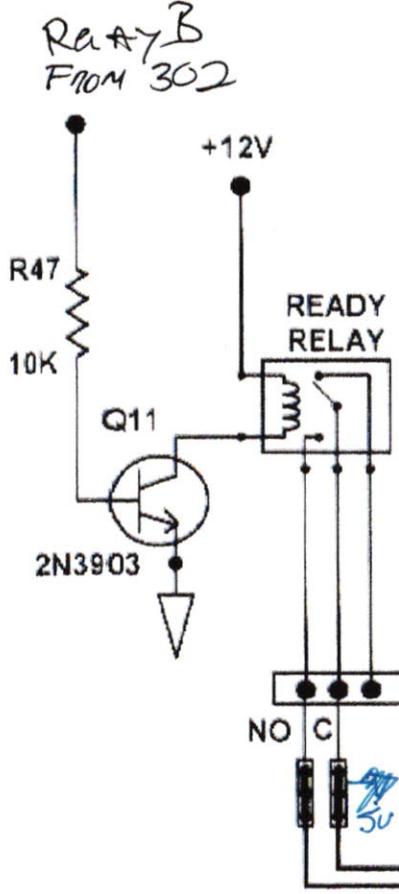
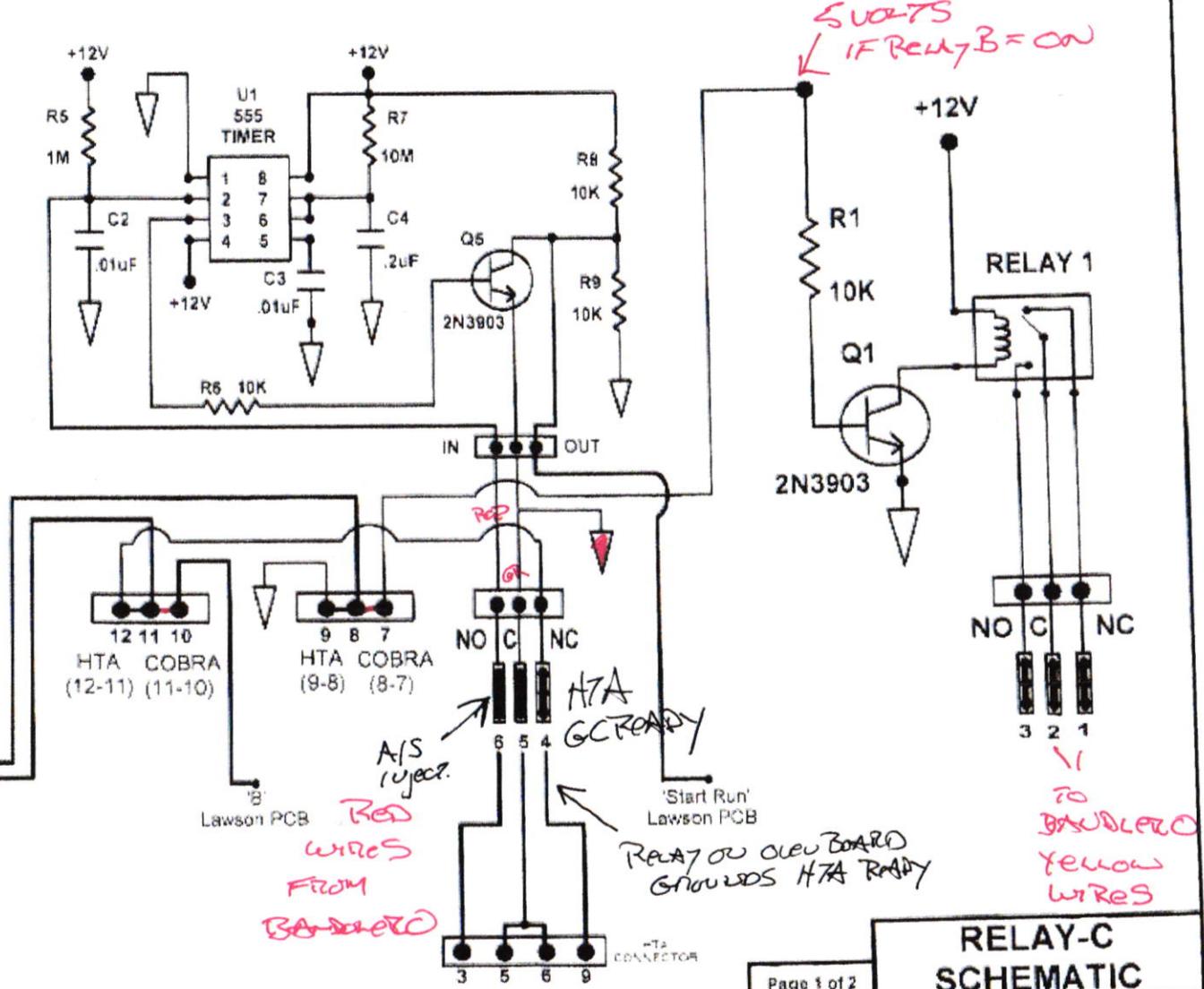


OVEN BOARD



COBRA/HTA RELAY BOARD (HTA CONFIGURATION)



RELAY-C SCHEMATIC

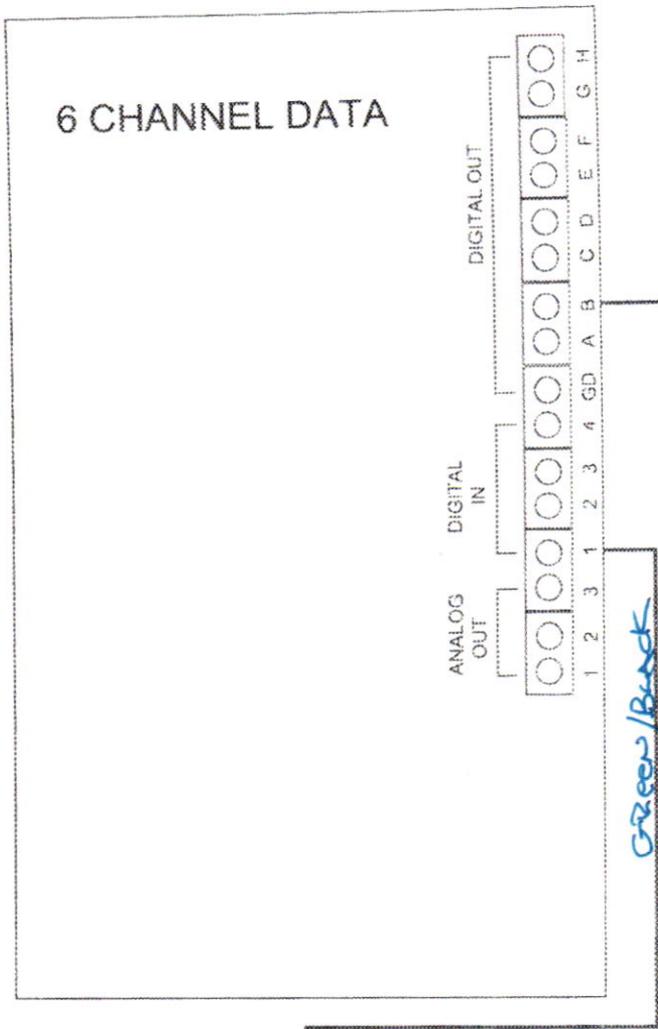
Page 1 of 2

Filename: relay-c pg1.tcw

Date: 12/20/97 By: R. Fenske

REV. DATE: 12/13/02 By: M. WATTS

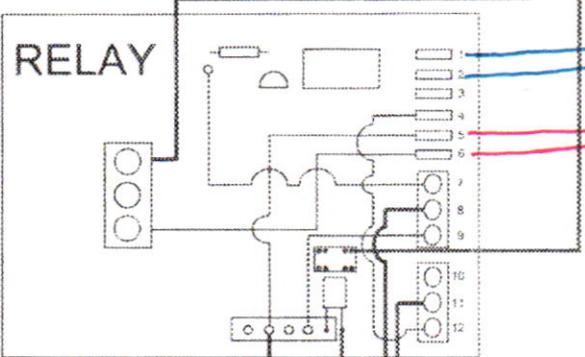
HTA/COBRA A/S



RED/ORG WIRE (A/S FUNCTION)

Green/Black
White/Brown

GRN/BLK WIRE (A/S START RUN)
SOLDER WITH GRN/BLK WIRE FROM
DISPLAY START RUN,
AND SAME TERMINAL ON THE DATA
BOARD.

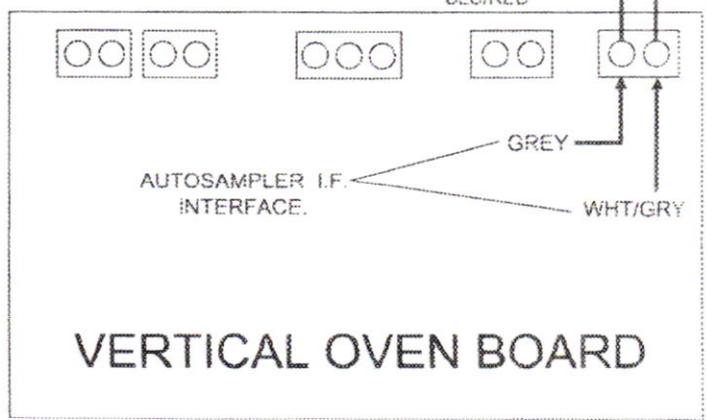


Yellow wires from Board...
Red wires from BANDOLERO

JUMPERS
COBRA
7-8 & 10-11
HTA
8-9 & 11-12

COBRA / HTA RELAY BOARD

CHASSIS GND GRN/YEL
+12 VDC BLU/RED



N12245
BANDOLERO
INTERFACE
9-6-2022

Communication with the Bandolero Autosampler is via relay contact closures. There are 2 outgoing relays in the Bandolero: START and PUMP. There are 2 incoming contact closure signals expected from the SRI GC: READY and RUNNING. READY (from the SRI GC to the Bandolero): OPEN Relay starts the Bandolero, CLOSED Relay means SRI GC is not ready START (from the Bandolero to the SRI GC): CLOSED Relay should start the SRI GC Relay is held CLOSED until it hears back from the GC that the run has started running RUNNING (from the SRI GC to the Bandolero): CLOSED Relay means the SRI GC run has started RUNNING is optional, a time delay in the Bandolero can be used if the GC doesn't have this signal PUMP (from the Bandolero to a power relay controlling the pump): CLOSED Relay means vacuum pump ON, OPEN Relay means vacuum pump OFF PUMP is optional. Some people choose to run their vacuum pump continuously. First you get the SRI GC ready to run a batch. Then when you turn the Bandolero power on and it will start an injection cycle as soon as it sees a READY OPEN Relay. The best vacuum pump would be a 2 stage diaphragm pump. It need not have a high flow rate capacity. The goal is to attain 27" Hg or better vacuum within 10 seconds or so. Many labs can find one of these laying around. There are rebuild kits for old units. This is an example of an off-the-shelf remote relay that can be used to run the vacuum pump: <https://dclidirect.com/collections/frontpage/products/iot-power-relay> I don't sell pumps or remote relays. They can more easily be found locally. Bob Rousseau 530-219-3527 bob@xyztek.com xyzTek.com

Untitled

NORMAL OPERATION

If you turn power on to the Bandolero, it will start running normally. If no GC is connected to the Bandolero the Bandolero will do its normal injection cycle continuously (because there is no READY control from the GC). If the GC is connected, the Bandolero will wait for the READY signal from the GC to do an injection. It will then wait for the next READY signal from the GC.

Normally when the Bandolero is turned on, the first thing it does is close then open each valve. You can hear the valves click and see them close and open if you look closely. This is an easy reality check you should do whenever you turn on the Bandolero.

There is a magnetic sensor behind the LED lights. If there is a magnet mounted in the belt near the bottom end of a vial, the Bandolero will stop when that vial and magnet move into position in front of the sensor (inline with the needle). The top light will flash red until you remove the magnet and RESET the Bandolero.

The phono jack on the rear panel is for controlling a vacuum pump through a relay. The absolute maximum current rating is 500 mA. The output impedance is 300 ohms. The jack provides a +12V signal to turn on the vacuum pump through an "IoT Power Relay", or an SSR that accepts a DC 3V to 32V to turn on.

The small button on the rear panel of the Bandolero is the "RESET" It will start the Bandolero from the beginning as if the power was shut of then turned back on.

TESTING MODES

The "BUTTON" is a small button on the top front of the Bandolero next to the LED lights

If you hold the BUTTON down as you turn on power or RESET the Bandolero it will start one of the testing modes. While still holding the BUTTON down for a few seconds, the LED lights will change color indicating the special mode of operation (Green, then Orange, then Magenta). When the desired mode color is lit, let go of the BUTTON and that mode will start. Magenta Mode is not an end user function.

Green Mode: Test the valves. Pushing the BUTTON will close and open the valves. The lights will be Green when the valves are open and Red when they are closed. Hold the button down and it will continue opening and closing valves. Release the button when the valves are in the desired state.

Orange Mode: Test the injection cycle. Pushing the BUTTON will single step through the injection cycle. Each time you push the button the program will continue to the next step.

"ORANGE MODE" Single Step Test:

As if there is a Magnet blocking the run, top LED is RED and nothing is happening.

Press BUTTON to continue

Waiting for the READY signal from GC, bottom LED is Blue, top LED is Green.

Press BUTTON to continue

Pump turns ON, Vacuum Valve Opens, Needle Valve Opens, bottom LED is Green, top LED is Yellow. "Flushing"

Press BUTTON to continue

Needle Valve Closes, top LED is White. "Evacuating"

Press BUTTON to continue

Needle moves IN, Top LED is flashing Green, then Top LED is Green. "Needle is moving"

Press BUTTON to continue

Vacuum Valve Closes. "Isolating the Sample Loop with a vacuum"

Press BUTTON to continue

Needle Valve Opens. "Filling the Sample Loop"

Press BUTTON to continue

Needle Moves OUT, top LED is flashing Green then top LED is Green. "Equilibrating to ambient pressure"

Press BUTTON to continue

Sending Start Signal to GC, bottom LED is Blue

Bottom LED is Flashing Green then Bottom LED is Green. "The GC has started"

Press BUTTON to continue

Vacuum Valve Opens, Top LED is Yellow. "Flushing"

Press BUTTON to continue

Pump turns OFF, Top LED is Green. "The GC is still running, no READY signal yet from GC"

In addition, the best way to actually test the valves and visualize their operation is to connect their tube to air and watch the bubbles from their other tube in a beaker of water.

To test the remote start from the Bandolero to the GC, connect an ohm meter (volt meter) across the 2 red wires. Let it run and watch for the resistance drop to zero when the START signal is sent (put it in continuity mode and listen for the beep).

To test the READY signal with the Bandolero not connected to the GC, hold the yellow wires together and turn on the Bandolero. It will stop until you disconnect the yellow wires from each other. The bottom LED will be Blue while it is waiting for READY and turn Green when it receives the READY signal (when you disconnect the yellow wires).

Bandolero Autosampler Installation

December 2024

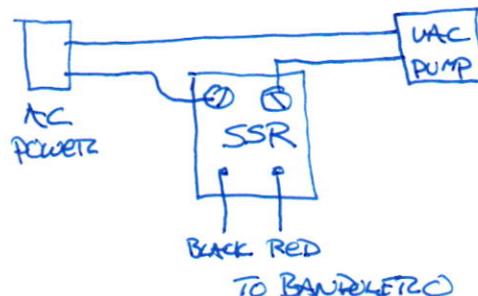
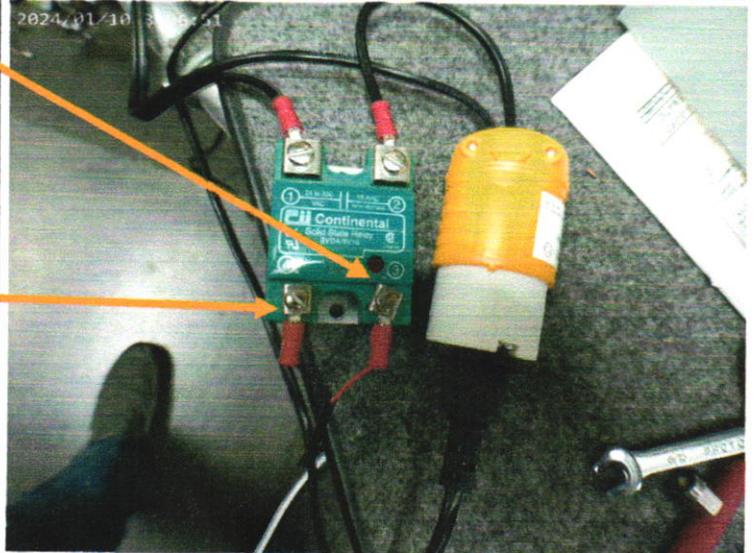
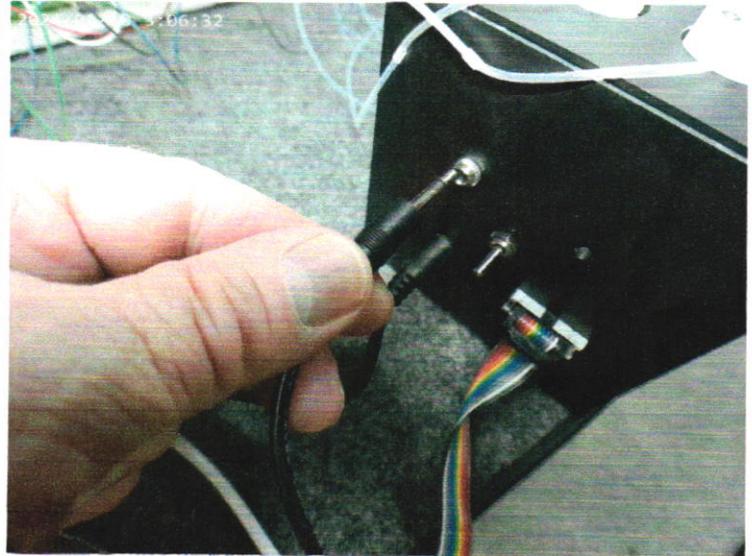
Plug the Bandolero supplied red and black wire cable into the back of the Bandolero to control a vacuum pump.

The vacuum pump does not need to run constantly and its much quieter if it only operates during the part of the Bandolero cycle where is evacuates the sample path.

The red wire goes to the + input of a zero crossing solid state relay (SSR) like the one shown in the photo.

The black wire goes to the - input of the zero crossing SSR.

The other two screws on the SSR control the line voltage powering the vacuum pump. In the photo, a US type power jack is what the vacuum pump plugs into. **User should mount the SSR in a safe location since there is exposed high voltage.**

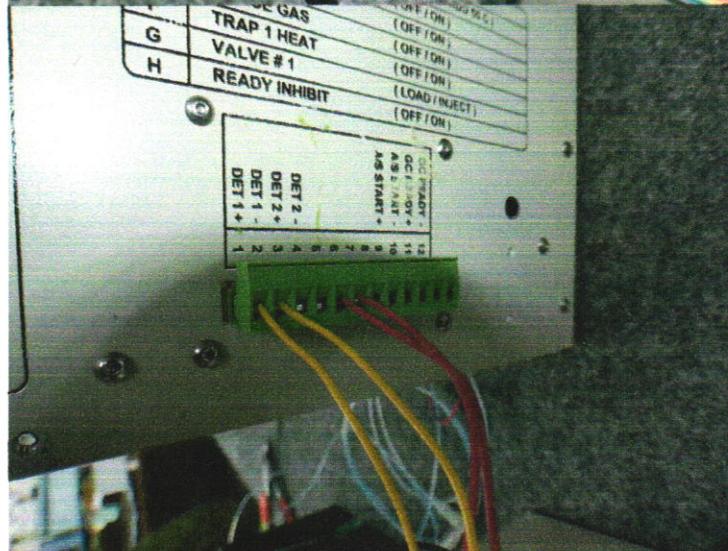
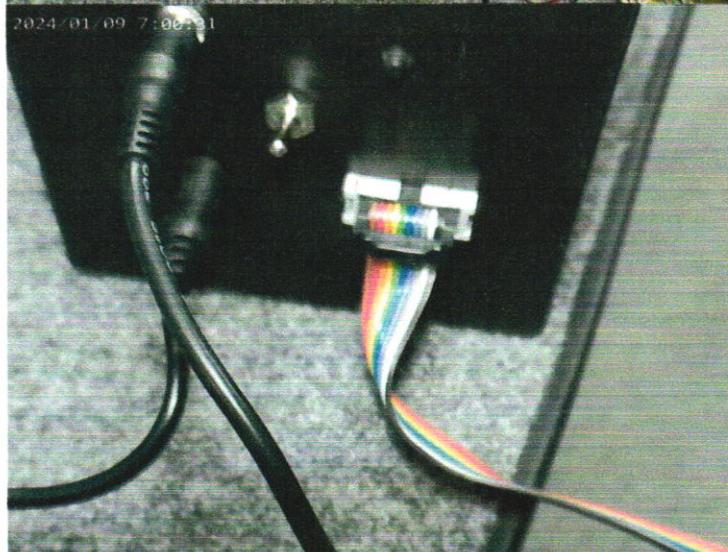
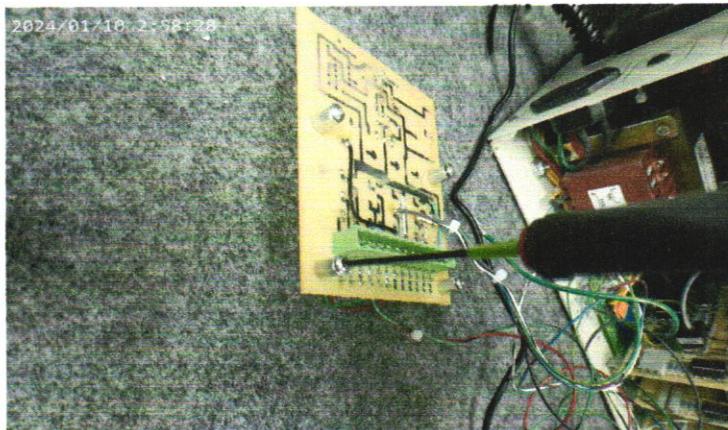
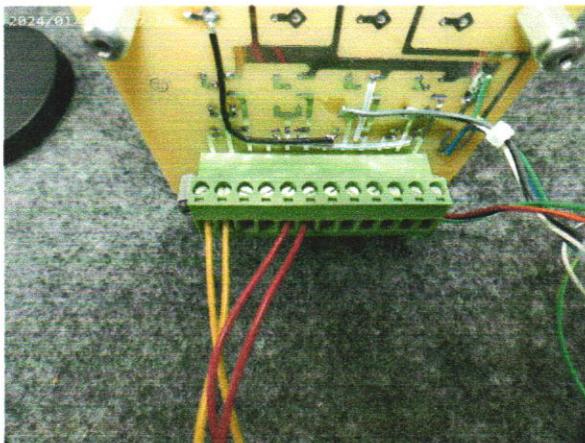


Bandolero Autosampler Installation

December 2024

Once the wires are connected, mount the interface board so the external green connector protrudes thru the pre-punched hole in the GC's right side.

Connect the multi-colored flat cable from the back of the Bandolero to the green connector. The multi-colored cable is broken out into two yellow and two red wires. It does not matter which yellow wires are connected to which screw terminal as long as they are connected to the correct screw terminals



Bandolero Autosampler Installation

December 2024



The green/yellow wire is connected to one of the chassis ground studs located at various points around the inside of the GC chassis.

There will usually be a ring terminal clamped onto this wire already.



The blue wire is connected to the +12 volt terminal on the amplifier board. This wire powers the interface board.



The grey and white/grey wires are connected to the 'over' board where there is a 4 pin position terminal block at the edge of the board. This relay closes when the GC ready light illuminates. This triggers the Bandolero to start a cycle as long as Relay B is also activated.



Bandolero Autosampler Installation

December 2024

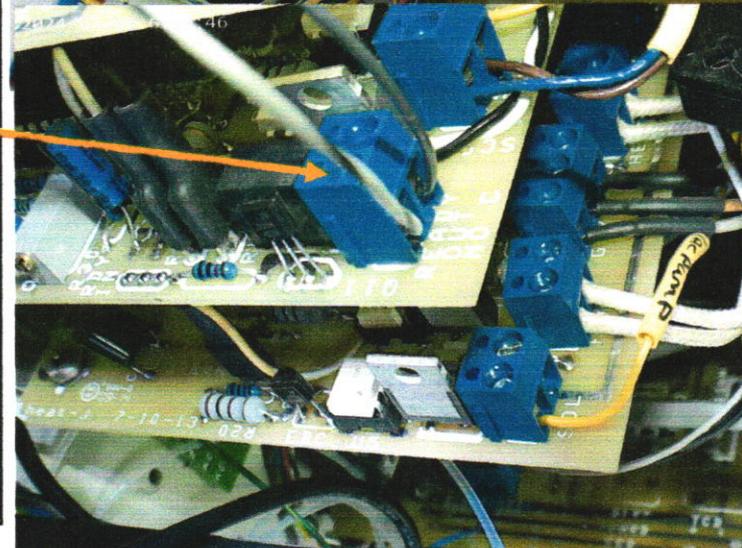
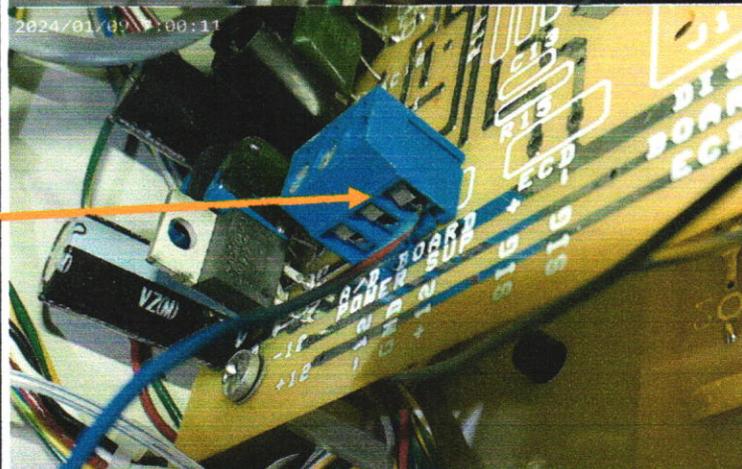
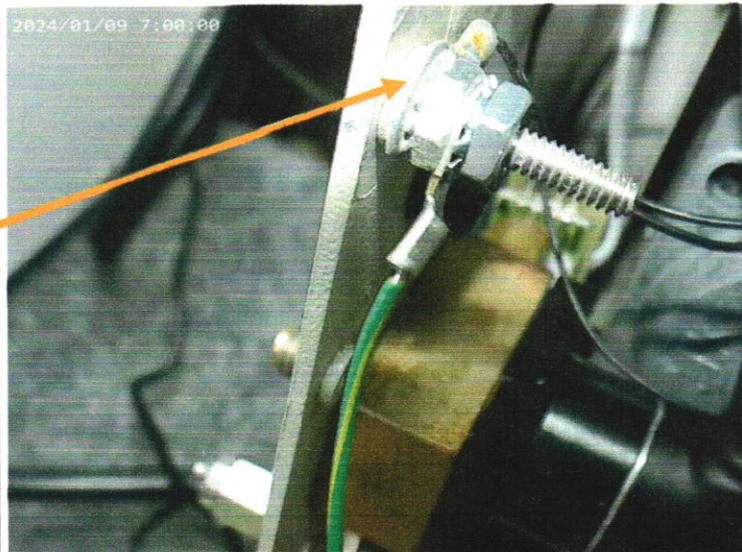
The green/yellow wire is connected to one of the chassis ground studs located at various points around the inside of the GC chassis.

There will usually be a ring terminal crimped onto this wire already.

The blue/red wire is connected to the +12 volts terminal on the amplifier board. This wire powers the interface board.

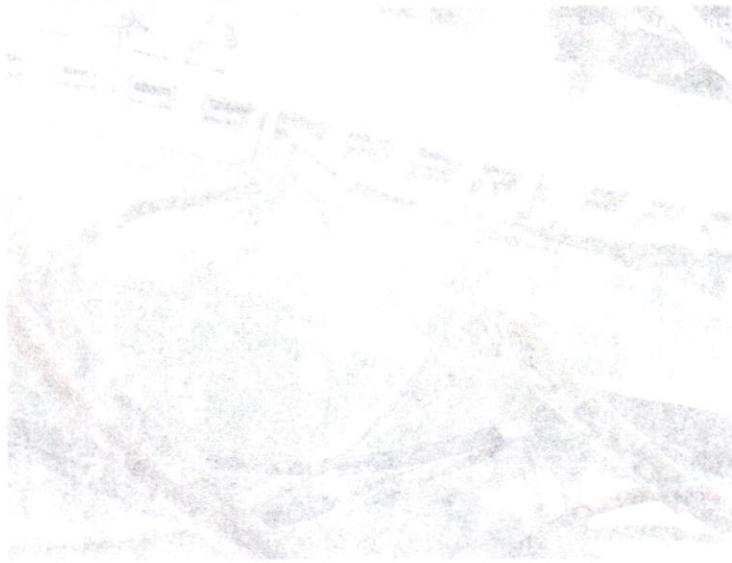
The grey and white/grey wires are connected to the "oven" board where there is a two position terminal block at the edge of the board. This relay closes when the GC ready light illuminates.

This triggers the Bandolero to start a cycle as long as Relay B is also activated



Bandolero Autosampler Installation

December 2024



The wires connected to the interface board are color coded.

When we say green/black it means the wire is green with a black stripe. The green/black wire is connected to the "Digital In 1" terminal on the A/D board. There will already be a green/black wire in the terminal from the start switch on the GC front panel. This wire is used to start the GC run. Both green/black wires can be connected to this terminal so the GC can be started either from the front panel or from the Bandolero.

The red/orange wire is connected to Digital output 5 on the A/D board. This wire gives the Bandolero permit-to-run when Relay B is set to start.



Bandolero Autosampler Installation

December 2024

The wires connected to the interface board are color coded.

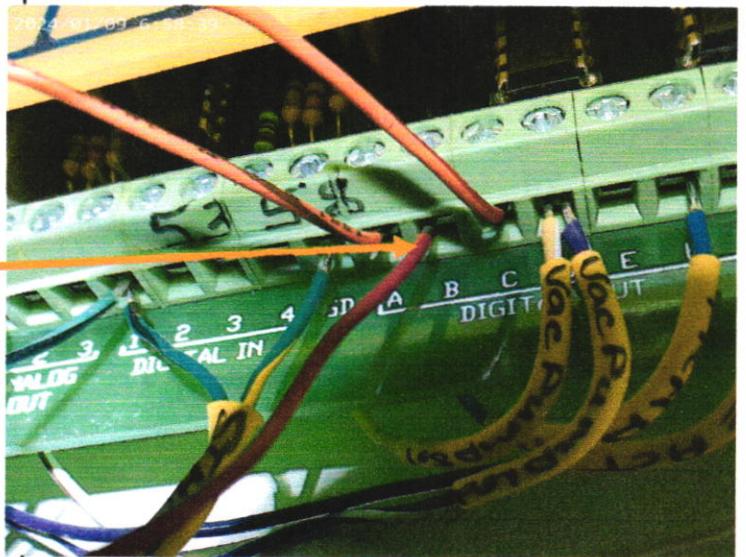
When we say green/black it means the wire is green with a black stripe.

The green/black wire is connected to the "Digital In 1" terminal on the A/D board.

There will probably already be a green/black wire in this terminal from the start switch on the GC front panel. This wire is used to start the GC run. Both green/black wires can be connected to this terminal so the GC can be started either from the front panel or from the Bandolero.

The red/orange wire is connected to "Digital output B" on the A/D board.

This wire gives the Bandolero permission to run when Relay B is activated.



Bandolero Autosampler Installation

December 2024



The Bandolero Autosampler is controlled by a small interface board which is mounted in the GC. The photo shows the board with many wires connected from it to the GC before the board was physically mounted in the GC.

Verify that there are two jumper wires connected to the board in the positions shown.

The interface board will be mounted underneath the sampler board so that the green connector part of the board protrudes to the GC's right side where there is a punched hole.



Bandolero Autosampler Installation

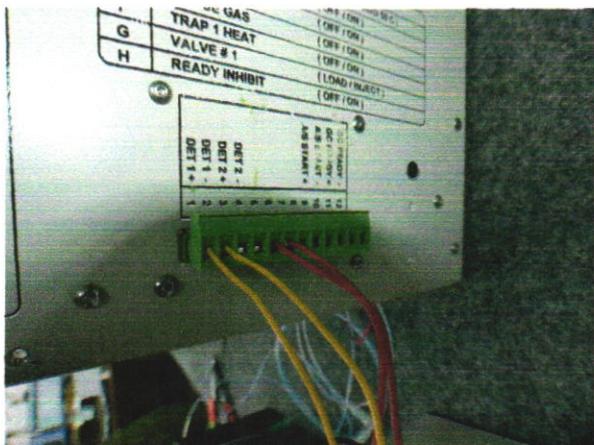
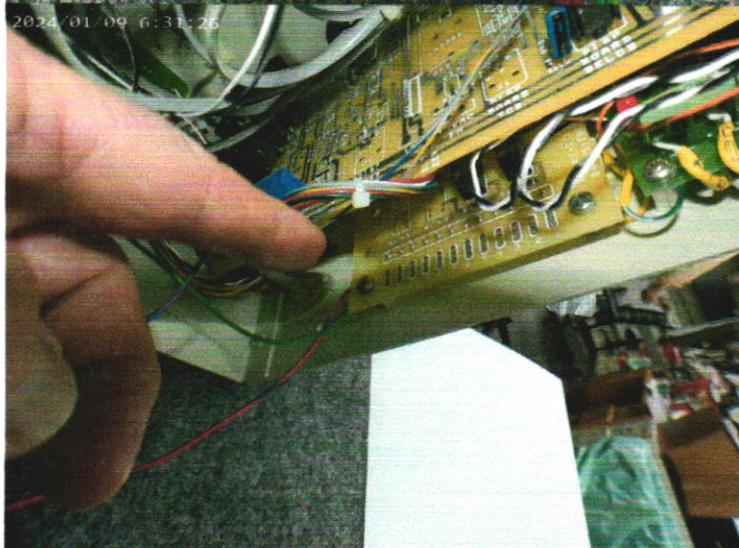
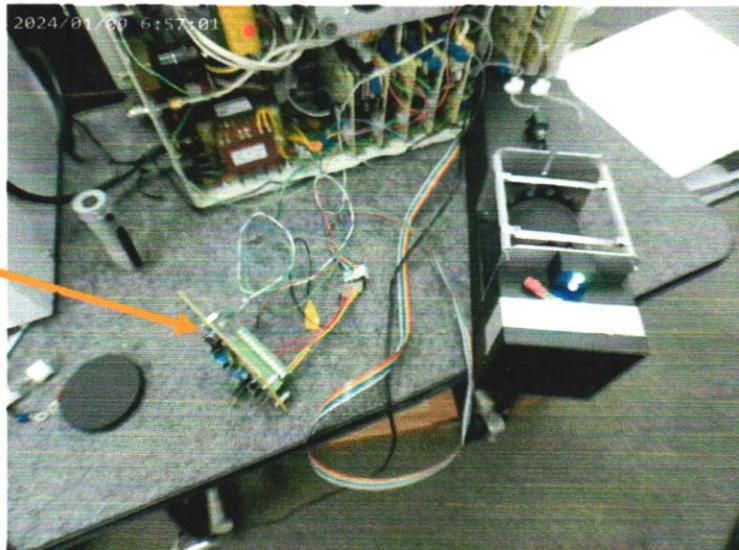
December 2024

The Bandolero Autosampler is controlled by a small interface board which is mounted in the SRI GC.

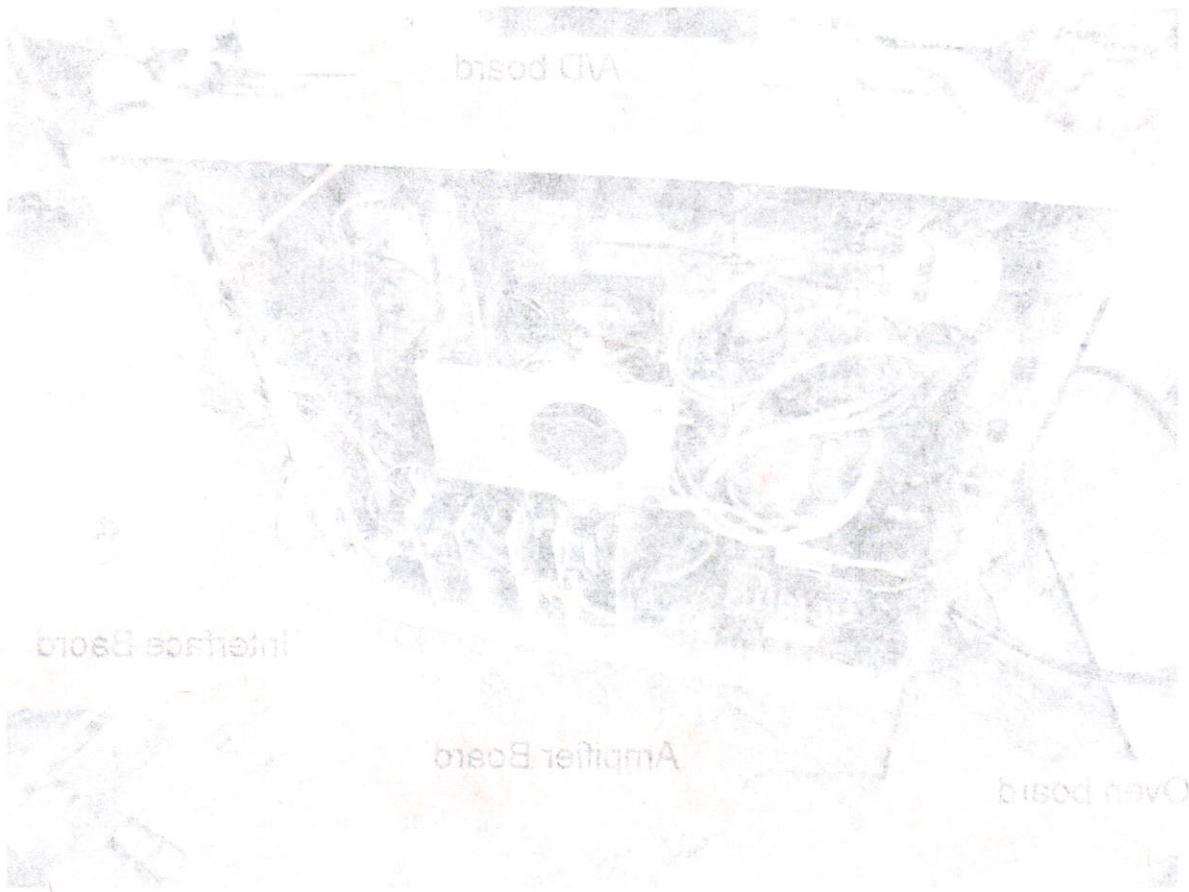
This photo shows the board with many wires connected from it to the GC before the board was physically mounted in the GC.

Verify that there are two jumper wires connected to the board in the positions shown.

The interface board will be mounted underneath the amplifier board so that the green connector part of the board projects thru the GC's right side where there is a pre-punched hole.



Bandolero Autosampler Installation
December 2024

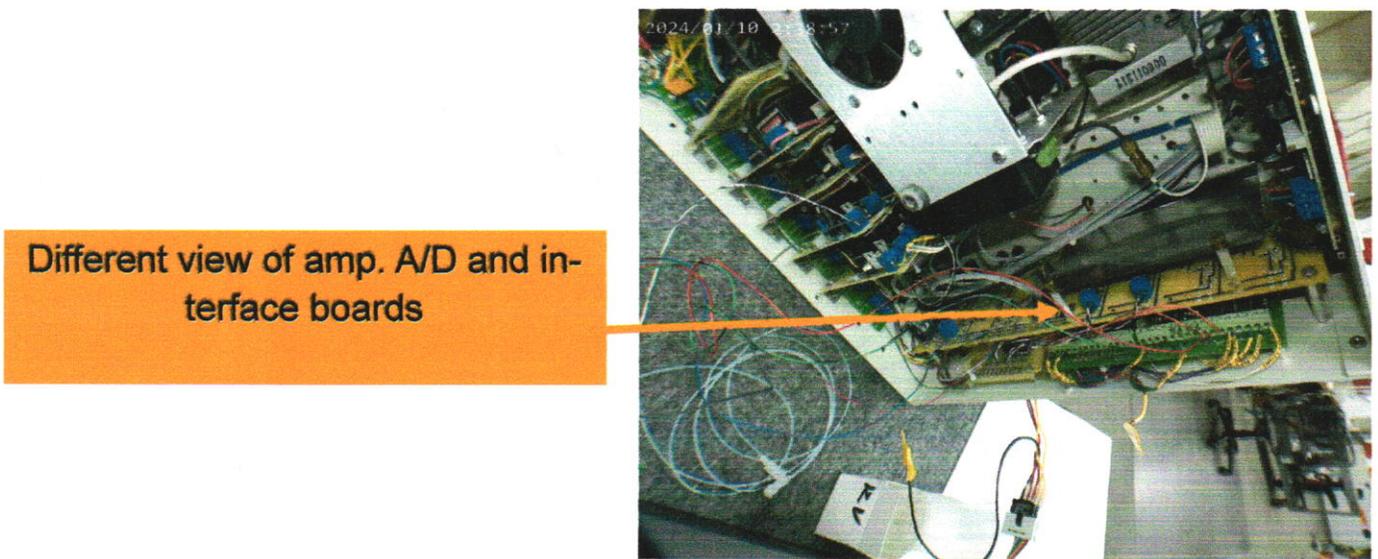
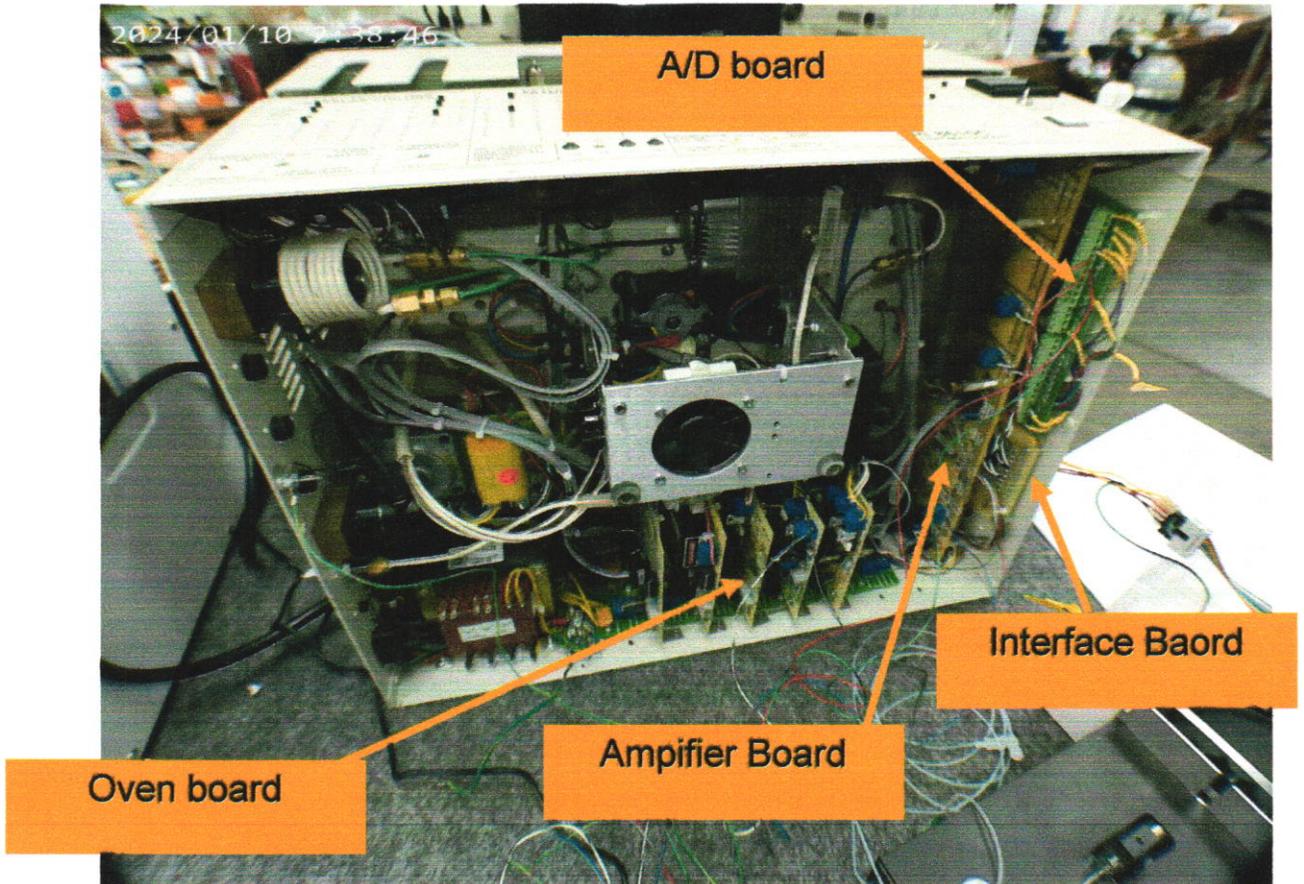


Different view of amp, AVD and interface boards



Bandolero Autosampler Installation

December 2024



Bandolero Autosampler

May 2023

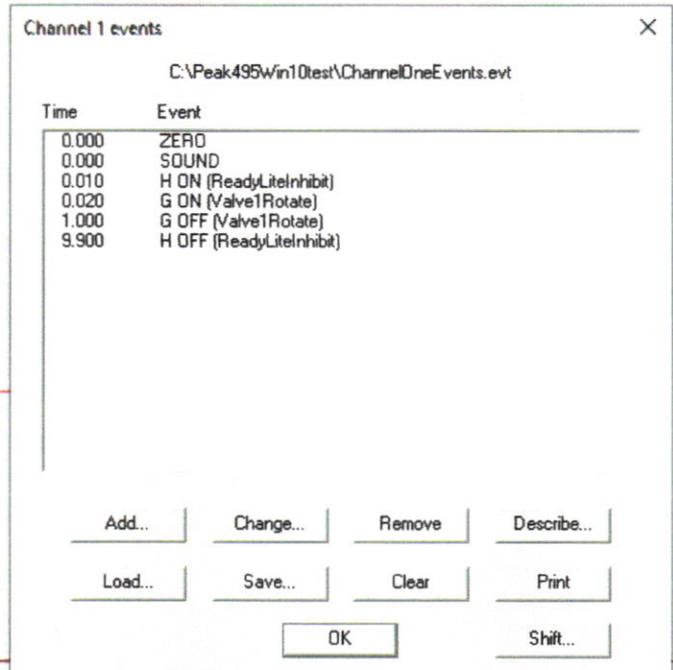
A typical Event table used with the Bandolero is shown.

Relay H inhibits the Ready lite on the GC from illuminating. The Bandolero is waiting for the Ready lit to start its next cycle so Relay H makes sure it stays off until the GC is really ready for the next run. Relay H turns off at the end of the run 9.9 minutes.

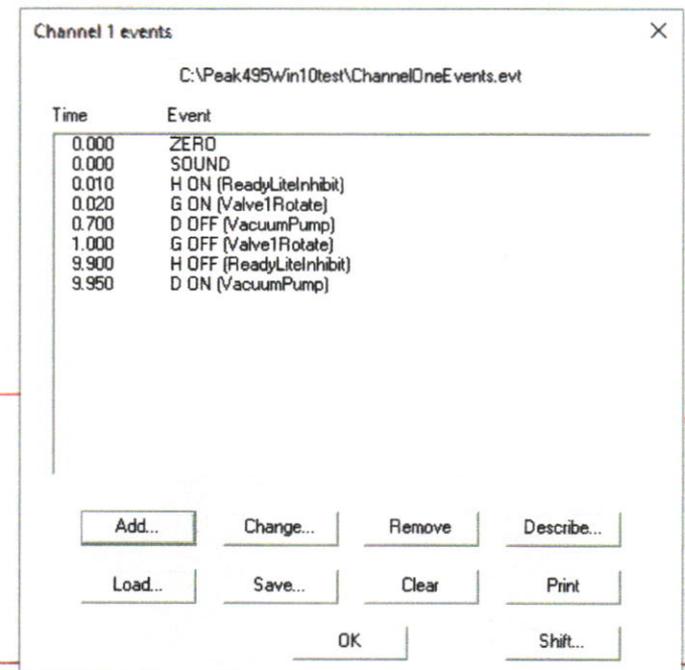
Here is the same event table but the vacuum pump is turned off by Relay D at .7 minutes. The Bandolero has finished its cycle by this time so no need to keep the vacuum pump running.

At 9.95 minutes Relay D turns the vacuum pump back on in preparation for the next Bandolero cycle.

To make this work, Un-check the box in the Edit/Overall screen labelled "Reset Relays at End of Run"



Time	Event
0.000	ZERO
0.000	SOUND
0.010	H ON (ReadyLiteInhibit)
0.020	G ON (Valve1Rotate)
1.000	G OFF (Valve1Rotate)
9.900	H OFF (ReadyLiteInhibit)



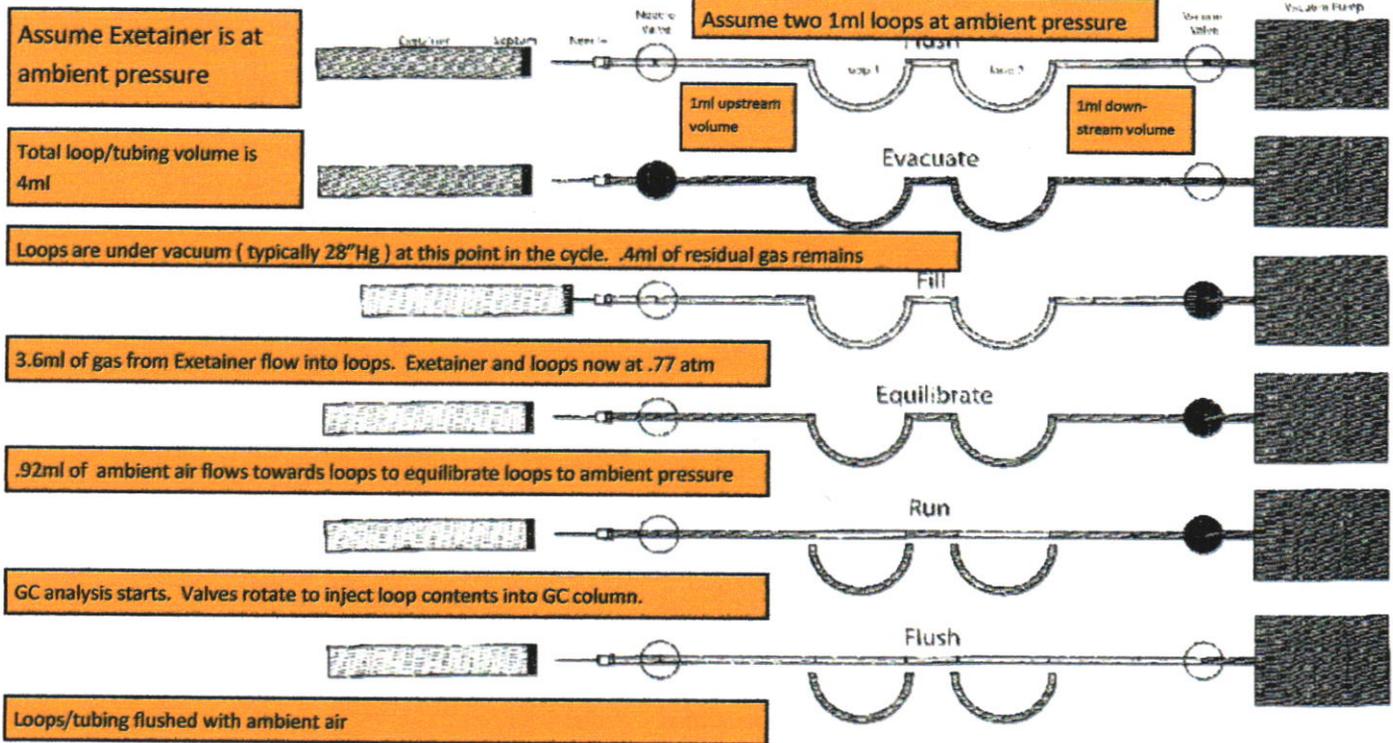
Time	Event
0.000	ZERO
0.000	SOUND
0.010	H ON (ReadyLiteInhibit)
0.020	G ON (Valve1Rotate)
0.700	D OFF (VacuumPump)
1.000	G OFF (Valve1Rotate)
9.900	H OFF (ReadyLiteInhibit)
9.950	D ON (VacuumPump)

Bandolero Autosampler

May 2023

Injectorr™ Sample Injection Method

The Injectorr™ method eliminates the syringe in GC injections. Sample flows directly from the needle through the sample loop. Contaminants are efficiently flushed with minimal use of sample.



This diagram shows the Bandolero cycle. It is important to understand that the vacuum pump evacuates the loop(s) to some pressure like 28" Hg (about .1 atmosphere) but not to absolute zero pressure. So there are still some gas molecules in the loop when the needle punctures the Exetainer. The residual gas molecules have to go somewhere so the volume between the loop and the downstream pinch valve has to be large enough to contain those molecules when the loop equilibrates to atmospheric pressure.

Similarly, the volume of the tubing between the upstream pinch valve and the loop has to be large enough that the slug of ambient air which flows towards the loop (in the fill part of the cycle) does not reach the loop.

Bandolero Autosampler

May 2023

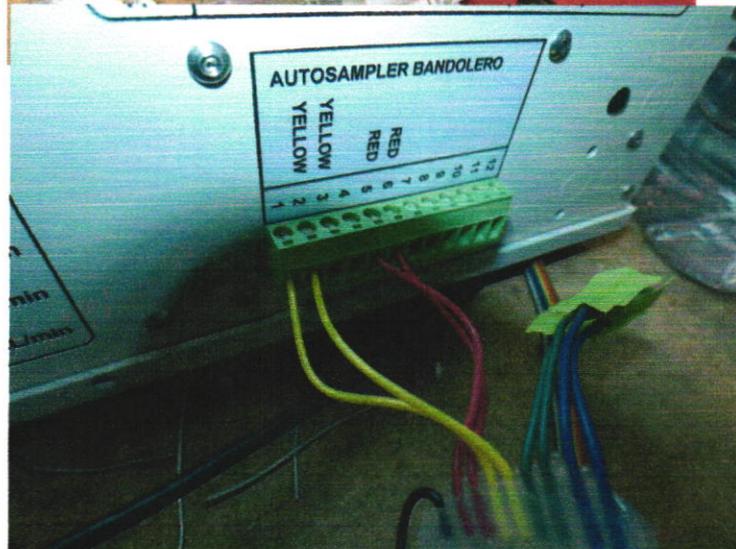
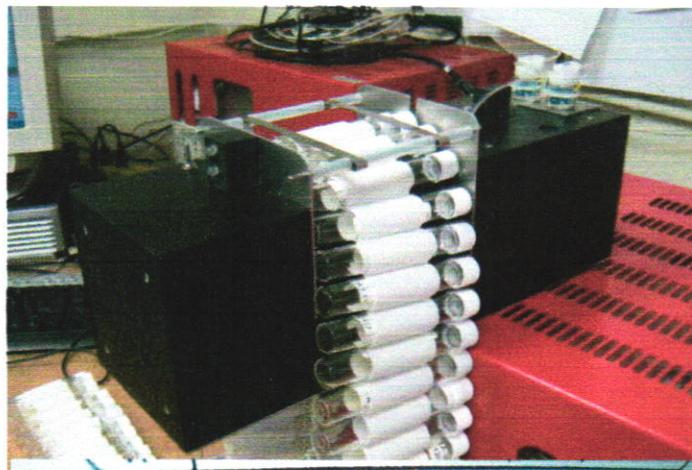
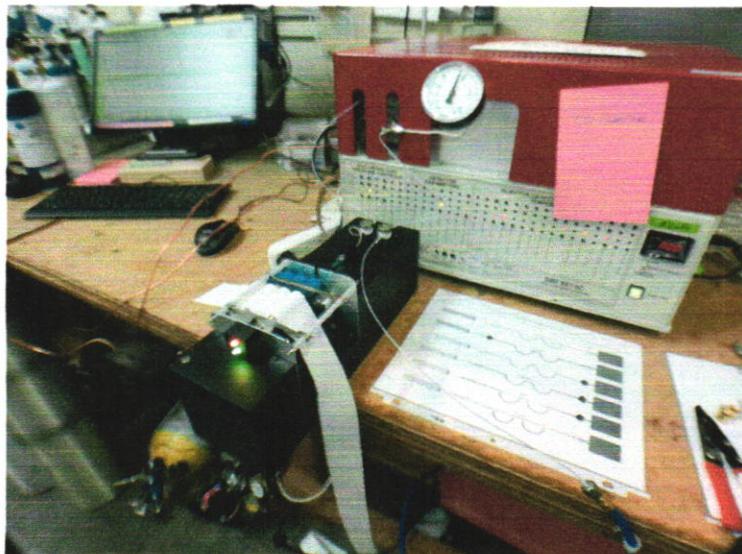
This photo shows the Bandolero connected to a SRI Greenhouse Gas GC. Exetainers are commonly used to collect gas samples in the field.

The Bandolero can mount anywhere the belt containing the Exetainers is free to travel.

The Bandolero interfaces to the GC with two sets of wires. The two yellow wires start the Bandolero cycle when the connection between the yellow wires is broken (open contact) not when the contact is closed.

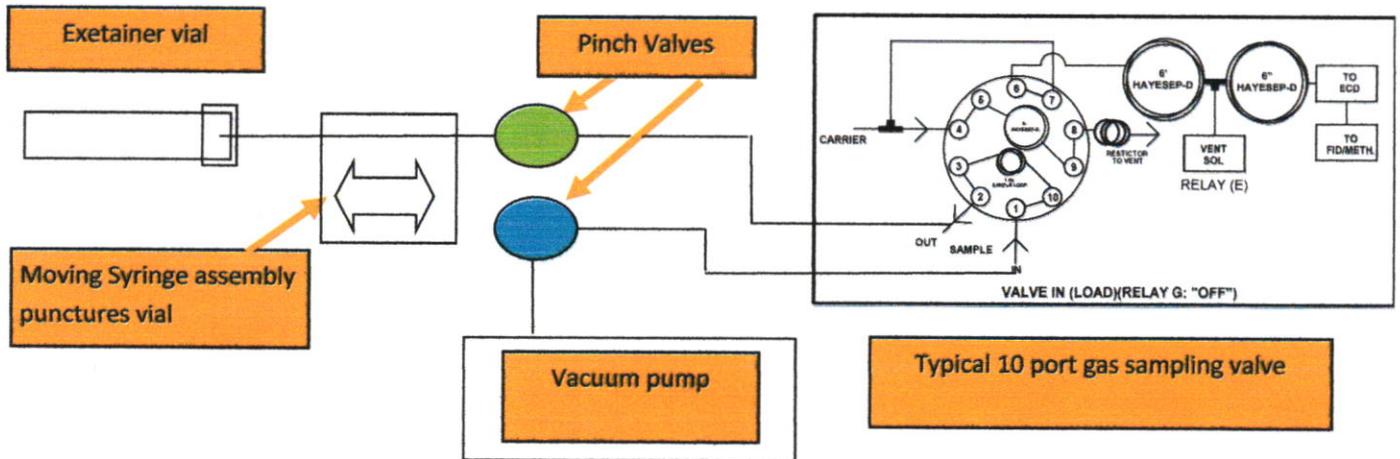
The two red wires start the GC when the Bandolero equilibrates the loop contents.

Note that the yellow wire label on the GC is wrong, but the wires are connected correctly.



Bandolero Autosampler

May 2023



The "Bandolero" autosampler starts its cycle when the GC ready signal illuminates.

- 1) The Blue pinch valve opens to let the vacuum pump evacuate the sample loop.
- 2) The Blue valve closes leaving the loop under vacuum
- 3) The syringe punctures the vial.
- 4) The Green pinch valve opens allowing the sample to flow into the sample loop.
- 5) The syringe retracts, allowing ambient air to flow into the tubing connecting the syringe to the sample loop. The air does not reach the loop, but allows the loop to equilibrate to ambient pressure.
- 6) The 10 port valve injects the loop contents.

To order: Price as of May 2023. Price subject to change

8640-1000 "Bandolero" vial autosampler with 100 vial belt. \$7495.

With universal 12volt power supply

If purchased with an SRI GC, there will be a power plug which can be controlled from the PeakSimple software into which you can plug any vacuum pump up to 200watts. The vacuum pump itself is not included.

Bandolero Autosampler

May 2023

The "Bandolero" autosampler for 12 ml Exetainer vials is a low cost solution for Greenhouse Gas applications and other gas samples.

The 12ml Exetainer vial is widely used to collect samples in the field and costs about 90 cents.

The "Bandolero" comes with a 100 vial belt

