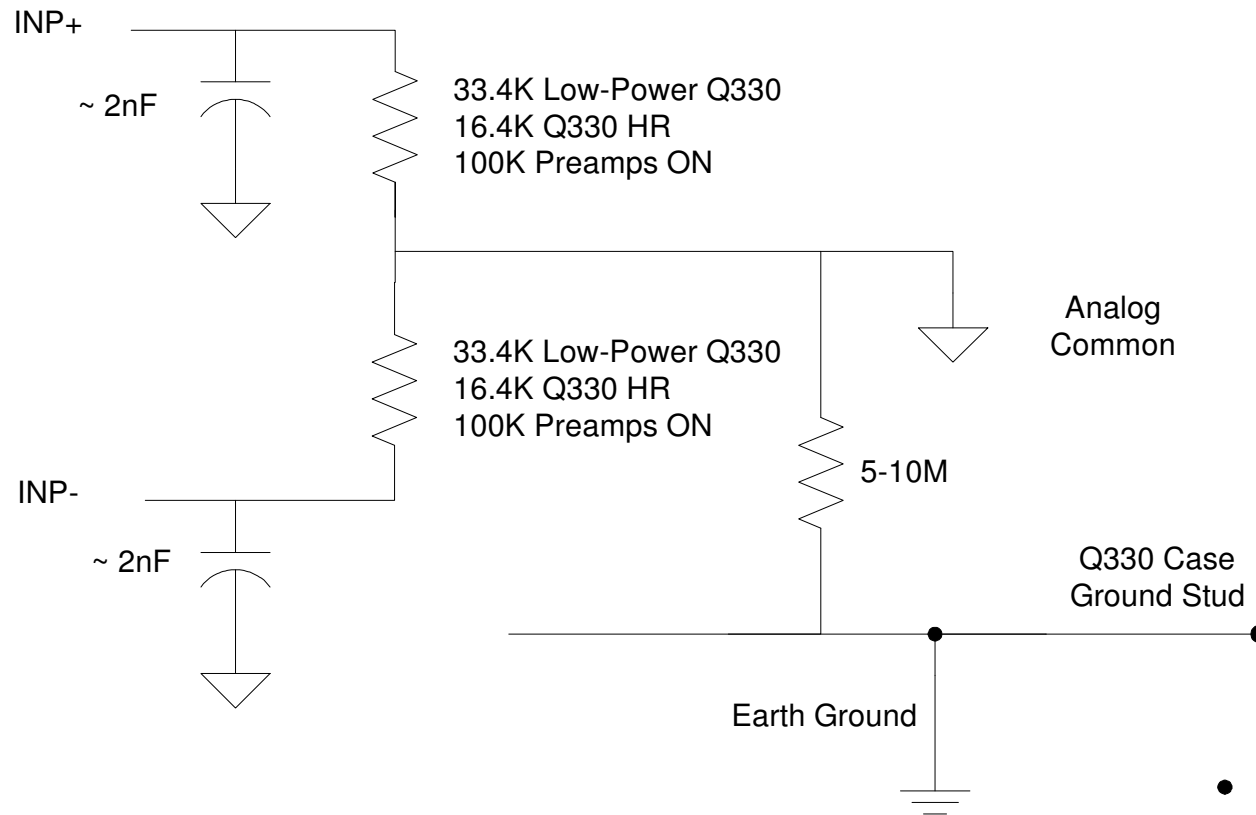
An example of the beginning of a data file follows, comprising a header line, and two of many lines of data.

```
0460 BHZ 07 26 23 57 42 119.538 20.00 2737 1.265E8 50 GSNVBB1
206 205 211 207 213 217 214 213 213 211 210 204 200 203 204 213 211 206 204
208 209 198 208 217 209 207 215 216 209 212 202 202 220 213 205 203 200 204
```

The Gain, Per, and Response Name are user-definable values that can tag the response. These values are read from a database indexed by the Channel name, and written into the ASL file. If you have not defined these values, “default specifications” will be used. Specifications may be entered in the “Options\ASL Specification” dialog. The Values are completely user-defined are simply looked up and written into the ASL file.



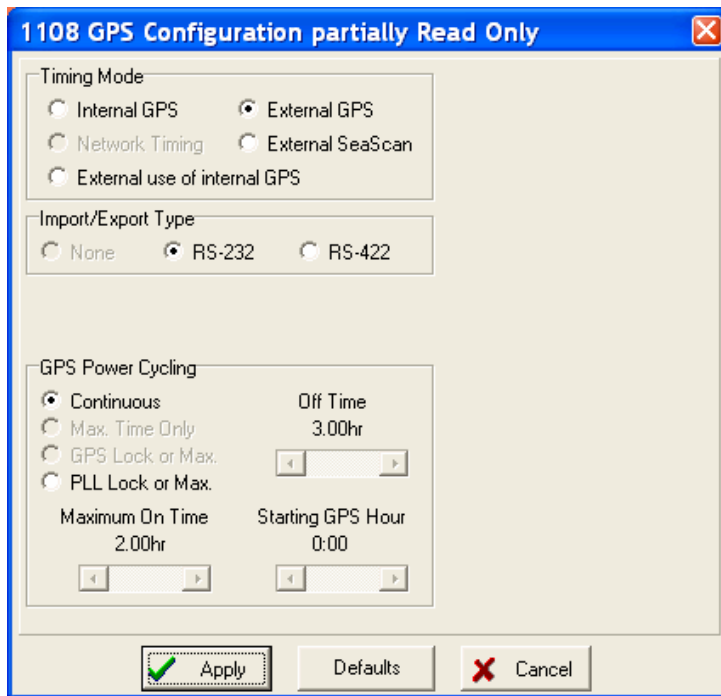
What is the simplified equivalent input of the Q330, Q330HR, and when the preamps are enabled?



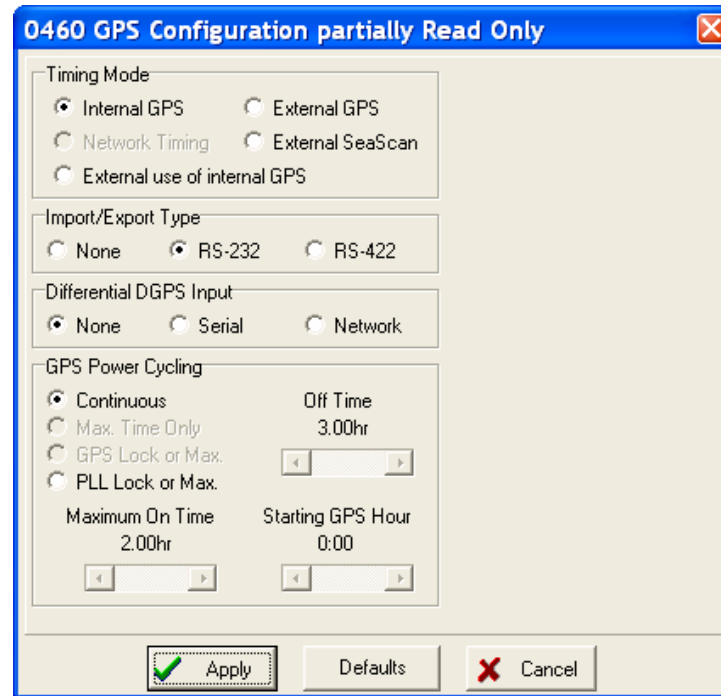
The Q330 panel has a “GPS” connector. What’s it for? Can one Q330 provide GPS time to another?

The “Ext GPS” connector allows the import or export of the time code and precise 1PPS time pulse information from either an external GPS receiver meeting the interface requirements of the Q330, or from another Q330. One Q330 may be configured as a MASTER, and another as a SLAVE. This capability allows side-by-side Q330’s to use the identical time reference while requiring only one RF antenna.

Slave:



Master:

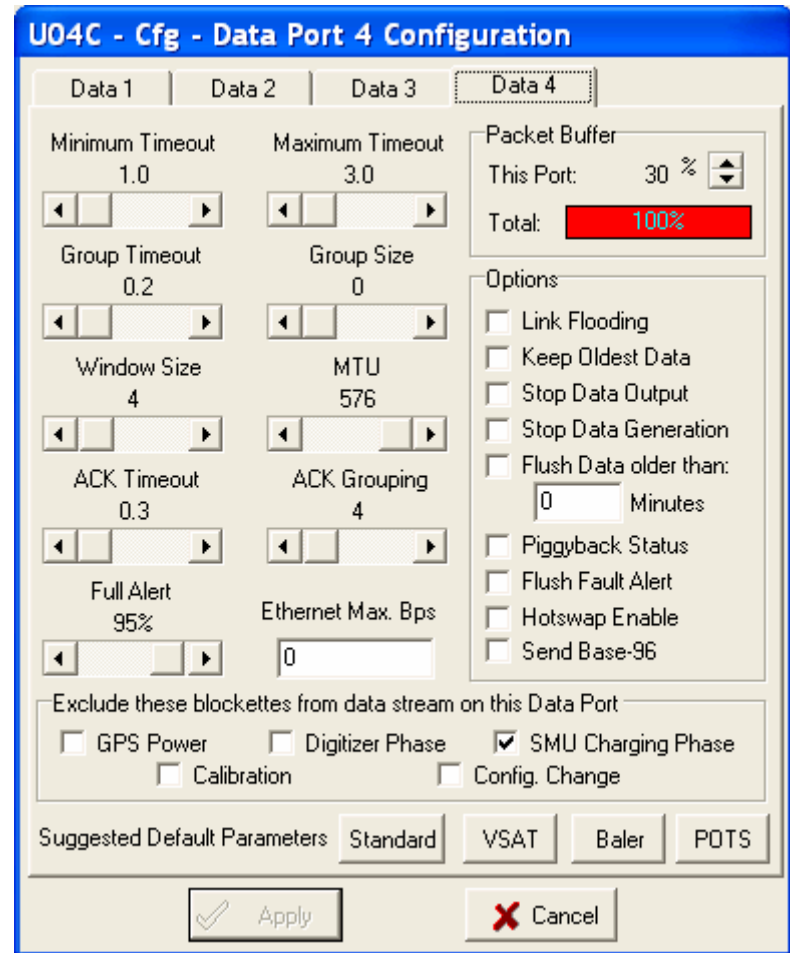


The Data Port buffer size is not as I configured them – how do I check, and why not?

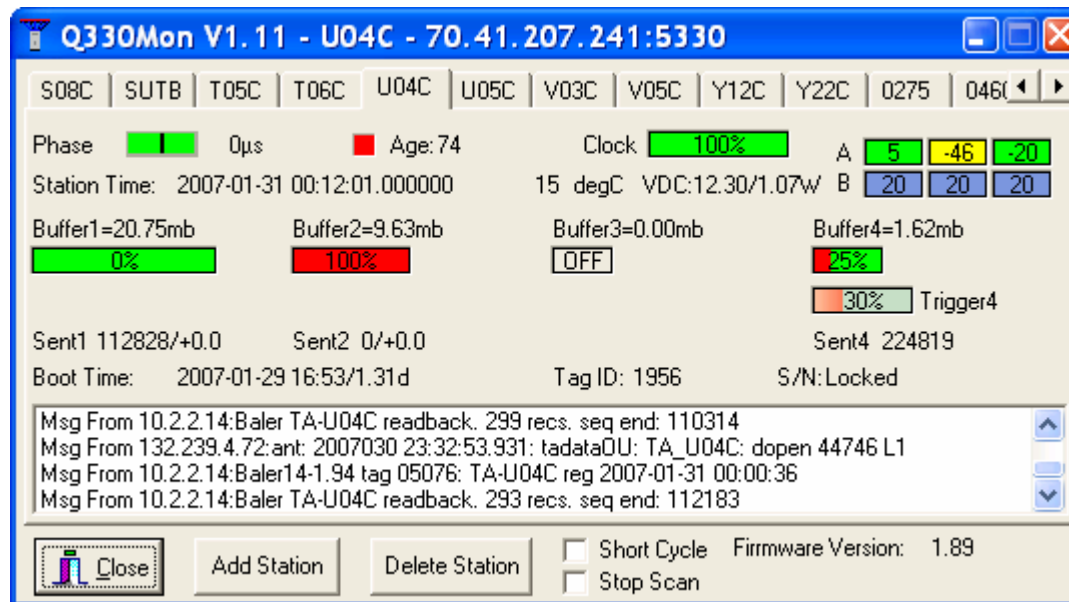
The size of the buffer associated with each Data Port is adjusted as a percentage of the total RAM in Willard’s “Configuration>Data Ports” form. A Q330 may be equipped with 8Mb or 32Mb RAM, so that the actual amount of RAM allocated to each Data Port varies according to the total. Because each port is specified to have a percentage of the total, it is possible to inadvertently specify a total of more than 100% allocation of memory. In this case, Willard will alert the user by changing the “Total” usage bar from BLACK to RED as at right. When “overallocated”, the “Apply” button will be grayed preventing the user from sending this configuration to the Q330. Here, the Packet Buffers were allocated 65,30,0,30, or 125% Total.

It is the user’s responsibility, however, to see that the total buffer allocation does not exceed 100%. It is possible for such invalid configurations to be loaded into the Q330 using very old version of Willard, or third-party tools that do not check for this condition.

After adjusting the Data Port allocation, you must save the Q330 configuration and reboot. If you need to perform other configuration steps, it is advisable to adjust and save the Data Port allocations and reboot before proceeding.

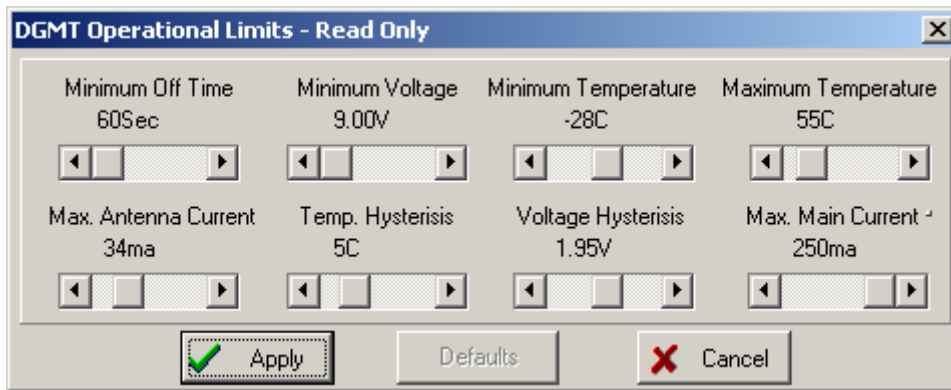


What happens if the Q330’s Data Port buffers are inadvertently “overallocated”, and how do you tell? When the Q330 boots, it begins allocating the buffer space for each Data Port from the available pool in sequence beginning with Data Port 1. Each Data Port, therefore receives its percentage of the total remaining until the pool is exhausted. So in the case above, where the allocation are 65,30,0,30, what happens? The Mon330 tool shows that the first three ports received their intended allocation, but for the Data Port 4, only 5% of the total remained available since the first 3 ports consumed 65+30+0=95% of the available memory. Data Port 4, for which in this case a Baler is configured, receives only 5% of 32Mb, or 1.62Mb. This will function, but cause frequent Baler cycles, since this buffer space is filled quickly. After adjusting Data Port buffer space, you should always do a final check that the system is actually operating in the manner you intend.

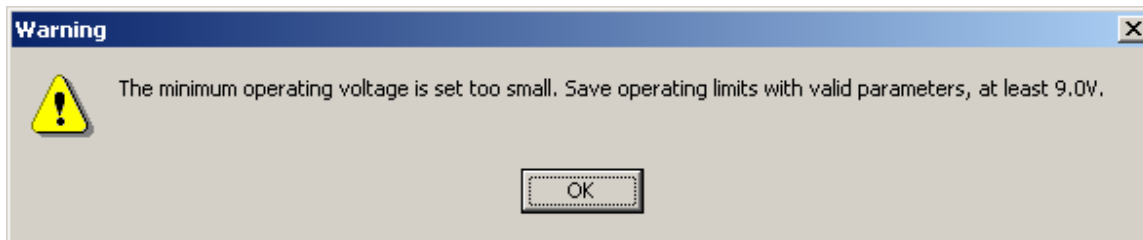


What are the operating voltage and current limits of the Q330? ...Q330HR?

The correct “Operational Limits” for the Q330 are shown below. With these parameters, the Q330 will turn on at a minimum supply voltage of 9.00+1.95, or 10.95V, and will remain on until the minimum 9.0V is reached. This value is measured internally, and may be a volt or so below your battery voltage.:



If the minimum voltage is somehow set too low, when you display the Operational Limits form, you’ll get a message that says:



In this case you **MUST** enable “Expert Mode” in Willard’s Help menu, and save the updated Operational Limits parameters. A limit that is set too low may cause the Q330 to enter a lock-up situation under certain circumstances.



IMPORTANT NOTE FOR VOLTAGE AND CURRENT SETTINGS FOR Q330HR

The Q330HR has an additional special consideration. Prior to early 2007, the Max. Main Current value of 250mA was sufficient. Following that data, all Q330HR’s **MUST** be configured for **at least 320 mA main current**. Current versions of Willard and Q330 firmware will automatically support this increased limit on units that are appropriately equipped.

Can the Palm DP application can be used to control the Q330 in the field?to clone Q330 configurations?

The PalmDP allows convenient control and monitoring of the Q330 in field applications, using either the wireless IrDA port, or direct hard-wired connection to the Q330's Console Port using a user-supplied Palm serial RS232 cable. The PalmDP application is available from the Q330 support web site: [http://www.q330.com/Download/VersionHistory.htm#PalmDP Application](http://www.q330.com/Download/VersionHistory.htm#PalmDP%20Application)

There are some special considerations, however, on the usage of the PalmDP application. The application was originally written before many new features were added to the Q330. Consequently, because PalmDP is unaware of some of these new features that are configurable in software, usage of PalmDP may render these features inoperative in your Q330.

PalmDP is a supported product and will be revised to be fully compatible with all of the Q330's features. However, in the interim, the existing published PalmDP should be used in accordance with some general rules to minimize the likelihood of inadvertently disabling important features in the Q330 and possibly causing data loss or corruption.

Here are some general rules for use of the present PalmDP:

- Any simple command (such as viewing status, Quickview, centering a seismometer) are OK. These do not change the permanent state of the Q330.
- Cloning is permissible with caution. After cloning onto a target Q330
 - You may change IP addresses and station names.
 - You may NOT use the Palm to change "Advanced" Interface settings. This will disable important feature related to Baler and Communications control that will likely render a remote station incommunicative.

In general, if you plan to use PalmDP to use cloning to install configurations on field systems, you should test the procedure in a lab. To test the procedure, you should:

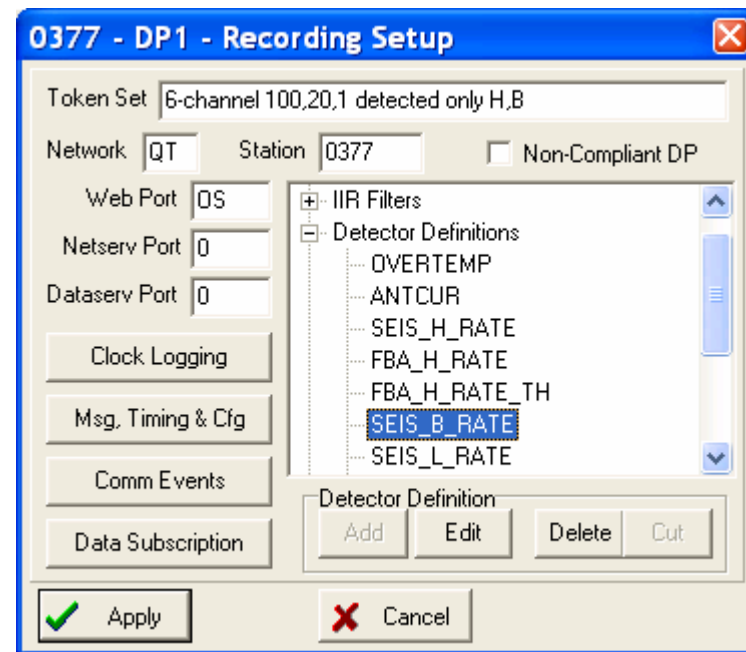
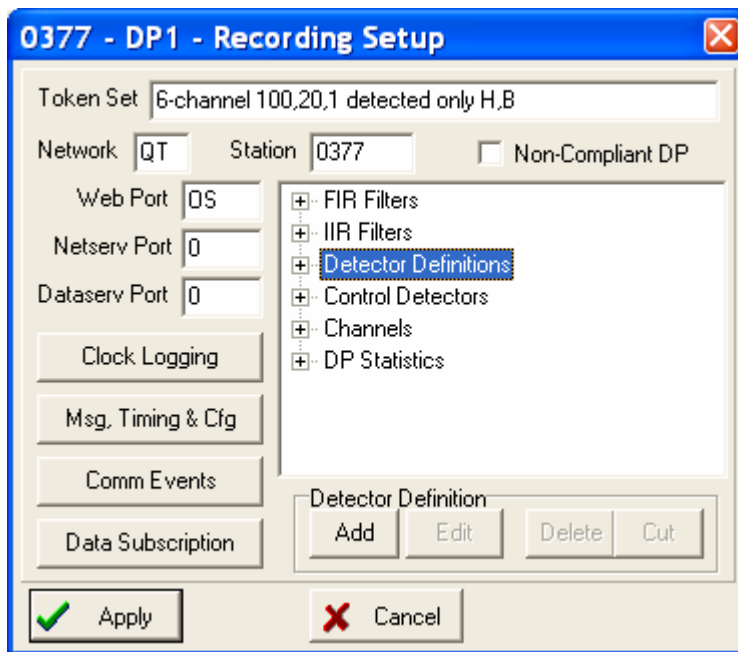
- Use Willard to save the XML state in a file from a "Master" Q330
- Use PalmDP to clone from this "Master" system onto a "Target" Q330
- Use Willard to save the XML state in a file from the "Target" Q330
- Use a file compare utility, such as "diff" or "winmerge" to compare the "Master" and "Target" XML files – they should be the same except for known differences, such as station names and IP addresses. You must resolve and understand each difference before using PalmDP to clone systems in the field.

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APPENDIX – Setting up Event Detection – a Graphical Checklist

The configuration of event detection is best done using one of the template XML configurations in which event detection is already set up. The event detection capabilities follows closely those of Quanterra MSHEAR systems. For a complete understanding of the event detection system, we recommend referring to MSHEAR documents (available from Quanterra) and the original Murdock, Hutt, Halbert USGS Open-File Report. Event detection in Q330 systems is performed in the DP, typically a Baler, according to the information specified in the Baler’s tokens set up by Willard. Prefiltering of broad-band data is available, along with specification of multiple triggers in different bands, and cross triggering of one channel from a trigger operating on another channel. We do not cover the design principles here, but instead cover a quick review, of the settings needed assuming an XML template has been loaded that already contains event detection set up. The specification of a detector follows essentially three steps: 1) a “definition” that establishes the data processing and detection algorithm used to process a specific data channel, 2) logical combination of one or more defined detectors to establish a “control detector”, and 3) application of a control detector to one or more data channels to control its recording. We often set up event detectors to operate in an advisory capacity only to inform that an event may be present, while recording the data continuously.

In the DP Token Editor for the Data Port you want, first check the Detector Definitions. In this case, let’s look at the definition “SEIS_B_RATE”. Detector specification is local to each Data Port in the Q330. In the example below, Data Port 1 is shown. Normally Data Port 4 is used for the Baler.



Highlight the SEIS_B_RATE detector, and select Edit. The form allowing specification of the detector's algorithmic parameters will be displayed. In this case, the detector type is a Murdock, Hutt, Halbert. A filter named "SPWWSS" is specified to prefilter broad band data as a Short Period World-Wide Standard Seismograph prior to detection. Following this, the MHH parameters are defined. Note that in the detector definition, the channel that is processed with these parameters is not specified. The detector definition is essentially a template for algorithmic processing, the channel on which this processing is performed to be specified later.

0377 - DP1 - Detector

Definition

Name: SEIS_B_RA Murdock, Hutt, Halbert

Filter: SPWWSS Threshold

Murdock, Hutt, Halbert Parameters

Filhi Samples: 2 Fillo Samples: 40

Xth1: 32 Xth2: 22 Xth3: 8 Xthx: 13

Iwin: 160 N_hits: 4 Def_to ms: 500

Wait_blk samples: 500 Val_avg: 8

VBB Defaults LP Defaults

High Limit: 0 Low Limit: 0

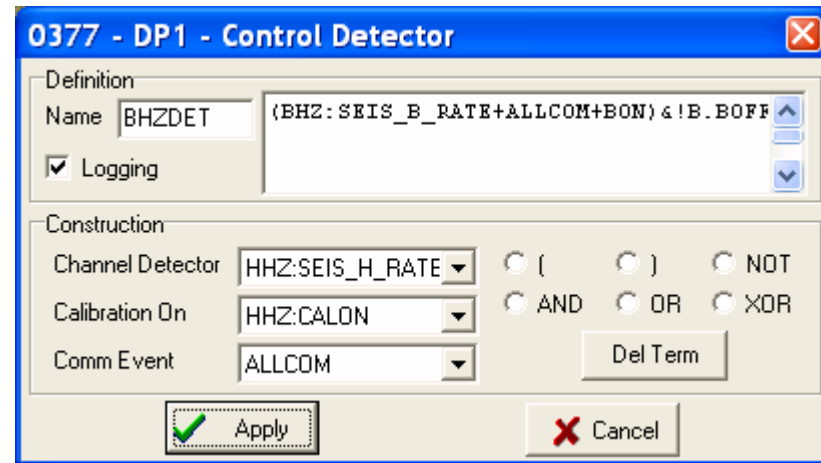
Hysterisis: 0 Window: 0 Tail: 0

Apply Cancel

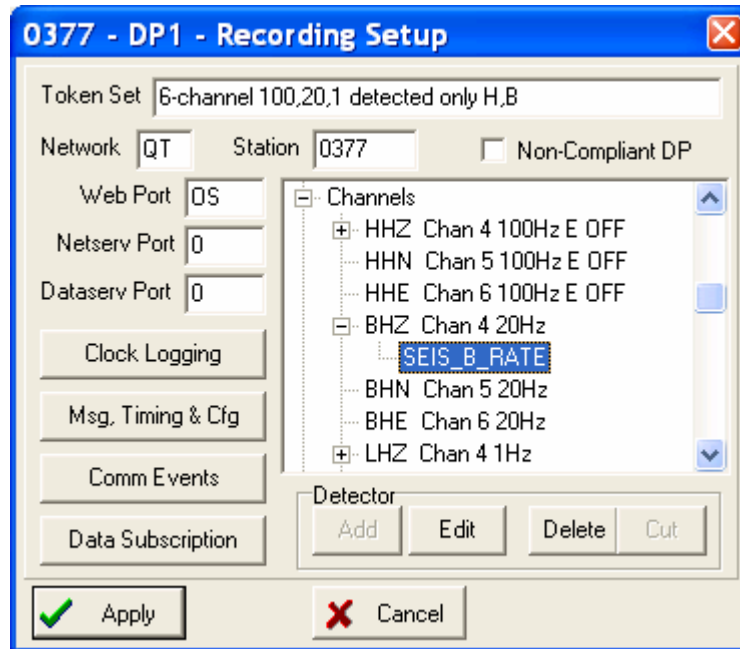
Next highlight, for example, the Control Detector named BHZDET, and select Edit. The Control Detector will be presented. Here the construction of the BHZDET control detector is shown in the window.

The logical expression establishing the BHZDET Control Detector is: (BHZ:SEIS_B_RATE+ALLCOM+BON)&!B.BOFF

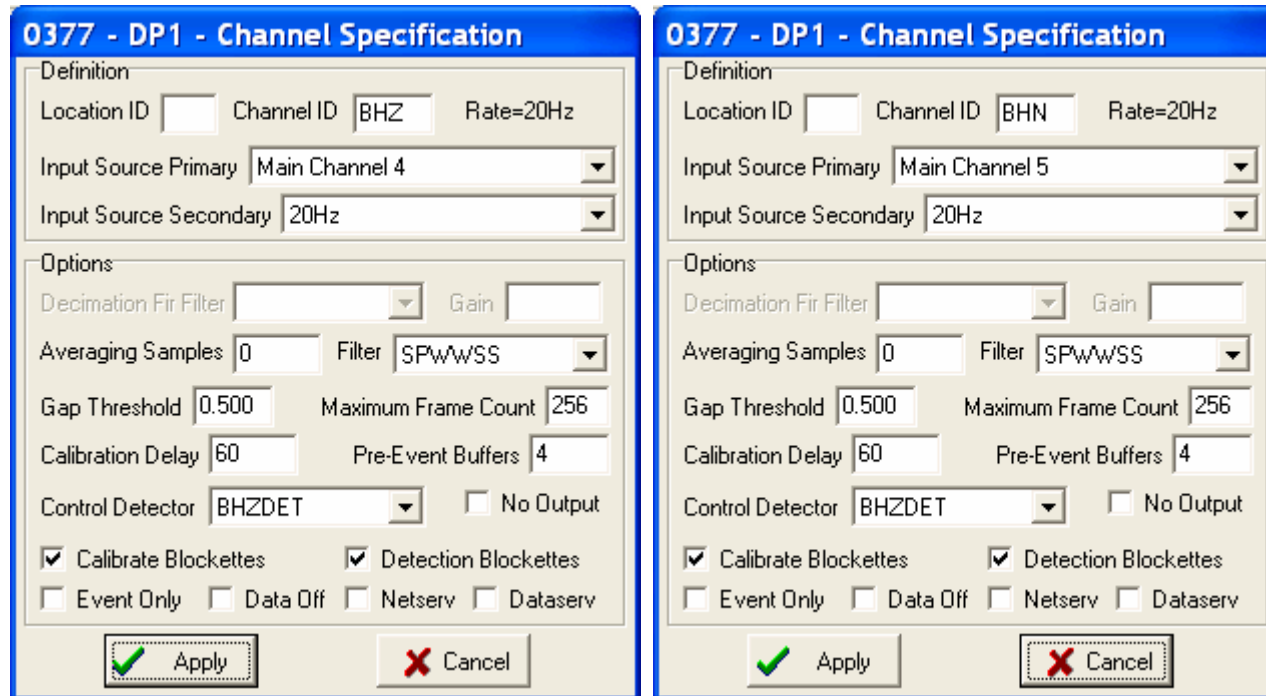
This invokes the SEIS_B_RATE definition template to process the data from the BHZ channel. In addition, there are logical combinations with certain named flags, e.g. ALLCOM, BON...etc., to allow commands from Willard to switch on detectors interactively for test purposes. Note that the logical expression is not edited as text, but is built using the construction and “Del Term” buttons in the Control Detector form. The syntax of the logical expression show follows MSHEAR syntax. The “Logging” checkbox specifies that picks from the detector are included in blockettes within the data stream generated on this Data Port.



Now a check is necessary to see that the Detector is enabled on the channel for which it is specified in the Control Detector specification. Note that the BHZ channel in the token tree shows a branch. Select the “+” box to drill down and show the Detectors (there may be more than one processing the BHZ channel) , highlight the SEIS_B_RATE detector, and select Edit. A small form will be presented that allows you to select three options: 1) actually run the detector on this channel, 2) place any resulting picks in the text LOG channel generated by the DP, and 3) place the picks in a separate Event Log searchable by the DP. The “Run this Detector” box allows the entire detector infrastructure to be set up, but switched off. Thus you can use one configuration including detection capability, but turn off the detection when you don’t want to run it.



Finally, to establish which channels are actually affected by the logical status (Event or No Event) of the BHZDET Control Detector, the individual Channel Specification form for each channel must be checked to see that the proper Control Detector is selected. Here, we see that the BHZ and BHN (also BHE, but not shown) channels use the BHZDET Control Detector to flag whether an event is in progress on these channels. In the case below, because the “Event Only” box is not checked, these channels will actually be recorded continuously, but event detector picks, and the MSEED Event In Progress bits will be present on these channels when the BHZDET detector is on. Effectively in this case the BHN and BHE channels are cross-triggered by the detector processing BHZ data. One, of course, could define a Control Detector that used a logical OR of a detector processing each of the BHZ, BHN ad BHE channels, or a logical AND of all three. One could also cross-trigger BHZ channels using, say, the HHZDET detector.



The factory configurations including detection establish a number of Detector Definitions and Control Detectors using typical pre-filters and detector parameters. As described in the MHH OFR, the detector parameters are best adjusted following a period of observations to de-sensitize the detector to reduce false triggering. You may also want to specify different prefilters to preferentially select different frequency bands, or combine the output of detectors in several bands. You may also want to extend the Wait_blk samples and pre-event buffers to maximize the data recorded when an event is declared.

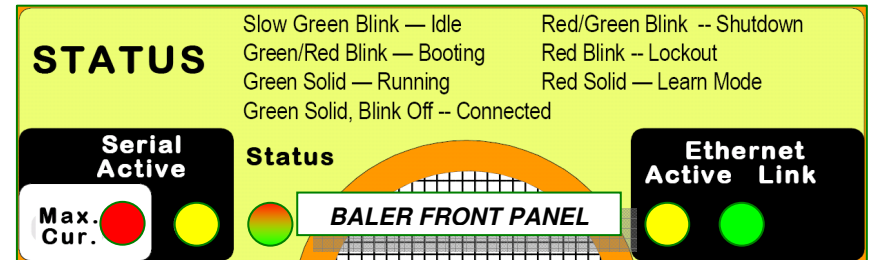
APPENDIX – Baler Status Indication

The Baler contains a number of LED status indicators. The Ethernet ‘Active’ and ‘Link’ indicators are illuminated whenever the Baler is connected to an active 10BaseT network. These are standard DATA & LINK indicators. The Serial Active indicator will be illuminated ONLY if the Baler is powered up as the result of a request on its serial data port AND serial traffic is currently active. The Max Cur indicator is a FAULT indicator only, indicating an internal problem.

The ‘Status’ indicator has many possible indications dependent on context. This is a bi-color (RED/GRN) LED, and in addition the pattern and timing of blinking is significant. It is important to understand the indications, as these provide useful information in the field without requiring additional equipment.

STATUS INDICATIONS

Color	Duty Cycle (seconds)	Meaning
GRN	ON ½ /OFF 4 ½	IDLE – Baler main CPU not powered, waiting.
GRN	SOLID	CPU Running – NOT CONNECTED TO HOST
GRN	ON 4 ½ /OFF ½	Baler connected to a host
GRN ½ /OFF ½ /RED ½ /OFF 3 ½		Baler is BOOTING UP
RED ½ /OFF ½ /GRN ½ /OFF 3 ½		Baler is SHUTTING DOWN
GRN	ON ½ /OFF 1	“Wipe” operation complete
RED	ON ½ /OFF 4 ½	“LOCKOUT” – 2 minute wait until Baler will accept a retry.
ORG	SOLID	Sometimes difficult to distinguish from solid RED. Indicates acknowledgement of “LEARN” mode. See APPENDIX.
RED	ON ½ /OFF 1	FAULT SHUTDOWN – ERROR – A previous “wipe” operation may not have completed properly.



FAULT INDICATIONS

The STATUS indicator will also blink a RED pattern indicating certain specific fault conditions. The STATUS LED will blink 1/sec a number of times in sequence to display a code from 2-8, then repeat continuously until a new request to power up. The FAULT indications are:

CODE	Meaning	
2:	'CPU Turn-on power fault'	Internal power supply hardware error. Return for service
3:	'CPU Running timeout'	Baler’s main CPU never boots up. Likely hardware fault. Return for service.
4:	'Input Voltage dropout'	Baler tries to start; the external power voltage drops. Your power source or cabling is defective.
5:	'CPU Timeout after running'	Baler main CPU starts, but crashes. Load latest Baler firmware and factory default tokens.
6:	'Q330/Vacuum Connect timeout'	Baler does not connect to Q330 or “Vacuum” within allowed time.
7:	'CPU Power down timeout'	Baler has not shut down gracefully. Possible hardware fault.
8:	'No Data Files'	This may arise in two conditions: <ol style="list-style-type: none"> 1) The internal disk media has failed. 2) The Baler fails to connect to a host within the allowed time after boot up. This is a transient error. Cables and configuration should be checked and operations retried.

APPENDIX – Baler setup using a simple Terminal Emulator - “Learn” Mode

In some cases, control of certain Baler settings may be necessary in the field without the availability of current PC support applications. In this case, a special mode called “Learn” mode requiring only a terminal emulator program (e.g. ProComm, TeraTerm, HyperTerminal...etc) and a serial connection to the Baler..

Why is it called “Learn” mode? Because, as you will see below, one of the simple commands allows the Baler to poll its Ethernet interface to learn the identity of all Q330’s that may be present, and allows the user to select one to which to bond.

To use Learn mode, you will need:

- A notebook PC or Handheld unit running terminal emulator software at 19200 baud.
 - A source of 12V nominal power for the baler.
 - A 110057 baler serial cable.
 - A serial cable for your PC and a null modem. The Baler with 111057 is a DTE.
1. **Disconnect** the baler serial cable if it is currently connected. The serial cable must remain disconnected until the appropriate point in the procedure, otherwise the baler may be powered up by the assertion of its DSR when plugged into your laptop. DSR is used to request a baler power-up in acquisition mode, where Learn mode is not available.
 2. Similarly, if you are using the 111058 “Power Adaptor”, **disconnect** any Q330 plugged into one of the ports on this adaptor, because the Q330 may assert ENETBPWR at an inopportune moment in the sequence.
 3. Start your PC terminal emulator application, set to 19200 baud, but do not yet connect the serial cable.
 4. If you want the Baler to be able to poll your network for a Q330 to which to bond, make sure the Q330 and Baler’s Ethernet connectors are plugged into your Ethernet switch or hub, and the switch or hub is powered on.
 5. Press and HOLD the ATTN button until the LED lights SOLID orange. This requires a continuous press of about 5s. The orange color is actually a combination of red and green and may be difficult to distinguish from RED. If the LED lights SOLID after about a 5s ATTN press, the first step is complete.
 6. Release the ATTN button.
 7. Attach the serial cable to your terminal. You need to do so promptly in order to see the main menu printed.
 8. As soon as the baler boots up, typically within less than 1 minute, you should soon see the main menu.

Here in the example at right, the Baler firmware version (1.94) is displayed, along with the electronic serial number of the Q330 to which the Baler is presently bonded, and the data port (4) on which it will register. A Baler that is not currently bonded will display this information as blank.

If you do not see a menu, power down the baler, check your connections, try a different null modem.

```
Version 1.94
Q330 Serial Number=010000069A6E42BE
Q330 Data Port=4
Permanent Baler IP Address=
Select:
  1) Change Q330 Serial Number assignment
  2) Change Permanent Baler IP Address
  3) Change Parameters for Non-Baler mode
  D) Disk Management
  L) Ethernet Loopback Tests
  S) Save changes and Quit
  Q) Quit without saving changes
```

Let's say we want to change the bonding of the Baler to a different Q330. In the main menu, select option 1). In the sub-menu are now two approaches:

- If there is only 1 Q330 of concern, then you may select option 2) to "Clear Q330 Serial Number and Data Port Assignment". This will have the effect of allowing the Baler to bond to the first eligible Q330 that responds to the Baler's next bonding request. You would use this method, for example, if you are at a site with only one Q330, and you want to assure that the Baler will bond to it.
- If there is more than 1 Q330 on a LAN and you want to select the one to which to bond, you may use option 1) "Scan for Q330 Serial Number".

In this case, we select option 2). Note that both the serial number and data port are erased. After the S/N and data port are erased, the main menu is again presented. If this was the desired action, then you would select S) to save, and the Baler will power down, ready for operation.

Note that in these examples serial numbers, ports, IP addresses, etc., will be different on your system.

If, however, you want to scan the Ethernet for Q330's, select option 1) in the sub-menu, and the Baler will begin probing the LAN for Q330's. Of course the LAN must be connected to the Baler and to any Q330's for this discovery to work correctly.

In this example, the Baler found two Q330's, the original one to which it was initially bonded, S/N 010000069A6E42BE, tag #0139 and another one S/N 010000069A37DC7A, tag #0002. In this example, we select 2).

Here we have changed the Q330 serial number assignment. Again if this was the desired action, select S) to save the changes, and the Baler will power down ready for operation, bound to the new Q330 selection.

```
Select:
  1) Scan For Q330 Serial Numbers
  2) Clear Q330 Serial Number and Data Port Assignment
  X) Exit and return to previous menu
Q330 Serial number and data port erased
Version 1.94
Q330 Serial Number=
Q330 Data Port=
Permanent Baler IP Address=
Select:
  1) Change Q330 Serial Number assignment
  2) Change Permanent Baler IP Address
  3) Change Parameters for Non-Baler mode
  D) Disk Management
  L) Ethernet Loopback Tests
  S) Save changes and Quit
  Q) Quit without saving changes
```

```
Q330 Serial Number=
Q330 Data Port=
Select:
  1) Scan For Q330 Serial Numbers
  2) Clear Q330 Serial Number and Data Port Assignment
  X) Exit and return to previous menu
Scanning for Q330's on Ethernet, this takes 77 seconds....
  1) S/N=010000069A6E42BE Tag=139
  2) S/N=010000069A37DC7A Tag=2
Select Q330 Serial Number or CR Only to ignore: 2
Version 1.94
Q330 Serial Number=010000069A37DC7A
Q330 Data Port=
Permanent Baler IP Address=
Select:
  1) Change Q330 Serial Number assignment
  2) Change Permanent Baler IP Address
  3) Change Parameters for Non-Baler mode
  D) Disk Management
  L) Ethernet Loopback Tests
  S) Save changes and Quit
  Q) Quit without saving changes
```


In some situations it may be desirable to have a permanent IP address for a baler, regardless of how the Q330 is programmed, this can be done by selection option 2) from the main menu and simply entering an IP address: Then S) for save. Be careful using this method of setting the Baler's IP address, since it overrides any setting in the Q330 that you may make with Willard. This can become confusing!

If you want to erase a previous permanent IP address setting, entering only a carriage return will clear the assignment.

```
Enter new IP Address (CR Only clears assignment):216.120.82.56
Version 1.94
Q330 Serial Number=
Q330 Data Port=
Permanent Baler IP Address=216.120.82.56
Select:
  1) Change Q330 Serial Number assignment
  2) Change Permanent Baler IP Address
  3) Change Parameters for Non-Baler mode
  D) Disk Management
  L) Ethernet Loopback Tests
  S) Save changes and Quit
  Q) Quit without saving changes
```

Whenever you save the changes by entering "S" you will see a confirmation:

```
Station file updated, have a nice day
You may restart the Baler in 10 seconds
```

You may also discard changes by entering "Q" at the main menu.

Now disconnect the serial cable from your terminal and re-connect the Baler for operation.

Why ever use a permanent IP address on the Baler assigned in Learn mode?

Normally the Baler's IP addresses are assigned by its address server, a Q330 during acquisition mode, or a vacuum application during a data offload. In special cases, however, for example where a Baler is connected to a large LAN in which address assignments are critical, it may be desirable to ensure that no mis-configuration of the information in the Q330 or a vacuum application could result in an erroneous address being assigned. The Baler's permanent IP assignment using Learn mode is a work-around for these situations. As noted, however, confusion may arise when changing your network configuration or if you change the Baler, because this permanent IP setting is deeply buried within the Baler. This setting is not visible using the normal administrative control under Willard, so use caution if you must use a permanent IP. VERY FEW uses ever require this.

There is another case where a Baler may not have broadcast access to its Q330 in order to be served an address. In this case, for example where a Baler may be located at a different site than its Q330, a special mode of the Baler (called "non-Baler" mode) can be configured. See below.

Disk Management

The disk management menu (Select D from main menu) is primarily used in an emergency to “clean” a disk that was not properly prepared using Baleaddr or BalerAdmin. “Cleaning” consists of removing all data files from a previous deployment and clearing any configuration settings. This would also be needed if an operator obtained a compact flash card that had not been prepared for those Balers that have facilities for removable compact flash cards. A CF card must be cleaned for use in the Baler. A blank, or formatted CF card will not record data without a cleaning operation.

Select D from the main menu.

The Disk Management menu will be presented.

First a WARNING message is printed to inform you that the media in the Baler has already been prepared allowing access beyond 8GB. This is important if you would use the “Partitioning” function. Partitioning should be considered an emergency measure only if the media has been replaced. It should never be necessary on factory-supplied media.

```
This drive has been formatted using Disk Manager to allow more than 8GB
"F" will partition and format only the first 8GB of this drive

Disk Model: IBM-DJSA-210 Revision: JS2OABDA
Select:
  C) Clean Drive
  F) Partition, Format, and Clean drive
  X) Exit and return to previous menu
```

To “Clean” only, select C from the sub-menu.

The Clean operation will require a few minutes to complete,

```
Are you sure (Y/N)?
Cleaning Drive - this may take some time
.....
Clean Drive Done
Total disk size is 10048864256 bytes in 5 partitions
594 Empty data files allocated
File Allocation Complete
Baler.ini Written
Station.ini Written
```

As you can see, this example was done on a 10GB drive. After completion you will be returned to the main menu.

Partition and Format

You should never have to re-partition and format a Quanterra-supplied hard disk. If the clean operation does not restore proper functioning then the disk is probably damaged and needs to be replaced. All compact flash modules we have tested have been pre-formatted, although blank cards do exist. It is likely that CF cards larger than 2GB will probably be formatted using an incompatible format and will need to be re-partitioned and formatted using Learn mode's Partition and Format commands.

Here is an example of partition, format, and clean of a 2GB flash drive.

Note that first it warns you that more than 8GB of storage is available on the drive. This means that you cannot partition and format the drive without losing storage space. Hard drives are partitioned and formatted at Quanterra to allow their available 10, 20, or 30GB capacities, depending on model.

IMPORTANT: IF YOU USE THE PARTITION AND FORMAT COMMAND ON QUANTERRA-SUPPLIED MEDIA EXCEEDING 8GB, YOU WILL PERMANENTLY LOSE DISK CAPACITY BEYOND 8GB. RESTORATION OF THE CAPACITY WILL REQUIRE RETURN TO QUANTERRA. THE BUILT-IN PARTITIONING IS DESIGNED FOR SMALLER-CAPACITY MEDIA, SUCH AS COMPACT FLASH AND SOLID-STATE DRIVES NOT EXCEEDING 8GB.

```
Disk currently has 1 partition(s)
All partitions appear to be properly formatted
You can select "F" to re-partition and format to be sure

Disk Model: SanDisk SDCFB-2048 Revision: HDB 2.06
Select:
  C) Clean Drive
  F) Partition, Format, and Clean drive
  X) Exit and return to previous menu
Are you sure (Y/N)?
Creating Partition Number 1
Writing Boot Sector
Baler14 will now reboot and clean drive
FF

Cleaning Drive - this may take some time
.....
Clean Drive Done
Total disk size is 2045476864 bytes in 1 partitions
915 Empty data files allocated
File Allocation Complete
Baler.ini Written
Station.ini Written
```

Ethernet Loopback Tests

These are for manufacturer testing purposes and require special external connections.

Non-Baler Mode

A Baler can also be used in what is called “Non-Baler Mode”, meaning it can’t, having no prior knowledge, just connect to a Q330 using broadcast mode as it normally does. In non-Baler mode, the Baler may be thought of as an embedded DP requiring configuration as any DP might require to specify the connection information needed to contact a “remote” Q330. This might be required if the baler is at a different site than the Q330 and not on the same network subnet. Not all of the steps required to set all the parameters are shown. You first by selecting option 3 from the main menu.

Note that when we changed from Ethernet to serial for the Baler to Q330 connection we got a new menu item to specify the Ethernet address of the Baler. This is because the baler permanent IP address is used for the interface between the Q330 and Baler, in this case, the serial interface.

All remaining non-Baler parameters would need to be set to complete the configuration. You would select “X” to return you to the main menu. If you instead select option 7 then you would change back to normal Baler configuration.

```
Non-Baler mode selected
Q330 Serial Number=010000069A40CAAF
Q330 IP Address=
Q330 Authentication code needs to be set
Q330 Data Port=4
Q330 Base UDP Port=5330
Baler uses Ethernet
Select:
0) Set Q330 Serial Number assignment
1) Set Q330 IP Address
2) Set Q330 Authentication Code
3) Set Q330 Data Port
4) Set Q330 Base UDP Port
5) Set Baler Port/Baud
7) Set to Baler Mode and return to previous menu
8) Set Optional Router (to 330) IP Address
X) Exit and return to previous menu
```

```
Enter Baler Ethernet IP Address : 216.120.82.61
Non-Baler mode selected
Q330 IP Address=216.120.82.58
Q330 Authentication code is set
Q330 Data Port=4
Q330 Base UDP Port=5330
Baler uses Serial at 115200 Baud
Baler Ethernet IP Address=216.120.82.61
Select:
1) Set Q330 IP Address
2) Set Q330 Authentication Code
3) Set Q330 Data Port
4) Set Q330 Base UDP Port
5) Set Baler Port/Baud
6) Set Baler Ethernet Port IP Address
7) Set to Baler Mode and return to previous menu
X) Exit and return to previous menu
```

APPENDIX – Baler bond dissolution without software support using only the ATTN button

Suppose you arrive in the field with a Baler ready to install on a Q330, and you find that the Baler will not connect to your Q330 because it was previously bonded to another one inadvertently? There are several approaches:

- You may set up your PC with administrative tools, such as Willard, Reload, Baleaddr (or preferably BalerAdmin) and wipe the Baler.
- You may use a terminal emulator program, and an appropriate serial cable to your PC to use the Baler's LEARN mode (see APPENDIX)
- If the Q330 and Baler are running current firmware (very early firmware through 2004 did not function this way) you may wait for 8-12 hrs to elapse, after which the Q330 and Baler will determine that no useful work is being done, and will bond with each other. Note, however, that this is true if the Q330 and Baler is connected to a LAN and there are NO OTHER Q330 OR BALER present.
- You may instead use a special purpose procedure requiring the use of only the Baler's ATTN button, and a source of power for the Baler. This procedure is designed to allow a field operator to "de-bond" the Baler without any special support tools. This method uses a special sequence of pressing the ATTN button, and watching the STATUS LED for visual confirmation at each step.

To use the "ATTN button only" method:

- Use an appropriate cable to apply POWER only to the Baler. Disconnect any Ethernet or Serial connections to the Baler. Note that if you are using the 111058 "Power Adaptor" you must be certain that there is no Q330 plugged into one of the ports on this adaptor, because the Q330 may assert ENETBPWR at an inopportune moment in the sequence. When you have connected power only, the Baler STATUS LED will remain in the IDLE indication.
- Press and HOLD the ATTN button until the LED lights SOLID orange. This requires a continuous press of about 5s. The orange color is actually a combination of red and green and may be difficult to distinguish from RED. If the LED lights SOLID after about a 5s ATTN press, the first step is complete.
- Wait for the CONNECT indication (mostly green with brief flash off) and press ATTN for about 1s to shut off the baler.
- Repeat the above two steps, i.e. power up again, and off again. After the second time the Baler shuts down, STATUS should flash GRN 1/s to indicate it no longer is bonded to a Q330. This is the same indication following a "wipe" operation.
- The Baler bonding has now been dissolved. Do a normal press of ATTN to power up the baler, and it should now connect to the Q330. If it does not connect, you will need to use the administrative tools to check the overall configuration.

APPENDIX – Quanterra Mini-SEED generation

Mini-Seed Generation from Q330 Data

This section is a reference describing specific aspects of Mini-SEED (MSEED) records generated by all Quanterra products in conjunction with the Q330 family. These products include all models of the Baler14, and software-only products such as Pecos, Pecos2, and the multi-platform Lib330 software library. For discussion in this section, we refer to all these generators of MSEED data as “DP’s”, or “Data Processors” in Quanterra’s terminology. This document does not describe the actual communications with the Q330, which is described in the detailed *Q330 Communications Protocol* and *Q330 DP Writer’s guide* documents.

Data Compression

All Quanterra DP’s generate Steim2 data records. The Q330 internally compresses data at sample rates higher than 1sps, and the DP essentially only repacks these compressed data into appropriately sized MSEED records. Some care is taken at record boundaries because the incoming data at 1 packet/s from the Q330 does not necessarily align with MSEED record boundaries. The MSEED record size of all Quanterra DP’s is user-adjustable from 512 to 16384. The default MSEED record size, in keeping with standard practice, is 4096-byte. Unless you have made an explicit adjustment to the MSEED record size of your Quanterra DP, the MSEED it produces will have 4096-byte record length. The Steim2 compressed data MSEED format is fully compliant with the SEED Version 2.4 specification, http://www.iris.edu/manuals/SEEDManual_V2.4.pdf.

Data Time Tags

All Quanterra DP’s tag each MSEED record with the best time information available to the DP (from the Q330) at the time the record is generated. The Q330 and Quanterra DP’s sample data at constant, fixed phase relative to UTC. All information, such as the delays of internal digital filters and the occurrence of leap seconds is taken into account. Each MSEED data record contains an embedded indication (see the “blockette 1001”) of the “quality” of this time information. *If this quality indicates greater than 10%, there is never any user time correction necessary to apply to obtain correct UTC time on your MSEED data.* It is essential that user software observe the time quality indication in MSEED records to properly interpret time information.

Fixed Section of Data Header

The following discussion describes the contents of compressed waveform data records; specialized records will be discussed later.

- Sequence number – Six digits, padded on the left with zeroes. Starts at one. Although we write a number on disk indicating the record number for that particular channel, we also will generate record numbers dynamically when extracting the data or interleaving with other channels. The Sequence Number has no permanent significance.
- Data header/quality indicator – We always use “D”.

- Station identifier code – Normally obtained from the Tokens. Left justified and padded with spaces.
- Location identifier designation – Normally obtained from the Tokens. Left justified and padded with spaces.
- Channel identifier designation – Normally obtained from the Tokens. Three alphanumeric characters.
- Network code – Normally obtained from the Tokens. Two alphanumeric characters.
- Record start time – The Data time-tag for the start of this record. As noted earlier multiple time-tags are likely to be obtained from the Q330, the highest quality one received during the record is used. If no time-tag is received from the Q330 during the record then a “backup time-tag” is used which is the same quality level as the last time-tag received and the actual time value based on the last time-tag received plus the number of samples divided by the sample rate. Since there is a time-tag every second from the Q330 this should only occur for high-rate data that compresses poorly and small record sizes.
- Number of samples – The number of compressed samples in the record.
- Sample rate factor – For 1Hz and greater it is the sample rate. For less than 1Hz it is $(-1/(\text{sample rate}))$, e.g. 0.1sps = -10
- Sample rate multiplier – Always exactly 1
- Activity flags:
 - Bit 0 – Calibration signals present – The Calibration status from the analog board (channel \$A8) is used to set a flag for each channel derived from the main digitizer based on whether a sensor calibration signal is being generated by the Q330. There is also a “hold up” timer that makes this flag stay on after the calibration is ended. This “hold up” is normally 60 seconds but can be changed on a channel-by-channel basis in the Tokens. If this flag is on when the record is written then this bit is set.
 - Bit 1 – Time correction applied - Always zero.
 - Bit 2 – Beginning of an event - Set in the first record where an event has been triggered.
 - Bit 3 – End of the event - Set in the first record following the last record where an event was triggered.
 - Bit 4 – Positive leap second - Always zero. Although there is a message log indicating a leap second was detected (if it was detected) we do not currently set this bit. If there is another leap second we will consider doing so.
 - Bit 5 – Negative leap second - Always zero.
 - Bit 6 – Event in progress – Set in every record where an event has been triggered.
- I/O flags and clock flags:
 - Bit 0 – Station volume parity error – Always zero.
 - Bit 1 – Long record read – Always zero.
 - Bit 2 – Short record read – Always zero.
 - Bit 3 – Start of time series – Always zero.
 - Bit 4 – End of time series – Always zero.
 - Bit 5 – Clock locked – Set if the time quality value is the same or higher than the “q_off” parameter (normally 80%).
- Data quality flags:
 - Bit 0 - Amplifier saturation detected – We use this bit to indicate that the channel had a calibration error when the Q330 booted up.
 - Bit 1 - Digitizer clipping detected – Always zero.
 - Bit 2 - Spikes detected – Always zero.
 - Bit 3 - Glitches detected – Always zero.
 - Bit 4 - Missing/padded data present – Always zero.
 - Bit 5 - Telemetry synchronization error – Always zero.

- Bit 6 - A digital filter may be charging – We set this flag for the first record of any data from the main digitizer if the DP received the first second of data after the Q330 has re-booted. It is also set in the first record for any channel that is being filtered by the DP unless the DP has a record of the filter contents from a previous connection (such as in Baler powered cycled mode).
- Bit 7 – Time tag is questionable – Set if the time quality value is lower than the “q_low” parameter (normal 10%).
- Total number of blockettes that follow – For data there are two (1000 and 1001) plus any event detection or calibration blockettes.
- Time correction – Always zero.
- Offset in bytes to the beginning of the data – 64 if there are no event or calibration blockettes. Add 64 for each of those.
- Offset in bytes to the first data blockette in this data record – 48.

Data Only SEED Blockette (DOB)

- Blockette type – 1000
- Next blockette’s byte number – 56
- Encoding format – 11 (Steim 2)
- Word order – Always 1 (big-endian)
- Data Record Length – Depends on DP. Pecos and Baler14 use 4096 byte records so this is 12.

Data Extension Blockette (DEB)

- Blockette type – 1001
- Next blockette’s byte number – 0 if no further blockettes, else 64
- Timing Quality – Percent, zero to 100. see below.
- µsec – zero to 99. When added to the normal SEED time stamp provides increased accuracy.
- Frame count – Number of compressed 64 byte data frames in the record.

Time Quality Percentage

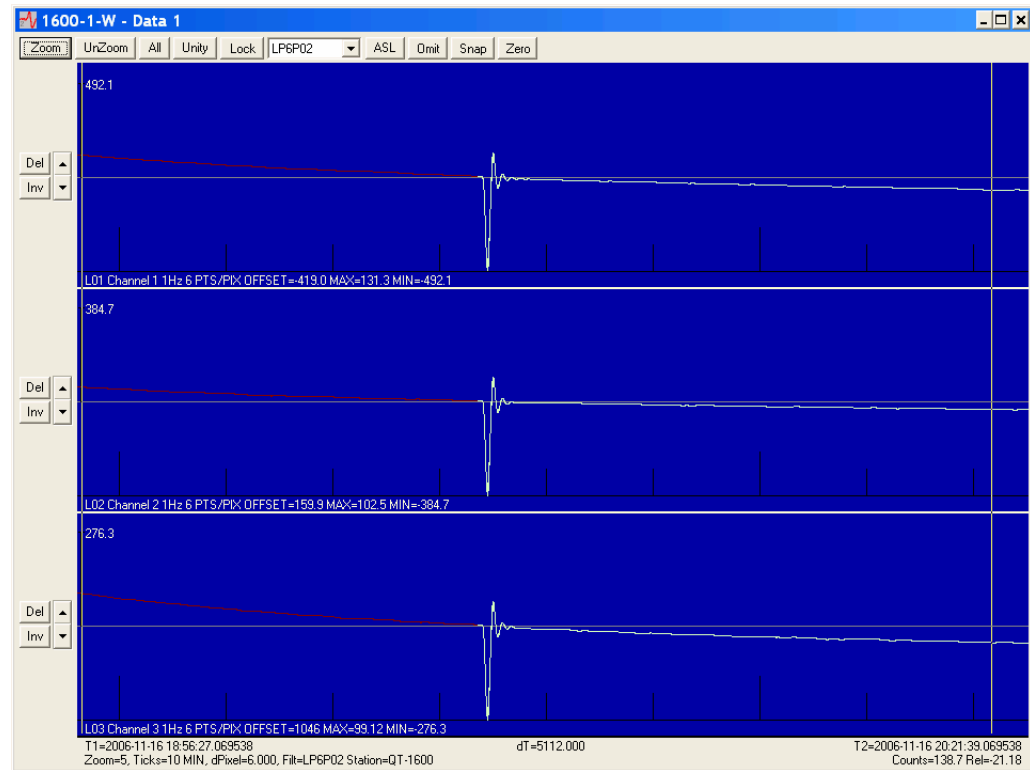
The Timing Quality describes the quality, or correctness, of the data record time tags. This is an important number, without which no proper interpretation of the data record time tags is possible. While the meaning ascribed to various percentages are programmable, few if any users will change the default values. Given that, there are a few simple rules, embodied in the color-coded scheme below. Time is guaranteed correct for any value 60% or higher.

0-10%	11-59%	60-79%	80-89%	90-100%
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In a system where the GPS is power-cycled, after acquisition of time and stabilization of the time base’s PLL, the GPS is switched off, and the quality decreases at the rate of 1% per 10min. Typically no more than a few hundred µsec error can accumulate in the standard 3-hr off cycle. So effectively, quality is acceptable in the range 11% or higher. If GPS time has been missing longer than 500 minutes, the quality decreases to 10%. Time quality 10% or less should be considered not meaningful. In particular, time quality <10% means there was never any GPS time acquired. The time is meaningless in this case.

What does “bad timing quality” look like in Cimarron?

Quanterra’s Cimarron MSEED plotting tool is aware of the MSEED status bits and timing quality information. We are often asked to interpret a case where MSEED plotting tools that are not aware of MSEED status bits and timing quality may show a “time tear” or decompression error reviewing a segment of data. Our first question to analyze such a situation is to obtain the data recorded by a Baler, and plot it using Cimarron. The scenario usually becomes clear. In the case at right, for example, data are plotted in the default dark red while the time quality is <10%, then the trace color switches to the normal default light blue when GPS time is acquired. What happened in this situation? The Q330 had been rebooted, and GPS time was not available when data recording began. As GPS time was acquired, the Q330 performed a “resync” operation, and began collecting data following a “jump” to correct time, which it will retain until powered down. In the log of Cimarron’s decompression, it notes that the first data record shows “inaccurate time”. At the acquisition of accurate time, there is an apparent reverse time shift. Subsequent records are recorded with accurate time. The interpretation is clear and simple.



```
Decompressing L01
Data block from 2006-11-16 18:44:41.069538 to 2006-11-16 19:37:05.069538
Data timed inaccurately
Data block from 2006-11-16 19:33:39.069542 to 2006-11-16 21:21:00.069542
Possible Gap detected of -206.000 seconds
```

If your MSEED plotting utility does not take into account the MSEED quality status bits, and time quality information, you may be misinterpreting time information! If your MSEED writer does not generate these bits, or is otherwise unaware of time quality, the MSEED produced may be irreparably compromised! The Q330 and Quanterra DP’s take special care to acquire, embed the time quality information within each MSEED record, and preserve the time quality information throughout processing to enable proper interpretation of the data.

Other Types of Seed Records & Blockettes

Message Records – default “LOG”

The Data Header contains the following:

Number of samples – Indicates the total number of message characters in the record. Each line of text is terminated with a carriage return and line feed.

Sample rate factor – Always zero.

Total number of blockettes that follow – Always one, the Data Extension Blockette is not included.

Offset in bytes to the beginning of the data – 56 (The first character of the message)

Data Only Blockette’s Encoding Format – Always zero.

Timing Records – default “ACE”

In our systems Timing Blockettes (500) go into their own data files. There is one timing blockette per Mini Seed record. The Data Header has the following differences:

- Number of samples – Always zero.
- Sample rate factor – Always zero.
- Total number of blockettes that follow – Always two, the Data Only Blockette and the Timing Blockette.
- Offset in bytes to the beginning of the data – Always zero.
- Data Only Blockette’s Encoding Format – Always zero.

The Timing Blockette is encoded as follows:

- Blockette type – 500
- Next blockette offset – 0
- VCO correction – The Q330’s VCO control value represented as 0-100% in single precision floating point
- Time of exception – The time of the Q330 time-mark in standard SEED format.
- μ sec – A value from 0 to 99 that can be added to the Time of exception for more accuracy.
- Reception quality – The time quality when the record is written.
- Exception count – The number of Q330 time-marks (seconds) since the last Timing record was written.
- Exception type – We generate the following types:
 - “Daily Timemark” – Written at midnight.
 - “Valid Timemark” – We log this when the time quality changes between major states. We do not log when degrading the clock over time to save log space. We also do not write a new log entry if it has been less than “clock_filt” seconds since the last message.

- Unexpected Timemark – (abbreviated to “UnExp Timemark” to fit in the space provided) – We log this if we get a time jump from the Q330. All jumps over ½ second are logged as well as those that exceed the “jump threshold” (default 100 µsec) programmed into the Q330.
- Clock model – As reported by the Q330. In almost cases it will be something like “P133T11NR1” the model number of a M12 GPS receiver. Padded on the right with spaces
- Clock status – For a Unexpected Timemark the actual time jump will be put into this area, such as “Jump of 37.000000 Seconds”. For the others a list of satellite signal to noise ratios are listed, such as “SNR=38,49,43,50,48,41,50,41,43,40”. Padded on the right with spaces.

Event Detection Blockettes (200 & 201)

Event Detection Blockettes are embedded within data records on channels where event detection is enabled. When adding a new blockette, 64 byte compressed data blocks are moved down to make room and the “Offsets in bytes to the beginning of data” and “Total number of blockettes that follow” are adjusted. Each Blockette uses 64 bytes in the record even though they are actually smaller to make handling the compressed data blocks easier by retaining 64-byte alignment. Any detections are generated by the DP, the Q330 does not perform event detection. We use the Generic Event Detection Blockette (200) for threshold detectors:

- Blockette type – 200 or 201
- Signal amplitude – The peak amplitude (in counts), this may be the value that exceeds the high or low threshold.
- Period of signal – Always zero.
- Background estimate – This will be either the high or low threshold depending on which threshold crossing caused this detection.
- Event detection flags – Always zero.
- Signal onset time – The time at which the threshold was crossed.

Murdock Event Detection Blockettes (201) are encoded using the standard methods for this type of detector.

Calibration Blockettes (300, 310, 320, and 395)

These blockettes are generated in response to a Q330 blockette within the Q330 data stream. Blockettes 300, 310, and 320 are a result of a Q330 Calibration Start Blockette (Channel \$98) and Blockette 395 from a Q330 Calibration Abort Blockette (Channel \$99). Refer to the *Q330 Communications Protocol* document for the format of these Q330 blockettes. Note that the DP generates one of these blockettes in every SEED data stream derived from a main digitizer channel that is in the “Calibration Bitmap” in the Q330 calibration blockette.

Step Calibrations:

- Blockette type – 300
- Beginning of calibration time – The “root time tag” as calculated at the beginning of this document for the second of data containing the blockette from the Q330 converted to standard SEED time.
- Number of step calibrations – Always one.

- Calibration flags:
 - Bit 0 – Set if bit six of Q330 blockette “Waveform” field is set.
 - Bit 2 – Set if bit seven of Q330 blockette “Waveform” field is set.
- Step duration – Multiply the “Duration in Seconds” field by 10000.
- Interval duration – Always zero.
- Calibration signal amplitude – (“Amplitude” + 1) * -6.
- Channel with calibration input – We simply scan the LCQ’s for the first channel in the “Monitor Bitmap” that is derived from that main digitizer channel, starting with the highest sample rate. So, if the first bit on in the monitor bitmap is 3 then this corresponds to main digitizer channel 4. If this channel has BLZ and LLZ LCQ’s, we use BLZ as the monitor channel.
- Reference amplitude – Always zero.
- Coupling – This string is whatever string was generated by the program who initiated the calibration. Willard uses 'RESISTIVE' and 'CAPACITIVE'
- Rolloff – We set this to ‘3DB@10Hz’

Sine Calibrations:

- Blockette type – 310
- Beginning of calibration time – The “root time tag” as calculated at the beginning of this document for the second of data containing the blockette from the Q330 converted to standard SEED time.
- Calibration flags:
 - Bit 2 – Set if bit seven of Q330 blockette “Waveform” field is set.
 - Bit 4 – Always set.
- Calibration duration – Multiply the “Duration in Seconds” field by 10000.
- Period of signal (seconds) – The “Frequency Divider” field.
- Amplitude of signal – (“Amplitude” + 1) * -6.
- Channel with calibration input – We simply scan the LCQ’s for the first channel in the “Monitor Bitmap” that is derived from that main digitizer channel, starting with the highest sample rate. So, if the first bit on in the monitor bitmap is 3 then this corresponds to main digitizer channel 4. If this channel has BLZ and LLZ LCQ’s, we use BLZ as the monitor channel.
- Reference amplitude – Always zero.
- Coupling – This string is whatever string was generated by the program who initiated the calibration. Willard uses 'RESISTIVE' and 'CAPACITIVE'
- Rolloff – We set this to ‘3DB@10Hz’

Pseudo-random Calibrations:

- Blockette type – 320
- Beginning of calibration time – The “root time tag” as calculated at the beginning of this document for the second of data containing the blockette from the Q330 converted to standard SEED time.
- Calibration flags:

- Bit 2 – Set if bit seven of Q330 blockette “Waveform” field is set.
- Bit 4 – Set if “Waveform” field ended with binary 111 equals binary 010
- Calibration duration – Multiply the “Duration in Seconds” field by 10000.
- Period of signal (seconds) – The “Frequency Divider” field.
- Peak-to-peak amplitude of steps – (“Amplitude” + 1) * -6.
- Channel with calibration input – We simply scan the LCQ’s for the first channel in the “Monitor Bitmap” that is derived from that main digitizer channel, starting with the highest sample rate. So, if the first bit on in the monitor bitmap is 3 then this corresponds to main digitizer channel 4. If this channel has BLZ and LLZ LCQ’s, we use BLZ as the monitor channel.
- Reference amplitude – Always zero.
- Coupling – This string is whatever string was generated by the program who initiated the calibration. Willard uses 'RESISTIVE' and 'CAPACITIVE'
- Rolloff – We set this to '3DB@10Hz'
- Noise type – And the “Waveform” field with binary 111 resulting in:
 - 001 – Set to ‘Red’
 - 010 – Set to ‘White’
 - 100 – Set to ‘Telegraph’

Calibration Abort:

- Blockette type – 395
- End of calibration time - The “root time tag” as calculated at the beginning of this document for the second of data containing the blockette from the Q330 converted to standard SEED time.

Variable Length Opaque Data Blockette (2000) – default “OCF”

Opaque Data Blockettes are used for the configuration record which normally has a SEED name of “OCF”. Configuration blockettes are written automatically by the DP as well as a result of receiving a Q330 Configuration Change blockette (channel \$93). For those written automatically by the DP the configuration log token has three bit flags and an interval:

Flag Bit 0 – Write configuration when starting the DP

Flag Bit 1 – Write configuration when stopping the DP. We don’t currently use this flag.

Flag Bit 2 – Write configuration at the specified interval.

When the DP writes these configuration records it writes the Global configuration (from the C1_GLOB Q330 packet), Fixed Values after Reboot (from the C1_FIX Q330 packet), the Data Port configuration that this DP is using (from the C1_LOG Q330 packet), and the Tokens that this DP is using. The global, fixed, and data port Opaque blockettes will fit into a single SEED record. The Tokens probably won’t fit if using a small record length like 512 bytes and so those are written as a series of records. We actually limit the size of the individual token blockettes so they could be split into 512 byte SEED records downstream even if we are writing to 4096 byte SEED records. We long-word align the start of each Opaque Blockette in the record (multiple of 4 bytes).

The Q330 blockettes will be written by the DP whenever they are received from the Q330. All the different configuration blockettes go into the single OCF SEED records. There may be more than one Opaque Blockette per SEED record. The Data Header has the following contents:

- Number of samples – Always zero.
- Sample rate factor – Always one.
- Total number of blockettes that follow – One plus the number of Opaque Blockettes. The Data Only Blockette is included, but not the Data Extension Blockette.
- Offset in bytes to the beginning of the data – Always zero.
- Data Only Blockette's Encoding Format – Always zero.

The Opaque Data Blockette is encoded as follows:

- Blockette type – 2000
- Total blockette length in bytes – seems pretty clear.
- Offset to opaque data – Depends on length of header, in our systems this is always 18
- Record number – This is always zero for other than tokens that cannot fit in one record. In that case the first record is zero, the next is one, etc.
- Data word order – Always 1 (big-endian)
- Opaque data flags:
 - For structures that fit in one blockette this is zero.
 - For the first blockette in a multi-blockette structure this is 5
 - For the middle blockette(s) in a multi-blockette structure this is 13
 - For the last blockette in a multi-blockette structure this is 9
- Number of opaque header fields – We always use one.
- Opaque Data Header fields – We encode the structure type here. GL~ for global, FX~ for fixed, Ln~ for data port (where n is the port number, such as L4~), and Tn~ for Tokens (where n is the port number, such as T4~).
- Opaque Data – This is just the binary data from the source structure.

What is the OCF channel good for? While you may not have a “cracker” for this channel, it contains a complete configuration record for the Q330-DP pair that generated the MSEED data packaged with it. Should any question or ambiguity arise later in describing the configuration of the data acquisition when the data are generated, the information contained within the OCF (and to a lesser extent the LOG channel) completely describes the equipment and software configuration state. OCF channels are therefore an important and indivisible part of the MSEED data generated by a DP.

APPENDIX – Baler 14 Internal Organization – document version 1.7 – minimum baler firmware 1.71

Certain internal defaults used by the Baler14 are adjustable in a special parameter file that may be downloaded to the Baler. Users will normally not require overriding the default values. This section is provided for expert reference. In particular, it is possible to render a Baler unbootable (requiring return to Quanterra for repair) through an accidental injudicious choice of parameters. In addition, some of the internal file organization of the Baler is described.

Document Conventions

In this document the parameters are represented by :

- n is a single decimal digit.
- nn is a multiple digit decimal number.
- hh is a multiple digit hexadecimal number.
- n.n.n.n is an IP address.
- ll is a SEED location identifier, spaces are replaced by underscores.
- sss is a SEED channel identifier.
- c is a single character.

Configuration File

A “baler.ini” file is optional and can be used to override the default values. The required section is called [baler] and can contain the following keys and values:

[baler]

maxsize=nn	Where nn is the maximum file size in megabytes, default is 16.
resize=nn	Where nn is the SEED record size represented as a power of two. Default is 12 (4096 bytes).
logthresh=nn	Where nn is the maximum time (in seconds) that can occur in a log record between the starting time and the actual time of the last message. Default is 60.
buffers=nn	Where nn is the number of recording buffers used in memory for caching of SEED records. The default is 1000 buffers.
retbuffers=nn	Where nn is the number of retrieval buffers used in memory for caching of SEED records. The default is 2000 buffers.
flush=nn	Where nn is the number of minutes between flushing buffers to disk. This is not normally relevant to power cycled balers since they will flush before they power down. The default is 30.
mintime=nn	Where nn is the minimum command timeout in seconds. The default is 5.
maxtime=nn	Where nn is the maximum command timeout in seconds. The default is 20.
continuity=n	Where n is one to enable continuity (default), or zero to disable.
q330flow=n	Where n is one to enable hardware flow control (default) on the serial port, zero to disable.

q330high=nn	Where nn is the highest baud to attempt on the serial port, default is 115200.
q330low=nn	Where nn is the lowest baud to attempt on the serial port, default is 1200.
firstdrive=c	Where c is the first drive letter to be used for index and data files.
lastdrive=c	Where c is the last drive letter to be used for data files.
zerohzthresh=nn	Where nn is the number of seconds of gap allowed between subsequent “zero hertz” data records. A new segment is declared in data availability if a gap exceeds this amount. The default is 600. “zero hertz” data would include opaque blockettes, message log, and timing records.
webtimeout=nn	Where nn is the number of seconds to keep a power cycled baler on even if it has emptied the Q330’s buffer and after the last web access, if there have been any. The default is 300 seconds.
minon=nn	Where nn is the minimum number of seconds to keep a power cycled baler on even if it has emptied the Q330’s buffer. The default is 120 seconds.
maxon=nn	Where nn is the maximum number of seconds to keep a power cycled baler on. The default is 43200 seconds (12 hours).
noncirc=1	If present, writing is stopped once the data files are full, preserving old data. Default is zero, meaning Old data is removed to make room for new data (circular buffer).
maxfiles=nnn	Where nnn is the maximum number of data files to allocate. Defaults to a large number that is limited to the amount of disk space, or 9500 whichever is smaller.

Note that unless both Firstdrive and Lastdrive are specified the system will search for drives starting at “C”, finding the first drive with at least 50MB space and continue searching until it finds a drive with less than 50MB space. Firstdrive and Lastdrive are automatically written to the baler.ini file when the disk is cleared.

There is an optional section that is used to override default web server locations for the not-yet-deployed information system:

[webroots]	
digi=url	Where url is the web address for digitizer information, less the serial number, the default url is http://www.seismicpower.com/digi/msg.htm?
amb=url	Where url is the web address for analog motherboard information, less the serial number, default is http://www.seismicpower.com/amb/msg.htm?
sensor=url	Where url is the web address for sensor information, less the serial number, default is http://www.seismicpower.com/sensor/msg.htm?
qapchp=url	Where url is the web address for QAPCHP information, less the serial number, default is http://www.seismicpower.com/qapchp/msg.htm?
ptag=url	Where url is the web address for Property Tag information, less the serial number, default is http://www.seismicpower.com/ptag/msg.htm?

By default the baler will start 1 NetServer (LISS) with no sync packets and no IP address filtering. To override these defaults:

[netserver]	
ports=n	Where n is the number of NetServers to start. Default is 1, maximum is 4. The first NetServer is

syntime=*n*
 ip_range_*n*=*lowip-highip*

on the TCP port specified in the Tokens. The next one is that port+1, the next at port+2, etc. Send a sync packet if “*n*” seconds have elapsed since the last packet (sync or normal) has been sent. Where “*n*” is 1 to a maximum of 10. “*lowip-highip*” signify a range of addresses that are allowed to connect. “*highip*” may be the same as “*lowip*”. If there are no “*ip_range_n*” entries then connections are allowed from any IP address. In the unlikely event that you need to cross over the 128.0.0.0 border, you must split the range into two entries. For example, the range 126.0.0.0-129.255.255.255 must be two ranges, 126.0.0.0-127.255.255.255 and 128.0.0.0-129.255.255.255

Station File

A “station.ini” file is created by the baler the first time it is able to communicate with a Q330. When a baler is powered it checks to see if this file is available, if not, it immediately starts scanning using the values from “baler.ini” or the default parameters. If this file is present it uses the parameters in it. If it can’t communicate using the parameters in this file it will go into scan mode where it tries to find a baler on interfaces/bauds in the baler.ini file. The station.ini file is located in the <firstdrive>:\idx\ directory.

[q330]

baud=*nn* Where *nn* is the baud for the serial port, zero to use ethernet.
 q330sn=*hh* Where *hh* is the serial number for the Q330.
 logport=*n* Where *n* is the logical data port to use when getting data from the Q330.
 network=*xx* Where *xx* is the network code.
 station=*ssss* Where *ssss* is the station name.
 q330ip=*ipaddress* Where *ipaddress* is the Q330’s IP address, only set in non-baler mode.
 q330auth=*authcode* Where *authcode* is the authentication code, only used in non-baler mode.
 q330port=*port* Where *port* is the data port number, only used in non-baler mode.
 nbbase=*base* Where *base* is the Q330’s base UDP number, only used in non-baler mode.
 retrycount=*n* Where *n* is the number of times the baler has powered up but failed to connect.

[baler]

permip=*ipaddress* Where *ipaddress* is the baler’s IP address, regardless of what the Q330 suggests.
 nbbaud=*nn* Where *nn* is the baud for the serial port connection to the Q330, zero to use ethernet, only used in non-baler mode.
 etherip=*ipaddress* Where *ipaddress* is the baler’s ethernet IP address if it is connected to the Q330 using the serial port, only used in non-baler mode.
 nullconfigs=*n* Where *n* is the number of times the baler has been started up in “learn” mode without user input.

Data and Index Files

Data files are written for each separate location/channel combination. It is anticipated that there will be 15-30 of these in a typical baler. Calibration and Event

blockettes are included in the data records they associate with. All index files are located in the <firstdrive>\idx\ directory. There are five types of files:

- DTnnnnll.sss Data file, where nnnn is the file number (starting at 1 on a fresh disk). These are located in <drive>\data\ directories.
- DInnnll.sss This is the index file for the above data file. Each record in the index file is two longwords that are the starting and ending time (seconds since 2000) of the corresponding record of the data file.
- EInnnll.sss This is the event index file for the corresponding data file. Each record in the event index file is two longwords, the first is the starting time of the event, and the second is the record number in the data file.
- CInnnll.sss This is the calibration index file for the corresponding data file. Each record in the event index file is two longwords, the first is the starting time of the calibration, and the second is the record number in the data file.
- MI0001ll.ss This is the master index file. Each record in the master index file is two longwords. The First record is special with the first longword being the sampling rate if ≥ 1 Hz, else it is 1. The second record corresponds to DT000ll.sss, the third record is for DT0002ll.ss, etc. In each of these records the first longword is the starting time of the corresponding data file and the second longword is the drive number where the data file is stored (3 = 'C', 4 = 'D', etc.).

APPENDIX – Standard Q330 System State-of-Health Channel Description

Overview

The factory default configurations typically contain a common set of set of State-of-Health (SOH) channels. This section describes their content. While you may feel the temptation “simplify” your configuration by recording “just the important waveform data”, i.e. the seismic sensor data only, you in fact greatly complicate any later analysis of the quality and usefulness of the seismic data.

LOG

A text log of Q330 and operator actions. Generated by the Data Processor. The text is packetized into MSEED format for efficient telemetry and storage using date stamps local to the DP system. The LOG channel includes a snapshot of system configuration and operation in a human readable form, and records any unusual events, such as reboots. Very helpful for post-facto quality or fault analysis. All Quanterra DP’s (Baler, Pecos, Pecos2, lib330-derived applications) generate a common LOG format.

ACE

Packed MSEED blockettes of significant changes in clock status. Daily status and any time discontinuities as reported by Q330. Data rate is event driven. See *DP Writers Guide* and *Q330 Protocol Document*.

OCF

Opaque Configuration File is binary configuration structures encapsulated in MSEED opaque data blockette form. The configuration structures are produced at the start and stop of recording and at intervals, such as daily. This channel is essential to retain in order to document in machine-readable format the physical origin of the data used to construct MSEED channels.

VM?

Boom Position Channels 1-6, commonly referred to as mass position channels because they usually record the mass position outputs of broadband seismometers. The rate is fixed at 0.1 sps, so the SEED channel code should begin with VM?. The channel identifier depends on the type of sensor. Typically VMU VMV VMW is for STS2 sensors and VMZ VMN VME for Guralp or STS1 sensors. The unit is 128 counts = 12.5 Volts or 10 counts / volt. Source is a DT_DATA packet with channel id 10100000 where the three signed 8 bit parameters are respectively boom position channels 123. For Boom position channels 456 the source is a DT_DATA packet with channel id 10100001 where the three signed 8 bit parameters are respectively boom position channels 456

LCQ

Clock channel, clock quality as a percentage 0-100%. Essential to assess time quality contemporaneous with data recording. Data rate: 1sps. See the *DP Writer’s Guide* and the discussion of time quality in this document.

LCL*

Clock channel, lock loss in minutes. A counter indicating the time since the last clock lock. The data rate is 1 sps and units are minutes. Source is a DT_DATA packet with channel id 10011000 second parameter (16bit). (*) Not normally included in the factory default status channel configuration.

LCE

Clock channel, phase error in microseconds. The difference between UTC and the sample clock. The phase error has already been applied to the time labels on sampled data. The LCE channel is not, therefore, a measurement of the time error of sampled data. Note that in the case of an unlocked clock, the phase error reported is held at the last value known. The data rate is 1 sps and units are microseconds, positive means the sample clock lags UTC. . Source is a DT_DATA packet with channel id 10011000 third parameter (32bit).

VPB or VFP

Logical Port status channel, the percentage of telemetry packet queue in use for the current Data Port. The data rate is 0.1 sps and units are 0.1%. Source is a DT_DATA packet with channel id 10001001 16 bit. On a Baler, it is typical to see this channel form a “sawtooth” waveform, cycling between the maximum full state triggering a Baler cycle, and zero.

VCO

PLL channel, VCO value. A measure of the automatic adjustment applied to the oscillator to raise or lower the clock frequency to phase lock with UTC. The median value is 2048 and ranges between 0-4095. The data rate is 0.1 sps and units are unspecified. Source is a DT_DATA packet with channel id 10001000.

VKI

System status channel, 330 internal temperature in degrees C. The data rate is 0.1 sps and units are degrees C. Source is a DT_DATA packet with channel id 10000000 second 8bit parameter.

VEA

System status channel, the current supplied to the GPS antenna in milliamps. The data rate is 0.1 sps and units are mA. . Source is a status request packet. Source is a DT_DATA packet with channel id 10000001 second 8bit parameter.

VEC

System status channel, 330 system input power supply current in milliamps (not including current passed through to Baler, sensors, etc that may share a power connection via a 330 connector). The data rate is 0.1 sps and units are mA. Source is a DT_DATA packet with channel id 10000001 first 8bit parameter.

VEP

System status channel, 330 system input power supply voltage. The data rate is 0.1 sps and units are 150mVolts per count. Source is a DT_DATA packet with channel id 10000000 first 8bit parameter.

AX0-AX3

Channels from the AUXILIARY A/D board, if equipped. 1sps. Gain depends on setting of individual channel gain in the AUXAD board.

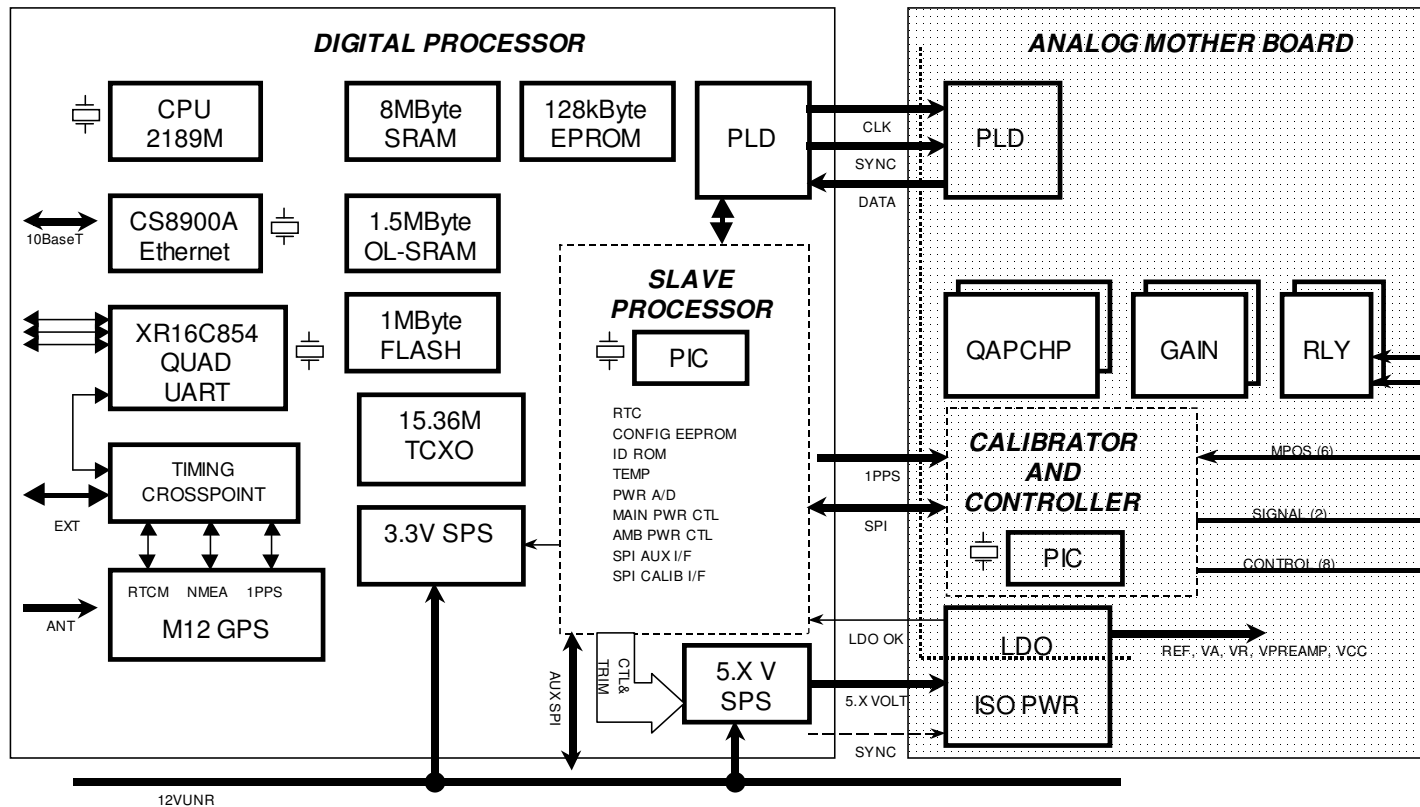
Q??

Telemetry performance channels, generated in the DP. Not supported in early DP software. Various channels, such as QDL (Data Latency) and QTP (Throughput in seconds/sec) are supported and others. See Willard’s Token Editor, “DP Statistics” token tree. Not included in many factory defaults.

APPENDIX – Simplified Q330 Block Diagram

Overview

The Q330 comprises a digital section containing 8 or 32Mb SRAM packet memory and an analog section. The digital section, including external interfaces, is powered from a high-efficiency step-down regulator (Switching Power Supply, or SPS) that shares a common with the primary external DC power. The Analog system is isolated from the primary DC power. An AUXAD Auxiliary A/D shares a common with the primary DC power. All of the analog and calibrator commons are tied together at the Analog power supply. All 6 channels of main high-resolution A/D share a power supply and common. Two 3-channel QAPCHP (Quantagratator Analog Processor – Channel Processor) modules comprise the high-resolution A/D front end. Optionally, a differential preamplifier may be switched in through relays to provide a fixed gain of 30 (or 20 in a Q330HR) when required. .



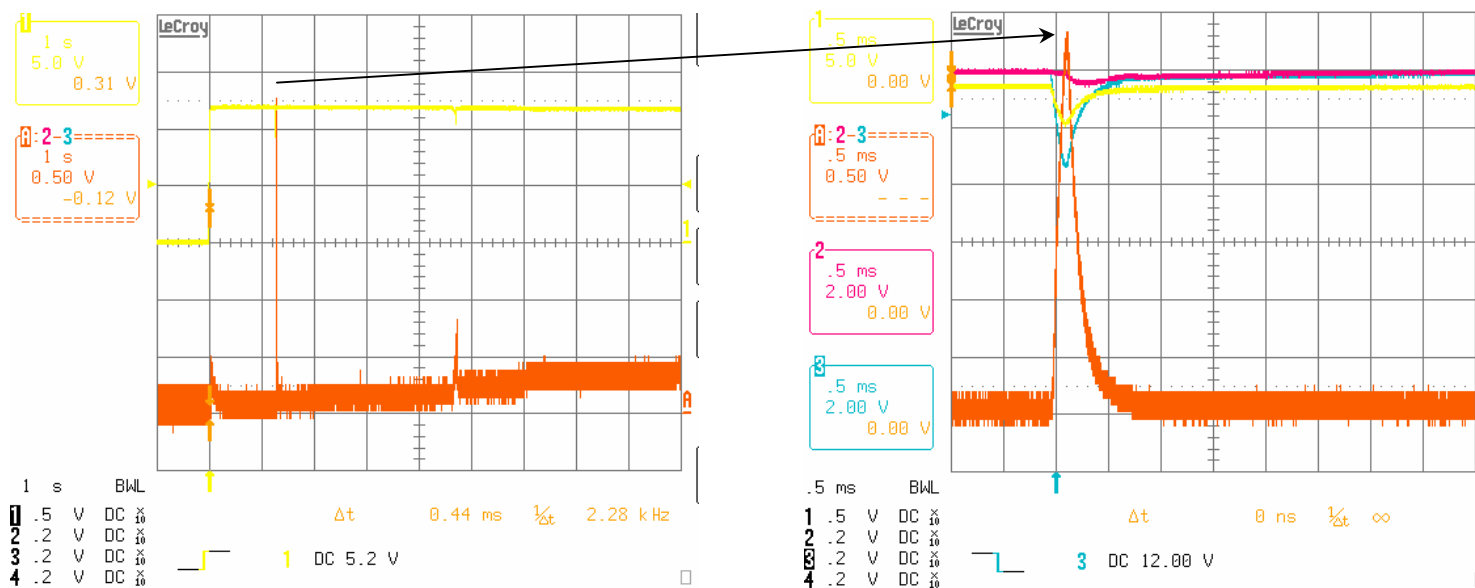
APPENDIX – Power supply and grounding performance considerations – Engineering data

Overview

In this section we discuss aspects of power systems and interconnection to obtain optimum performance from the Q330 and Q330HR. Safety considerations discussed in other sections must always be adhered to in all circumstances. This section discusses particular attributes of systems engineering applicable in general to systems involving interconnection of various sensors with a DC-power acquisition system, with reference to the both the Q330 and Q330HR, although the text mentions only the Q330HR for simplicity.

Power system source impedance

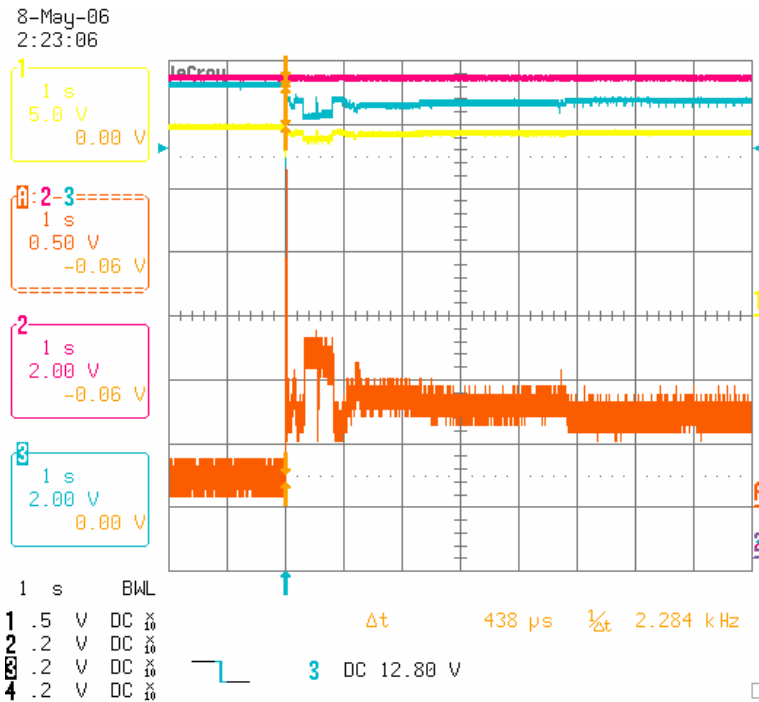
The Q330 was designed to run from a low-impedance power source, such as, in an office environment, the recommended KMI mains supply, or, in most typical field installations, from a storage battery connected to a charger. A battery presents a very low-impedance source. This is important, because the Q330HR, like many electronic systems, may place brief instantaneous demands on the power supply, although the average power requirement is quite low. A power supply with excessive source impedance, or simply a length of small-diameter wire from a low-impedance supply, **will cause the Q330HR to reboot** when its protective microprocessor based power monitoring system detects a **load-induced voltage drop** across the source impedance. Q330HR's may reboot on seemingly "good" power from a "big" power supply. Beware source impedance and source transient handling capability!



Peak current requirements: Q330HR with maximum power configuration: 1s/division. 500mA/vert div. Three pulses, with the largest ~3A for 0.5msec duration, shown in the zoom detail at right. Average current ~200mA after ~5s.

Similar peak currents are observed at Baler turn-on. The figure below shows the peak current demand at ~3.5A for 0.5msec, followed by ~1-1.5A for 1-2s during disk spin-up, followed by settling at steady-state ~750mA (total current Q330HR+Baler).

At Baler turn-off, the current profile is similar (the disk must be spun up) except for the initial higher current spike.



15 Watt BR Single Series DC/DC Converters



Description

The Calex BR series are 15 Watt DC/DC converters in a 1" x 2" case with a 4:1 input ratio. The input voltage range is 9 to 36 VDC for 24 Volt models and 18 to 72 for 48 Volt models. The BR series requires a low source impedance at the input terminals by using an external capacitor (see Application Notes). These models do not have an internal input filter. The units are filled with a compound which allows them to withstand a normal water wash after being soldered to a PC board.

Model	Input Range VDC		Output VDC	Output mA
	Min	Max		
24S118-4500BR	9	36	7.8	4500
24S234-4500BR	9	36	2.5	4500
24S318-4500BR	9	36	3.3	4500
24S2-3000BR	9	36	5	3000
24S12-1250BR	9	36	12	1250
24S15-1000BR	9	36	15	1000
48S118-4500BR	18	72	7.8	4500
48S234-4500BR	18	72	2.5	4500
48S318-4500BR	18	72	3.3	4500
48S2-3000BR	18	72	5	3000
48S12-1250BR	18	72	12	1250
48S15-1000BR	18	72	15	1000

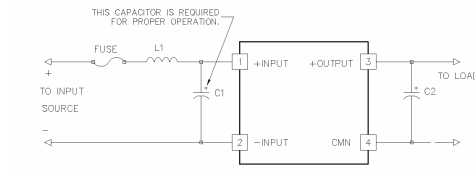


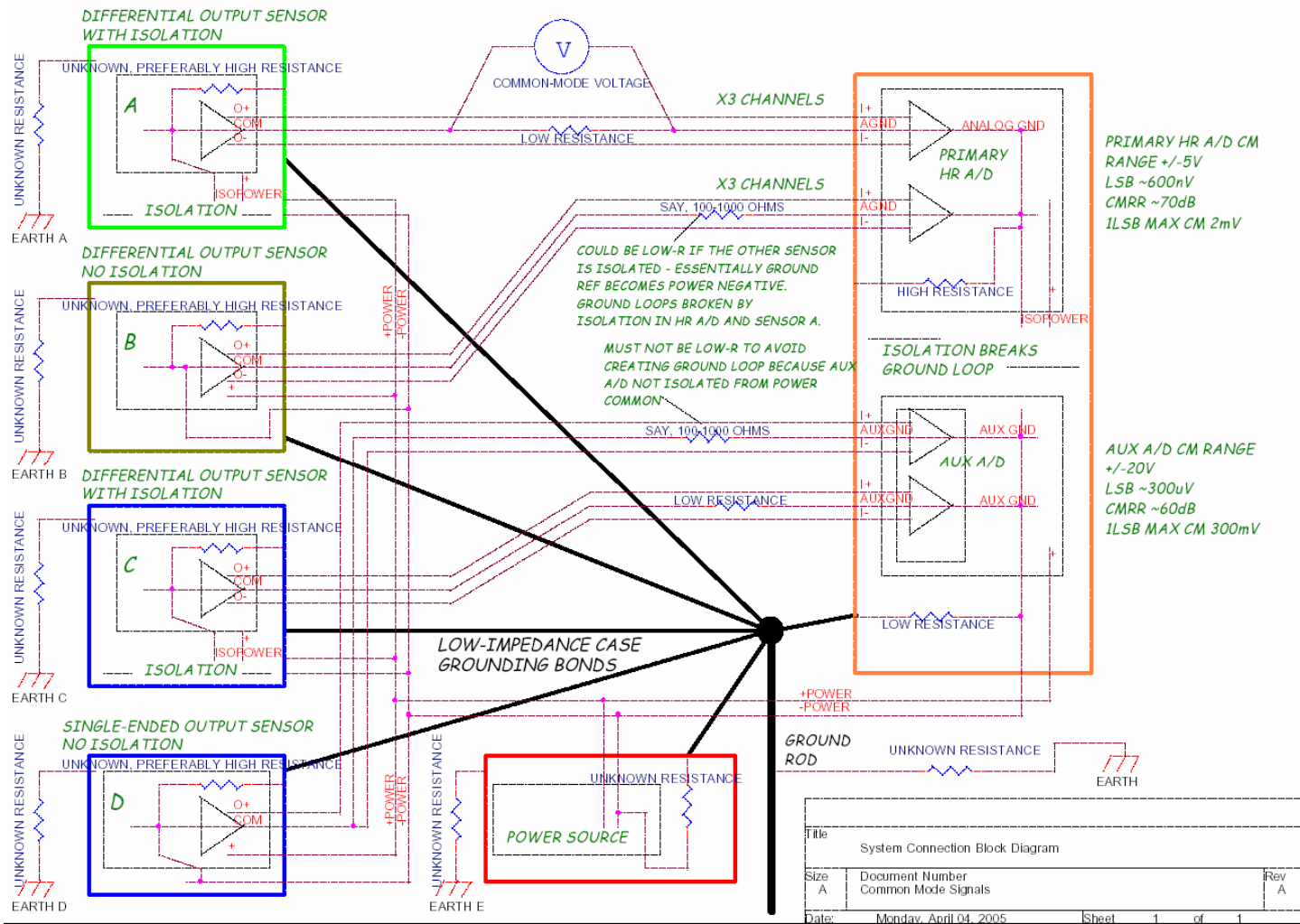
Figure 1. Recommended application

IMPORTANT: Typical DC/DC converters (such as that shown above) that may have sufficient steady-state current delivery capability cannot deliver even brief (milliseconds) peak current requirements exceeding their steady-state current ratings. Such converters must be accompanied by post-filtering and reservoir capacitors to provide an appropriate source impedance to supply the required peak current demands. A battery operated from a constant-voltage float charger, on the other hand, typically has sufficiently low source impedance with no external components.

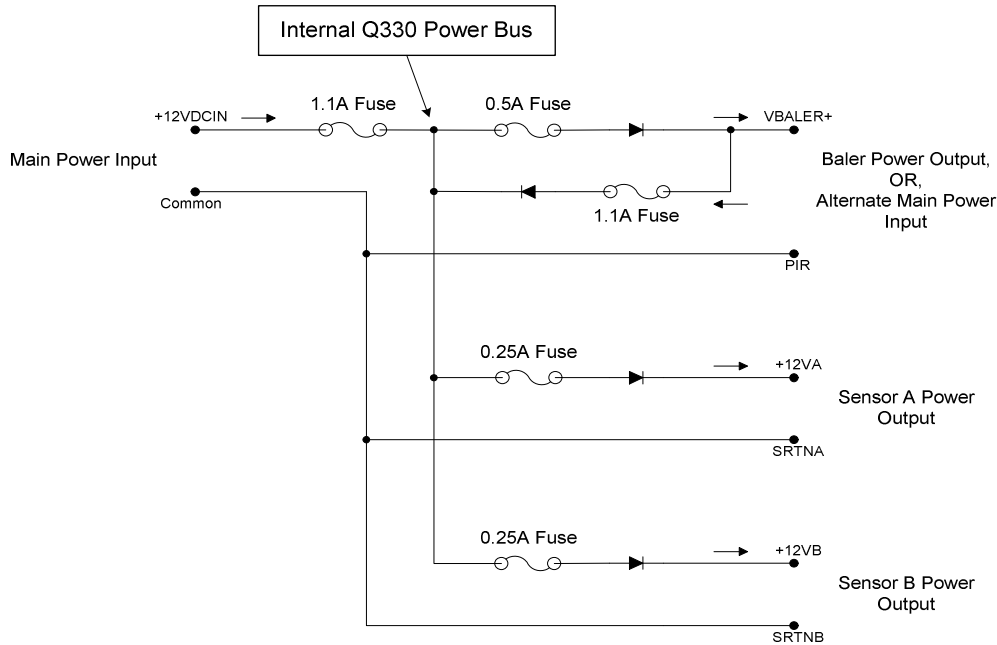
This engineering data is provided to assist in host power system design. Consult Quanterra if you have any questions.

Grounding and Power Connection to Minimize Ground Loops and Common-Mode Errors; Optimal connection of multiple sensors

This diagram provides information on suggested grounding, power distribution, and cabling recommendations



Power distribution inside the Q330



Notes:

1. Simplified circuit diagram does not show transient protection or filtering circuitry.
2. All fuses automatically reset after end of over-current condition.

Test Conditions: +12VDCIN = 12.00V

Output	Current Drain thru output	Voltage at output connector
VBALER+	450mA	11.20V
Sensor +12V	200mA	11.20
Sensor +12V	100mA	11.40

The power distribution system within the Q330 allows the Q330 to be powered through either the POWER connector, or the QNET (VBALER) connector. The blocking diodes mean that the higher voltage present on either connector will provide current for the Q330 and both sensors connected to the Q330.

Note that the sensor current is limited to 250mA maximum. Certain Guralp sensors may require higher currents during centering or locking operations, and may be required to be powered separately. The blocking diodes on the Q330 sensor connector prevent backfeed into the Q330.

Grounding and Power Connection: Reverse Polarity and Split-Supply Caution

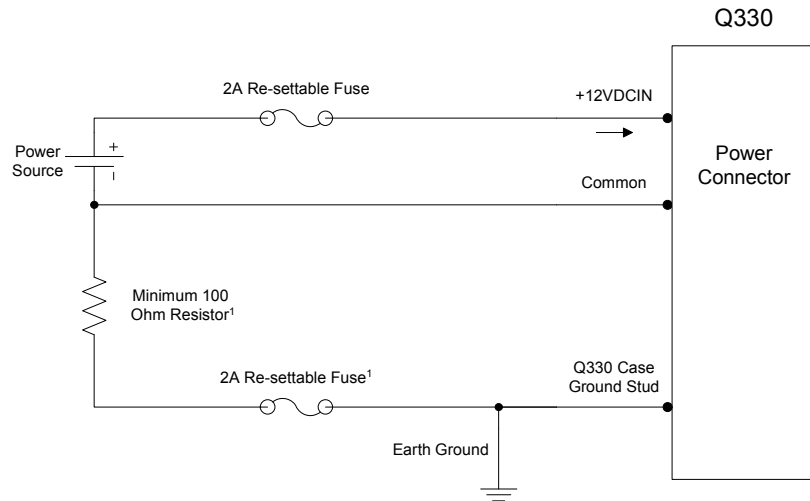
As shown in an earlier diagram above that illustrates grounding, power distribution, and the origin of common-mode signals in typical system configurations, power systems typically have some finite resistance between their negative or common side, and EARTH ground. While the Q330HR can tolerate a polarity reversal of power applied to the + and – power input terminals, the Q330 can be IRREPARABLY DAMAGED if the minus (-) side of the external power supply is ALSO tied to the EARTH ground (and the $\frac{1}{2}$ terminal) AND the polarity is REVERSED. This is because excess current will flow from the (-) power terminal through components in the Q330.

Engineering Analysis:

The Q330 power input circuit is rated to withstand a maximum forward voltage up to 30V (operating voltage 9-18), and to tolerate polarity reversal between the +12VDCIN (pin A) and POWER COMMON (pin B) of without damage or excess current flow. However, unlimited current flowing between the POWER COMMON (pin B) and the PROTECTIVE GROUND PLANE (pin F) of the front panel POWER connector will cause the failure of internal Inductors BD107 & BD108. Such a situation might arise if PROTECTIVE GROUND PLANE, which is tied to the front panel EARTH GROUND stud is connected at the power supply to the negative side of the 12V source AND the 12V power is applied to the Q330's POWER COMMON (pin B), not to the +12VDCIN (pin A). In other words, both a polarity reversal AND connection of the power source return to the EARTH GROUND is required to cause this destructive failure. Note that if unlimited current flows between the POWER COMMON (pin R) and PROTECTIVE GROUND PLANE (pin P) on the QNET connector, a similar Bead Inductor BD153 and BD154 will be destroyed.

Recommended Problem Avoidance:

It is recommended to place an in-line 2A resettable fuse in power supplied to the Q330. It is further recommended to connect your power source return to EARTH ground through a 100Ohm resistor, and/or a 2A resettable fuse. The EARTH GROUND should be bonded only to exposed chassis and case connections. To prevent the possibility of damage to the Q330 in the event of power polarity reversal, it is therefore recommended that your power supply (-) terminal NOT be connected to EARTH through a low resistance. Instead, we suggest a resistance no less than about 100 ohms. This will prevent damage to the Q330 in the event that the polarity of power applied to the Q330 is reversed. See the figure below:

**Notes:**

1. Use minimum 100 Ohm resistor and/or a 2 Amp re-settable fuse in the path from the power source return to earth ground.

Split Supplies – Danger!

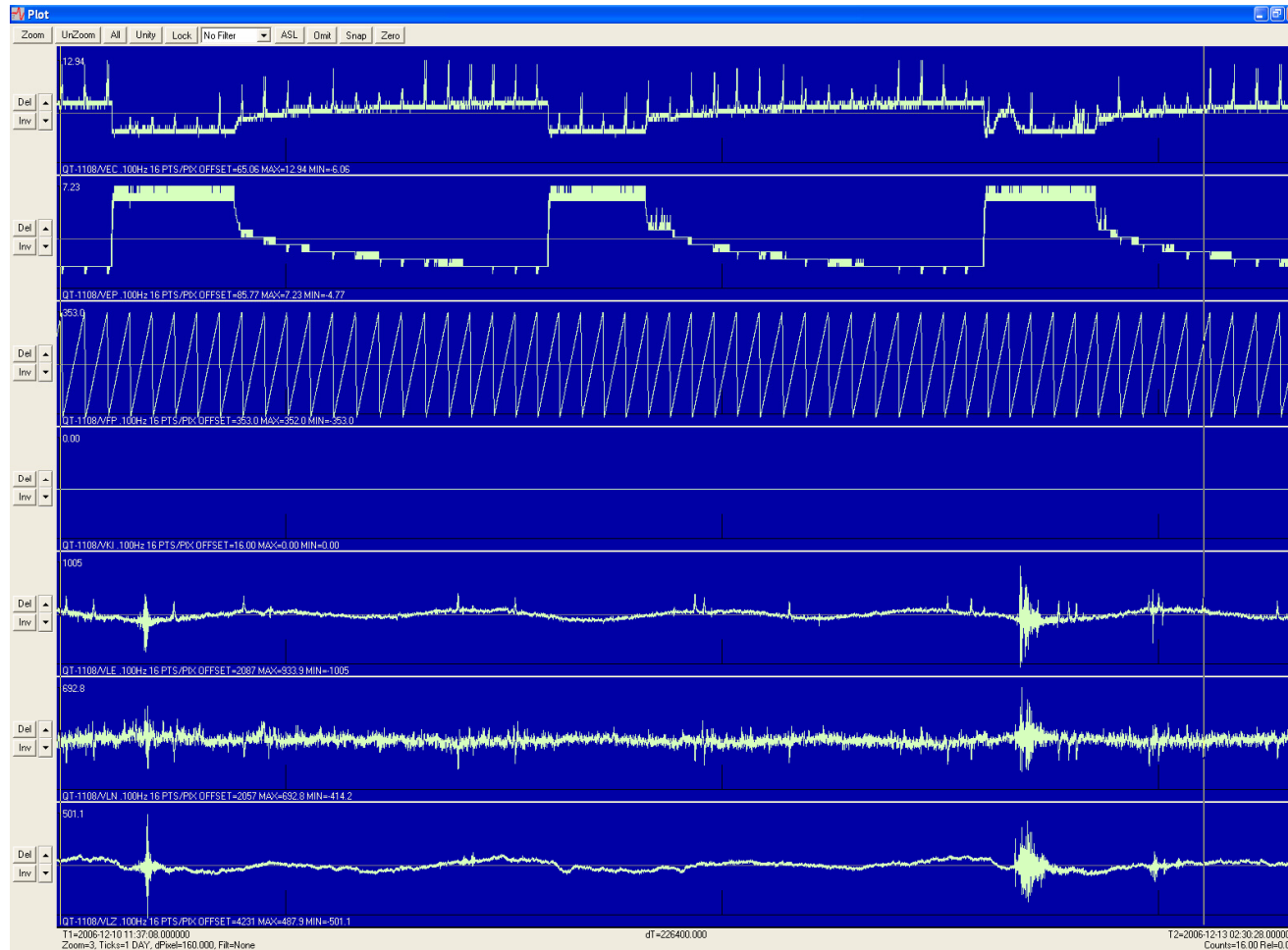
Q330's may be used in “legacy” installations, or at sites where older equipment powered by 24VDC nominal power is the primary uninterruptible power source. In such systems with 24V charging, it may be tempting to use “half” of the 24V supply. This is NOT recommended, and may cause permanent serious damage to the Q330 because of unpredictable current paths. The “neutral” in a 24V system may not be the negative side of the supply, in which case **SERIOUS DAMAGE** will result, since reversed polarity may effectively be applied between the EARTH terminal on the Q330 and the power common.

A word about supplies:

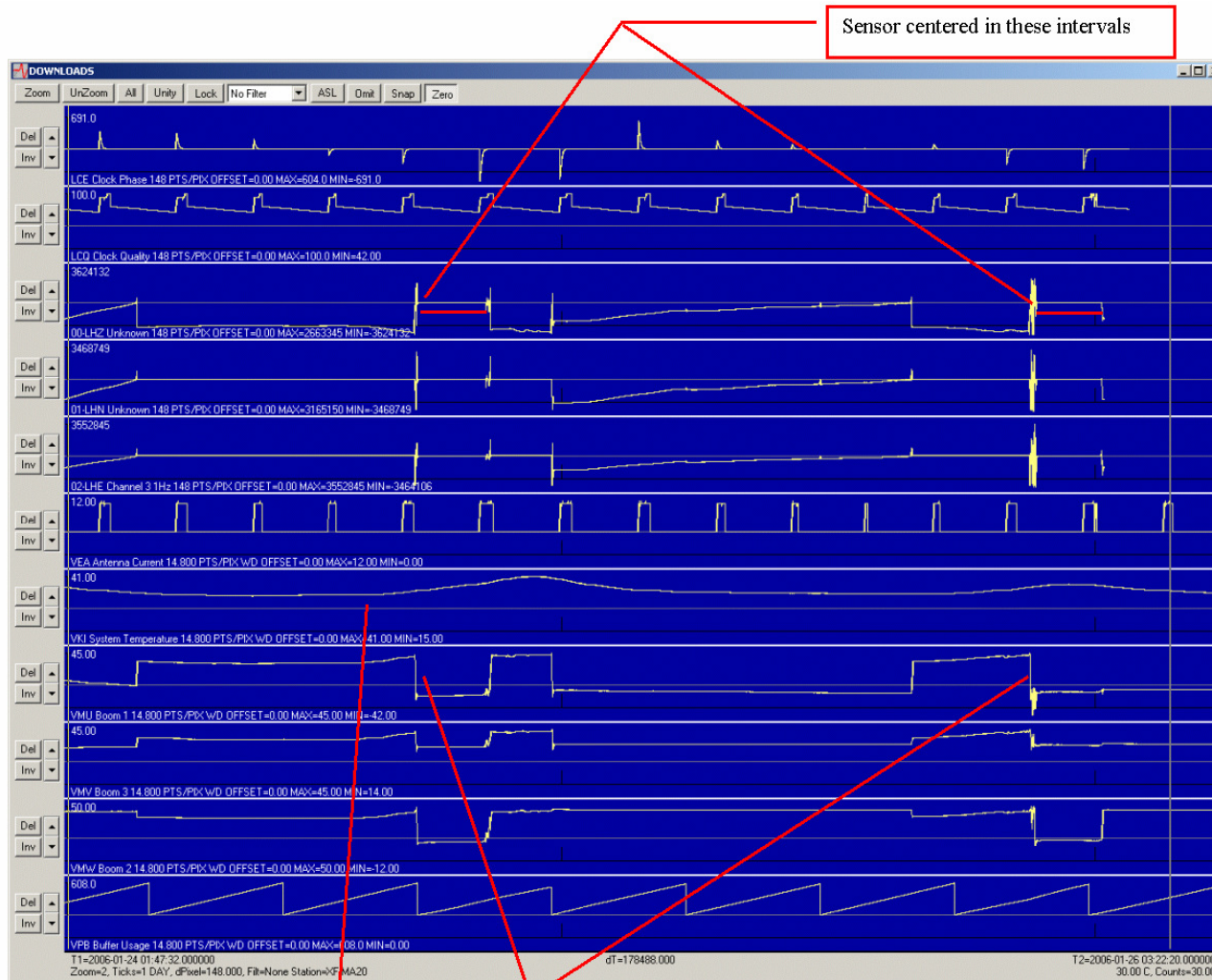
The Q330 family offers an opportunity to discard “heavyweight” power systems. The current demands for a Q330 are measured in mA, not AMPS. Smaller, modern, lightweight power supplies run cooler, are more reliable, and are easy to transport and service. Use the right supply for the Q330.

APPENDIX –Station Quality Assessment using Q330 State-Of-Health Data

The Q330-Baler’s V?? rate data and SOH streams provide compact and powerful tools for quick checks of station integrity. Viewing these channels together provides a simple means of correlating sensor data with external events such as temperature and power variations; these are the most frequent sources of damaging influences. Below, about 2.5 days of data from a good STS-2 station is shown. The VL? Sensor channels show tidal signals and earthquakes that are apparently not affected by the large power changes during battery charging (VEP) or baler cycles (VFP). Temperature stability is good (VKI).



A “good” installation showing no influence of power variation on data, despite changes of several volts on the primary DC (VEP). Thermal stability is excellent at this site, showing no measurable temperature change during the 2.5 days (VKI). Cycles of the Baler (VFP shows the data packet buffer fullness) do not affect the data.

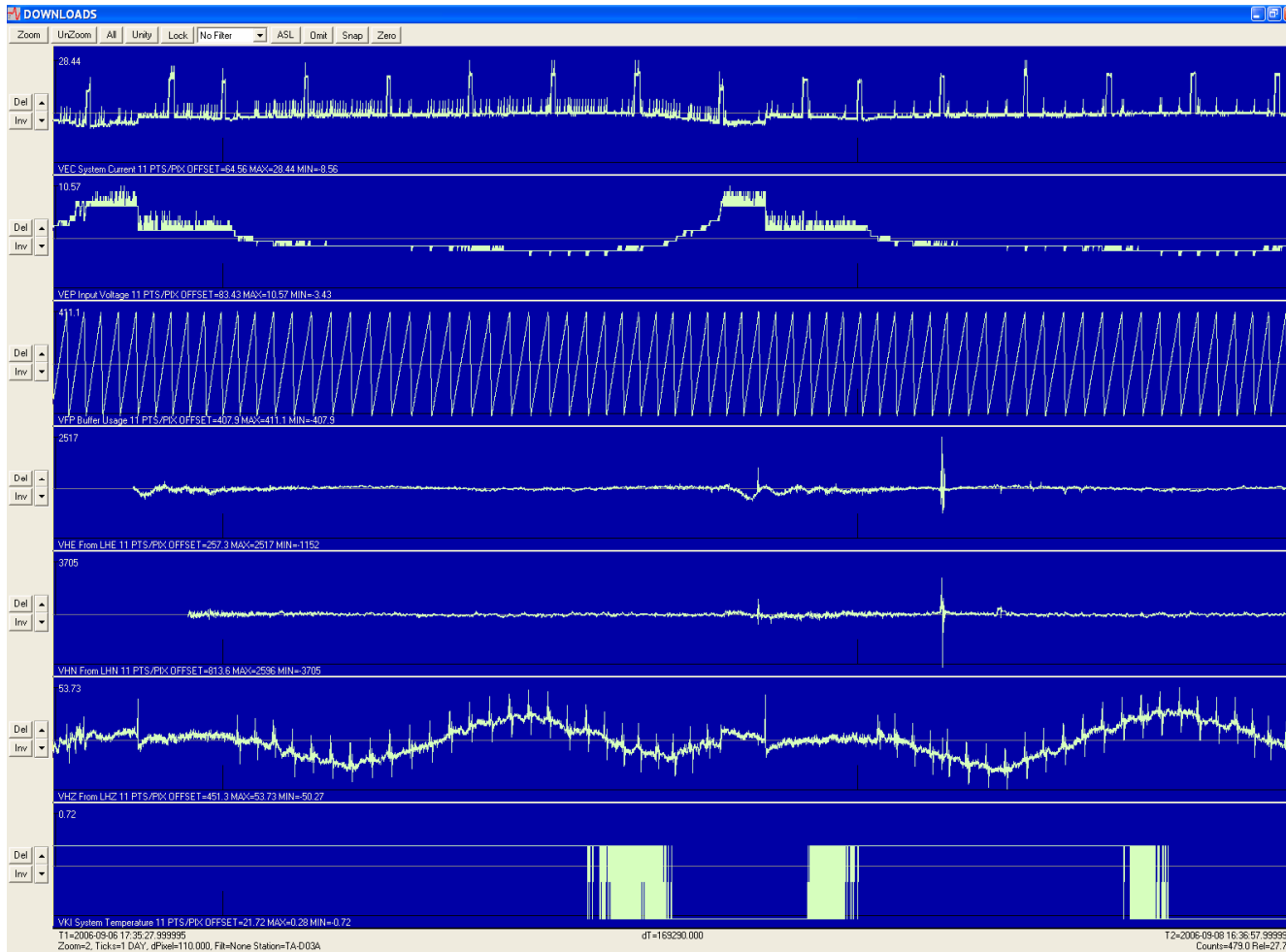


A very BAD place for a broad-band sensor. The VKI channel shows a daily temperature variation of 25degC at this site! No useful broad-band data can be acquired at such a site. The variation is so great in this case that the sensor boom position drifts off-scale, causing the Q330 to automatically recenter it.

Thermal stability is ESSENTIAL!

Diurnal temp change 25C

Probable autocenter



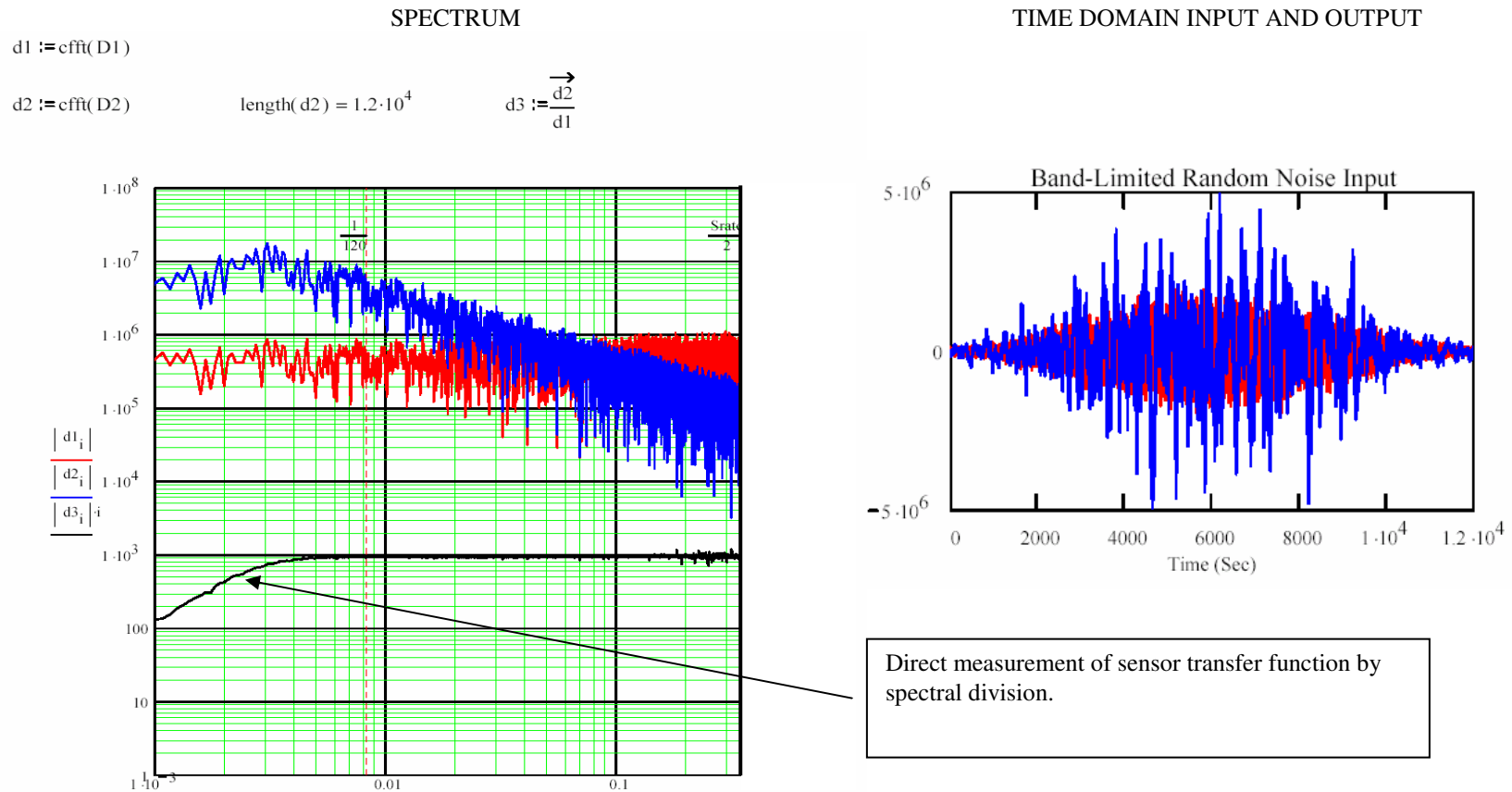
Here, very strong effects of variation in primary power during battery charger cycling (VEP) and during Baler cycling (VFP) are seen in the VHZ data. This installation has inadequate cabling or grounding, or a sensor problem.

Note, however, that although the spikes on the VHZ data appear large, they are not visible in the broad-band data. The VH? channels are a powerful and efficient view for quality analysis.

We strongly recommend routine generation and storage of the complete V?? rate data and SOH channel suite to allow quality analysis. These data are extremely compact and easy to manage.

APPENDIX – Sensor Calibration Using the Q330

While calibration of absolute sensitivity cannot be performed on sensors having a calibration coil or other calibration signal input, measurement of the shape of a sensor transfer function can be done with such an input. The Q330, in fact, allows an arbitrary signal (such as white noise, steps, or sine waves) to be applied to a sensor’s input, while recording both the input (called a “monitor” channel on the Q330) and the sensor’s output. Knowing both the input and output signal from the sensor allows the response of the data system to be totally removed with very high accuracy. The example below shows the time-domain and spectrum of the Q330’s white noise calibration signal (RED) and STS-1 sensor output (BLUE). The process is so stable that a simple spectral division produces the transfer function (BLACK) of the STS-1 in a single operation. No assumptions about the characteristics of the calibration signal or sensor behavior is needed to obtain this highly stable and robust result. This is a direct measurement of sensor transfer function.



“Network Analysis” commonly uses a similar approach, where the input stimulus to a system is measured along with the system output. The “network” response is then the ratio of the output spectrum divided by the input stimulus spectrum.

With appropriate standard cabling for common broadband seismometers, such as an STS-2 or CMG3, acquiring the data to perform a calibration analysis such as that shown above is very simple. Willard’s “Sensor Calibration” command with parameters such as those below will enable a “white noise” calibration on Sensor A (physical Channel 1), and will acquire the calibration signal applied to the sensor on the selection Monitor channel (Channel 3).

Note that the “Use Capacitive Coupling” is available only on a sensor that supports such a function internally, such as a KS-54000.

1601 Start Calibration

Duration in Minutes: 240 Settling in Minutes: 1 Trailer in Minutes: 1

Waveform:
 Sine Red Noise
 Step White Noise
 Random Telegraph

Amplitude: -6dB (±5.000V) Random Freq.: 5.000

Calibrate Channels:
 Chan 1 Chan 2 Chan 3 Chan 4 Chan 5 Chan 6

Monitor Channels:
 Chan 1 Chan 2 Chan 3 Chan 4 Chan 5 Chan 6

Starting Time: 22:24:00 Use Capacitive Coupling

Apply Cancel

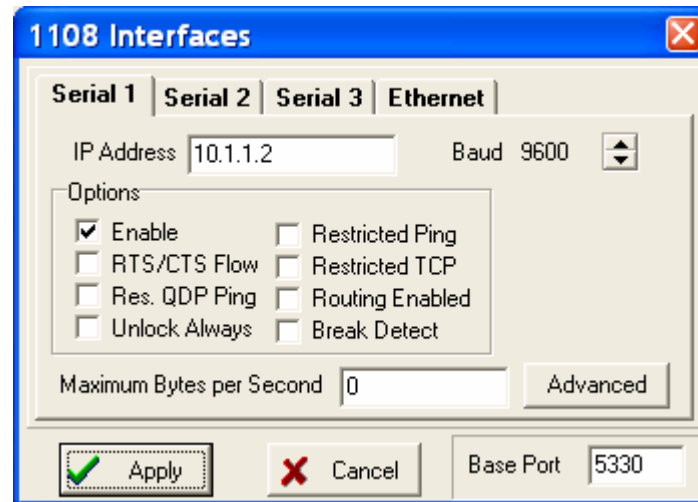
APPENDIX – Configuring the Q330 for Acquisition of Data from Paroscientific Barometers

The Q330 is capable of acquisition of high-precision barometric pressure using a digital sensor connected to one of its serial ports. This capability is supported by Q330 firmware version 1.99 and above. The current release of Willard is necessary to support configuration of the sensor. In order to record the barometric data, Baler firmware 1.89 or higher, or the current Pecos1 or Pecos2 software is required.

The Q330 handles an external barometer as a “Serial Sensor.” This is a class of sensors not restricted to barometric pressure. At present, a Paroscientific sensor, such as the 6000 and 8000 series are handled. In the future, additional sensor types may be added. Serial Sensors are in general a class capable of providing measurements of one or more time series at sample intervals up to a maximum of 1 sample/s. Because the Q330 is equipped with two serial interfaces, a Q330 may support independent connection of up to two Serial Sensors.

After installation of current Q330 firmware and update of your Willard program, the steps for configuration of the Q330 for a Serial Sensor are as follows:

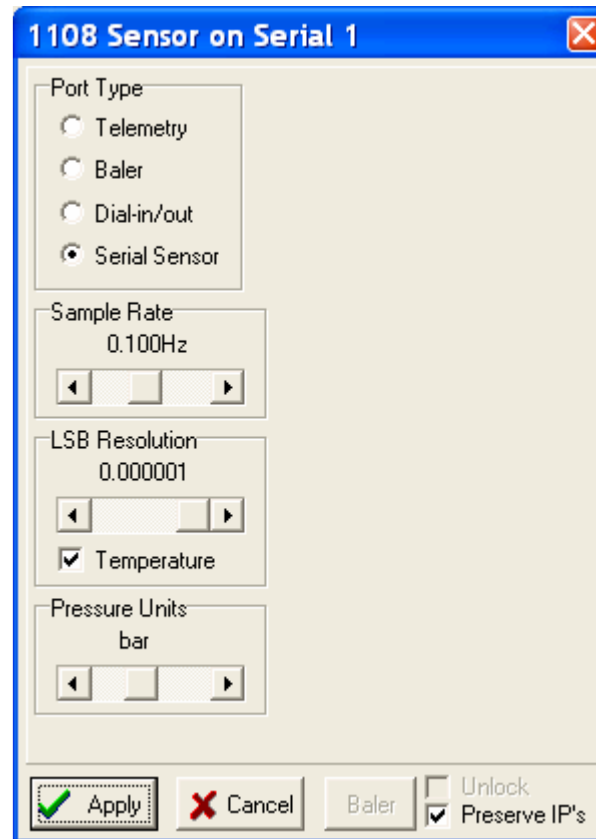
First, set the Q330 Configuration Interfaces appropriately for the device on the Q330 serial interface your will use. For the Paroscientific, the baud rate must be set to 9600



Next, select the “Advanced” button for the serial interface to which the Serial Sensor will be connected, and select “Serial Sensor.” A few parameters are now available for selection.

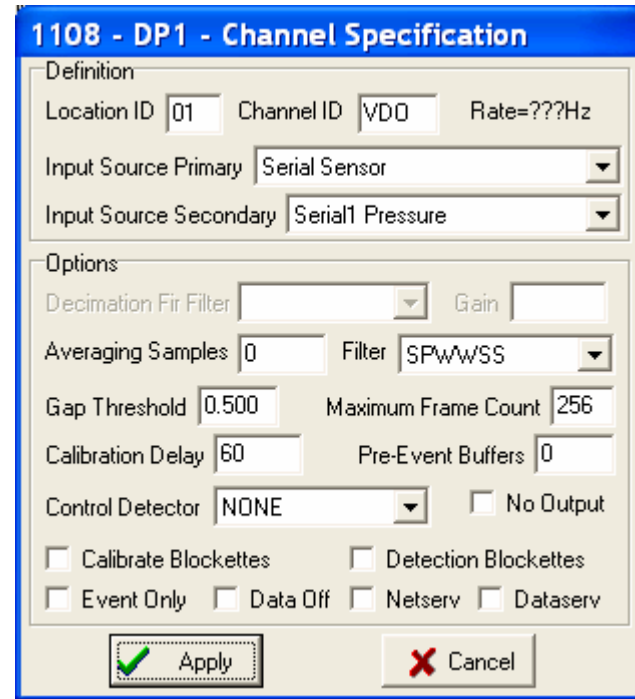
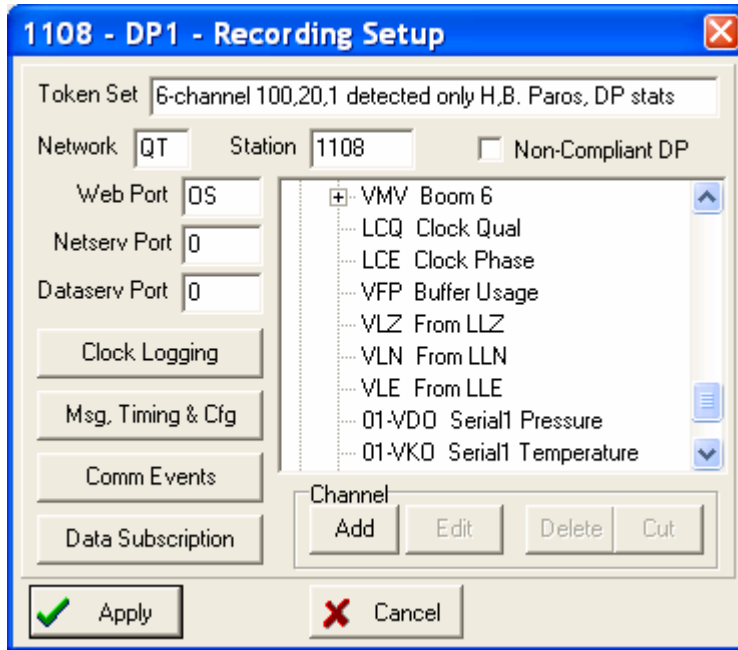
The sample rate may be set from 0.01Hz to 1Hz. Typically, the barometer will be set to 0.1Hz to produce data at the V?? rate synchronous with the VH? seismometer channels. Next select the LSB resolution and measurement units. The settings below will set 1 LSB equal to 1 microbar. Ambient sea-level pressure will therefore produce an output of roughly 10^6 counts. Finally, if desired, the sensor temperature may be acquired for background information regarding the ambient environment of the pressure sensor. The temperature measurement is not the seismometer temperature, nor is it highly accurate, but provides useful background in the event of large disturbances. The temperature units are degrees C, but the multiplier is dependent on the specified LSB. For example, if the LSB setting is 0.000001, as shown below, then the units are micro-degrees C.

After setting the interface, save the Q330 configuration and reboot.

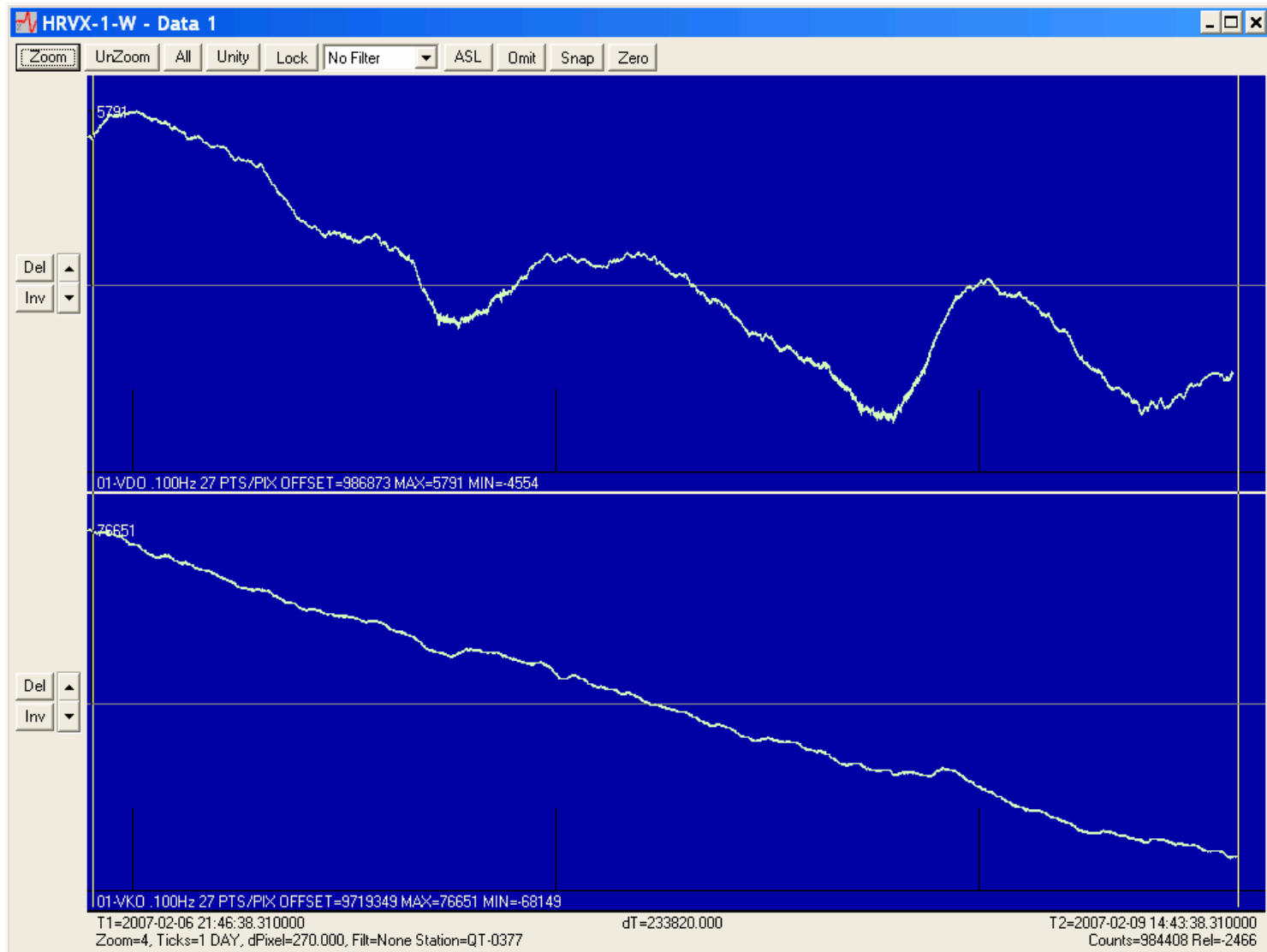


To record the pressure (and optionally serial sensor temperature) waveforms, it is necessary to create new tokens for these channels for each data port. Of course once the tokens are created, you may save a new master XML template including the pressure channels to load into other Q330's.

A typical SEED channel name for “external pressure” is VDO and “external temperature” is VKO. These channels are added through the usual channel edit dialog by selecting “Serial1 Pressure” for example to acquire data from the Serial Sensor connected to the Q330's serial interface #1, and so on.



Now install current firmware on your DP (such as the Baler) and pressure data will be recorded. An example is shown on the following page of 3 days of VDO and VKO data acquired in a stable environment. Pressure deviation is about ± 5 mbar.



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MAINTENANCE & SERVICE

Overview

In this section we discuss recommended maintenance and service procedures for the Q330, Q330HR and PB14F.

Run Remote Check Tests

The Q330HR/Baler system has been designed to allow the system status to be determined remotely via any available communication links. This prevents the need for most preventative maintenance visits.

The following remote checks can ensure that the unit is functional and the peripheral systems are operational.

- Verify the power input to the unit is at the correct voltage
- Verify the units power consumption is within normal ranges
- Verify that the temperature is within normal operating ranges.
- Verify that the GPS and timing system are functioning correctly
- Review the reported internal voltages to ensure that they are all normal.
- Review software and communication logs for signs of communication problems or security breaches.
- Perform maintenance on disk files to remove older unused files.

These checks will indicate if a field visit is required to investigate an abnormal value or anomalous system performance.

Desiccant Replacement

To help maintain low humidity inside the Q330HR, Kinometrics places a packet of desiccant inside to absorb any water vapor. We recommend that you replace the desiccant package if the humidity label indicates humidity above 30% when servicing the unit. If the unit remains sealed the desiccant package can maintain the required humidity level for up to five years. The Desiccant and Humidity Indicator label can be ordered from Quanterra or Kinometrics as Kinometrics part number 700049.

Note: If the unit has been in a hot environment for a long period of time it is possible that the sealing gasket will be damaged when the end caps are removed. Replacements can be ordered from Quanterra or Kinometrics as Kinometrics part number .

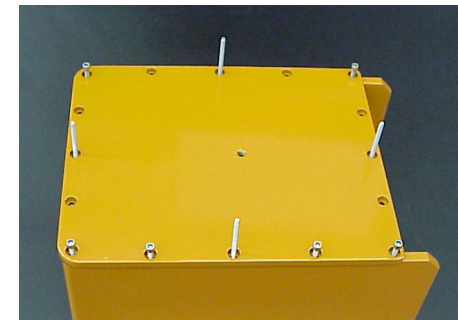
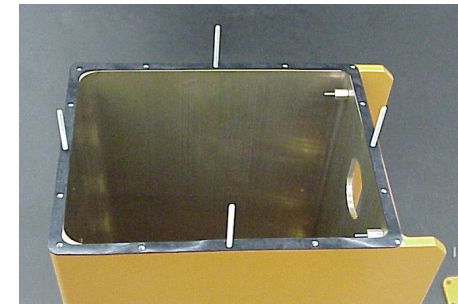


Caution: Potential ESD equipment damage. The Q330HR/Baler circuit boards contain CMOS components that can be damaged by electrostatic discharge (ESD) if not properly handled. Use a grounded wrist strap, with impedance of approximately 1 M Ω , to protect components from ESD damage when handling circuit boards. Before removing any circuit boards or disconnecting any internal cables, be sure that all batteries and the charger are disconnected.

To check or replace the humidity indicator and desiccant proceed as follows:



1. Remove all power sources from the system and wait until it has completed its shutdown sequence.
2. Remove the right protective bumper by gently easing it off the metal end cover.
3. Remove the seal screw from the end cover to allow the pressure within the unit to equalize.
4. Remove the right end cap by unscrewing the 16 visible hex head bolts. Take care not to damage the rubber gasket
5. The desiccant package and humidity indicator will be visible as shown in the picture.
6. Replace the desiccant and label. The old package can safely be disposed of in normal trash.
7. Replace the end cap ensuring that both the gasket and end cap are correctly oriented. The gasket corners with the holes closest to the corners align with the holes in the front of the housing (right). The square corners of the end cap also align with the front of the housing, with the more rounded corners at the rear (below right).
8. Make sure all screws pass through the gasket. One trick is to use toothpicks in the screw holes in the middle of each side of the case to hold the gasket correctly in position until the end cover is in place and all other screws are inserted a few turns. The end cover can then be lifted to verify gasket alignment before replacing the toothpicks with the final four screws.
9. Tighten the screws in a pattern to ensure that the cover is evenly pulled back onto the casing.
10. Replace the seal screw in the end cover of the unit.
11. Replace the protective bumper.
12. Reconnect the unit to the power sources.



Caution: Possible equipment damage. If you do not correctly replace the end cap, gasket, and the seal screw the watertight integrity of the unit can be compromised and damage can occur to the unit.

Internal Batteries & Fuses

The Q330HR/Baler contains no user replaceable fuses. The Q330HR/Q330 uses a CR1620 3V Lithium/Manganese Oxide coin cell battery (KMI 840969) to back-up the real time clock when the system is un-powered. This battery is located on the memory board in the digital pack of the instrument and should have a lifetime in excess of five years. If it requires replacement during the lifetime of the Q330HR we strongly recommend returning it to Quanterra/Kinometrics for replacement and replacement of the desiccant. A Q330HR/Q330 is returned to the factory for battery replacement will be checked for operation and functionally tested.

Note: If the battery is exhausted the real time clock will lose time when the unit is un-powered. The timing will be corrected directly when GPS time is reacquired. Thus in many applications, if the user is running current software, loss of the RTC backup may be of no concern.

Replacing External Batteries

If your system has either a battery back-up or is solar powered you should replace the external batteries at regular intervals as these batteries lose their capacity over time. Generally these batteries are Sealed Lead Acid (SLA) batteries and Quanterra/Kinometrics recommends that you replace them every three years in normal operating environments; more frequently if the unit's ambient temperature is significantly above 20°C. Read the *Safety* section before replacing batteries.

External Battery Specifications

If your power system was supplied by Quanterra/Kinometrics we recommend that you purchase replacement batteries from us; the replacement batteries will be high quality 12V SLA batteries equipped with a pressure relief valve that meets UL924. The battery capacity will have been chosen to provide the required length of autonomy given the average current draw of the system. If you designed your own system or bought it from another vendor you should ensure that you replace the batteries with identical or functionally similar batteries. Pay particular attention to the warning below.



WARNING! Fire or explosion hazard. Do not install a non-rechargeable battery to be charged by the unit. For a Kinometrics power system only install a sealed lead acid battery with specifications compatible to the original units. Other types of Lead Acid battery should not be used as the temperature corrected charging voltage is set for SLA batteries only. On no account install alternative battery chemistry such as Lithium Ion or Nickel Metal Hydride!

If you store a battery, you should still charge it every six to nine months to prevent permanent loss of capacity. You can float-charge a SLA battery at 13.5-13.8V or cycle-charge the battery, provided the current is correctly limited according to the battery capacity and the voltage is kept to less than 14.7V. When the voltage reaches 14.7V, the battery will be damaged unless you convert the cycle charging to float charging. Kinometrics ships batteries fully charged; make sure a battery is still fully charged before installing it.

External Battery Installation

Follow the instructions provided with the power system to install a new external battery.

WARNING! Burn or explosion hazard. Never place metallic objects (such as a screwdriver or your wristwatch strap) across the terminals of a battery. The metal terminals can get very hot. Handle batteries with care, and do not drop them or attempt to take them apart. Recycle used batteries, or dispose of them in accordance with local regulations. Do not throw used batteries onto a fire.

Caution: Before installing the new battery make sure it is fully charged. If the battery is uncharged, the unit will charge it, but this can take some time — and if AC power is lost, the unit's power autonomy will be reduced.



Battery Recycling

We recommend you recycle the sealed lead-acid cells used in the Q330HR/Baler system; if properly recycled they are environmentally friendly. You should be able to recycle used batteries at the same centers that recycle automobile batteries.

Cleaning the Q330HR/Baler

Disconnect all power from the unit before cleaning it, including the external battery. Then wipe off the exterior surfaces with a mild detergent and a damp soft cloth. Do not use an abrasive cloth especially on the label area as this will damage the unit. The external battery can also be cleaned with a mild detergent and damp cloth following the precautions outlined in the battery maintenance section.

Caution: Possible water damage. Do not loosen the seal screw or end caps before cleaning the unit. Do not use water to clean the inside of the Q330HR/Baler. Doing so will severely damage the unit!

The Q330HR/Baler should not normally be opened so the interior of the units should be clean. If dust or debris does get inside the unit, we recommend you use a small "computer vacuum cleaner" to remove this debris. Make sure you have turned the power off before vacuuming the unit.

Troubleshooting & Service

If your unit needs repair or service, we strongly recommend that you return it to Quanterra/Kinometrics for diagnosis and repair. If you wish to diagnose hardware problems yourself, we provide some cautions below. The procedure for loading new firmware/software into the units has been discussed in the previous sections.

Hardware Problems

Caution: Only a qualified electronic technician who has been through a Quanterra/Kinematics training course should diagnose and repair the unit. Be sure the technician carefully follows both the ESD precautions and the precautions described in the *Safety* section.

Do not attempt to repair the unit. We recommend that you stop your diagnosis at the assembled unit level and send the entire unit back to Kinematics for repair.

Decommissioning & Recycling



The Q330HR/Baler should be recycled and not thrown in the normal waste stream destined for the local land fill. We have made the product easy to disassemble and recycle the constituent parts. The recycling passport describes the various materials in the Q330HR/Baler and any hazards than can be encountered in disassembling the unit. The Recycling Instructions describe how to disassemble the products safely, while the Recycling Materials show the exact materials that make up the various components of the units. By following these instructions a large portion of the units can be recycled.

Quanterra/Kinometrics Recycling Passport				
	Product Name	Q330HR/Q330		
	Product Model Numbers	110900-XX-PL, 112300-XX-PL		
	Date	10/16/2006		
	Version	1.0		
	Contact Information	www.q330.com		
Product Contains	Substance	Present	Location	Comments
Batteries				
External	Mercury/NiCad/Lithium/Other	Option	External	Sealed Lead Acid Battery Optional.
Internal	Mercury/NiCad/Lithium/Other	Yes	Q330HR/Q330	Lithium Battery CR 1620 on Memory PWB
Parts Containing RoHS Hazardous Substances				
	Lead	External Battery Optional	External	Covered by the Battery Directive. Should be recycled in the normal Lead Acid Battery Recycling Stream
	Lead Tin Solder	PWBs	Internal	Circuit boards are Lead/Tin Soldered
	Mercury	No	N/A	
	Cadmium	Connectors	N/A	Green Connectors & Dust Caps are Cadmium plated
	Hexavalent Chromium	Yes	Internal	Aluminum is Iridite Coated
	Polybrominated Biphenyls (PBB)	No	N/A	

	Polybrominated Diphenyl Ethers (PBDE)	No	N/A	
Other Potentially Hazardous Substances/Information				
	Printed Circuit Board Assembly >10cm ²	Yes	Inside	Multiple PWBs
	Capacitors with PCBs or other items of concern	No	N/A	
	Gas Discharge Lamps	No	N/A	
	Backlight Lamps LCD/TFTs	No	N/A	
	Backlight Lamps containing Mercury	No	N/A	
	Plastics containing brominated Flame Retardants	No	N/A	
	LCD >100 cm ²	No	N/A	
	Asbestos	No	N/A	
	Refractory Ceramic Fibers	No	N/A	
	Radio-active Substances	No	N/A	
	Beryllium Oxide	No	N/A	
	Other forms of Beryllium	No	N/A	
Other Hazards				
	Parts under Pressure	No	N/A	
	Liquids	No	N/A	
	Gasses	No	N/A	
	Hidden Mechanical Springs	No	N/A	
	High Storage Density Capacitors	Yes	Internal - Memory Card	Can discharge significant current do not discharge with an electrical short.

END OF DOCUMENT