BOOM BOX 3

Dynamite Controller

User's Manual
Revision 2.7

Boom Box 3 Dynamite Controller User's Manual

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Trademarks
Boom Box 3 is trademark of **Seismic Source Co**.

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1. Safety

Because this equipment is used with explosives, extreme caution must be observed. Make sure you know the safety regulations and follow them.

- Follow the correct procedures.
- Shooters and helpers must wear hard hats.
- Keep non-essential people far away from the shot point (both members of the public and crew personnel).
- Always keep CAP lines shorted together when it is not safe to Fire the shot.
- Only connect CAP lines to the Boom Box 3 when it is safe to Fire the shot.
- Never press the ARM or Charge switch on the Boom Box 3 unless it is safe to Fire the shot.
- Only shoot when ready and safe. Observe local safety regulations.
- Do not shoot in stormy weather.
- Do not fire shots close to power lines without ensuring that there is no possibility of cap wires coming into contact with the power lines.
- Do not shoot close to high-power radio transmitters.
- After the shot:
    - Make sure all the charges at a multiple/pattern shot have detonated.
    - Keep a record of any shots, which it was not possible to fire. They must be disposed of safely.

The Seismic Source Company does not represent that this manual is entirely comprehensive, accurate or covers each and every safety topic or risk which may be encountered by those using this manual and the Seismic Source Company disclaims all responsibility and liability for any such utilization of this information by the users thereof. By receipt of the Boom Box 3 Manual, the recipient/user agrees to release, indemnify and defend the Seismic Source Company from and against any and all claims, demands and liabilities that may arise from the utilization of the Boom Box 3 System by such recipients/users.

The end user uses the Boom Box 3 System at his/her own risk.

The Seismic Source Company does not assume any responsibility for accidental firings or any accident occurring with the Boom Box 3 System.

2. Boom Box 3 System Description

The Boom Box 3 (BB3) is a new generation of Blasters for Seismic Exploration.

The BB3 is specifically designed to operate more efficiently with autonomous continuous Seismic Recording systems.

The BB3's main features are:
- Internal Clock is synchronized to GPS time.
- All Shot data including shot times to microsecond accuracy is stored in non-volatile memory in the unit.
- Wi-Fi HTML interface that allows viewing of shot information and setting BB3 parameters on many Cell phones, PCs, or Tablet computer
- Shot timing is synchronized to GPS clock for firing on 8 msec sample boundaries. This assures no sample skew on most autonomous seismic recording systems.
- Compatible with older Boom Box units in standard VP radio mode. This allows the newer BB3 units to operate with the older Boom Box equipment on the same crew.
- Multiple Modes of operation
  - Autonomous mode – Decoder unit's use GPS time to fire the shots. No Encoder unit or Radio telemetry is required. Multiple shooters can be used with no overlap of shot times.
  - Standard Radio Mode – (UE/VP Mode) Decoders receive start commands from central Encoder unit via a VHF/UHF radio. Compatible with older Boom Box units operating in VP mode.
  - F3 Radio Mode. The F3 radio mode is used to start the Boom Box 3 on an exact GPS time. The Encoder and radio are still used to send the radio start codes to the Decoder unit. The precise GPS time of the Fire is sent to the Decoder and the Decoder unit fires the shot at the precise time requested. This mode is especially useful when using digital radios with unknown or variable modulation delays.

2.1.1 Boom Box 3 and Boom Box differences

There are important differences between the Boom Box 3 and the older Boom Box unit
Decoder Cable
The BB3 Decoder cable has an added wire for the PPS pulse from the GPS receiver. The BB3 can operate with the older Boom Box decoder cable, but the GPS time will not be set. The BB3 will communicate and operate the same as the older Boom Box unit with the old Boom Box cable. The new BB3 decoder cable should not be used with the older Boom Box units. The PPS pulse from the GPS will be grounded by the older Boom Box units. This could damage the GPS receiver.

Parameter Loading
The basic parameters of the BB3 can be loaded using the older Source Control software. However, many of the new parameters of the BB3 must be loaded using either the Wi-Fi interface or the SourceLink software.

GPS Baud Rate
The BB3 is set to use GPS receivers set at 19.2 K baud rate

The older boom box is set to use GPS receivers set at 9600 baud rate.

Geophone Test

The BB3 includes detailed geophone tests. These tests assure that the uphole geophone is planted correctly and is operational. The Geophone tests the following parameters:
- Resistance – measures DC resistance – Geophone must be connected.
- Frequency – geophone must be planted in vertical position for frequency to pass.
- Damping - geophone must be planted in vertical position for damping to pass.
- Sensitivity -geophone must be planted in vertical position for sensitivity to pass.

The older Boom Box unit only tested the Geophone resistance.

Radio Telemetry

The BB3 uses a new radio telemetry interface. This new interface is designed to provide a robust and reliable connection to most VHF and UHF radios. The BB3 uses the same radio telemetry design as the Force 3 vibrator electronics.

When the BB3 is set to maximum radio modulation level, the radio interface requires a similar interface as the older Boom Box units. The same "Radio Pigtails" should work for both the BB3 and the Boom Box unit.

The BB3 may require different radio polarity than the older Boom Box units. The Microphone and Speaker polarity should be tested for optimum operation.

When different radios or different radio polarities are used with the BB3 units, there may be a start time difference between the BB3 and the older Boom Box units. The "Decoder Delay" entry of the Boom Box 3 can be used to match the start times of the older Boom Box units.

2.2.1 BB3 Autonomous Mode:

The Boom Box 3 can be used in Autonomous mode. In this mode the Decoder units use GPS time to fire the shots. No Encoder unit or Radio telemetry is required. Multiple shooters can be used with no overlap of shots times. The Units and Record length can be assigned using the User Interface software. For further details refer to BB3 autonomous Mode section.

2.3.1 Standard Radio Mode:

The Boom Box 3 system is used to synchronize and control dynamite operation on seismic recording crews. A typical system includes at least one Boom Box 3 set up as a Decoder, and one Universal Encoder II (UE2) for the Encoder.

The Encoder unit interfaces the Seismic Recording System with a radio system, which communicates to the Decoder system. The Recording System sends a start command to the Encoder, which causes the Encoder to send a fire command to the Decoder. The Decoder receives the Fire command and will fire the CAP if the Decoder unit is ARMED and Charged. While the Decoder unit fires the CAP, the Encoder issues a Time Break signal to the Recording System. After the shot is fired the Decoder records the signal from the Uphole Geophone and transmits this data along with other QC data to the Encoder.

2.4.1 Encoder System consists of the following:

- Universal Encoder 2
- Recording System Interface:
    - o Remote Start – signal from Recording System, which starts Boom Box 3 Encoder.
    - o Time Break – T.B. – signal from Boom Box 3 Unit when voltage is applied to High Voltage for Cap firing.
    - o Aux 1 – Analog Uphole – BB3 firmware prior to 15.14, Analog line where uphole geophone signal is reproduced at 3.5 seconds after Time Break. An analog pulse at 3.0 second is used to check timing accuracy of system and another analog pulse at 3.25 seconds confirms that current flowed to the CAP. BB3 firmware 15.14 and newer, Analog line where uphole geophone signal is reproduced at 2 seconds after Time Break. An analog pulse at 1.0 second is used to check timing accuracy of system and another analog pulse at 1.5 seconds confirms that current flowed to the CAP.
    - o Aux 2 – BB3 firmware prior to 15.14, Timing pulses at 3.0, 3.25, 3.5 seconds after Time Break. – BB3 firmware 15.14 and newer, Timing pulses at 1.0, 1.5, 2 seconds after Time Break.
    - o COM 2 – Recording System Serial Interface plug. Connects to Recording System for data communication.
    - o Ethernet Port
        - ▪ Setting Encoder parameters
        - ▪ Viewing and storing Shot Status Report
        - ▪ Viewing and storing GPS position
        - ▪ Monitoring Recording Truck Serial Message
        - ▪ Viewing Decoder Ready Messages
        - ▪ Monitoring Start Time Errors
- Battery – 9-36-volt DC voltage
- Radio – Encoder - Unit connects to UHF or VHF radio to communicate with the radio connected to the Decoder.
- GPS and cable. Used to synchronize the clock of the UE2 unit.
- UE2 Encoder Cable:

2.4.2 Decoder System consists of the following:

- Boom Box 3 Unit configured as Decoder
- Boom Box 3 Decoder Cable
- Boom Box 3 Decoder backpack. Designed to carry all components of the Decoder System.
- Uphole Geophone – Geophone sensor used to measure time from when shot is fired to when motion is received at surface.
- Battery – 9-36 VDC battery used to power Boom Box 3 Decoder
- Radio – Decoder unit connects to UHF or VHF radio to communicate with the radio connected to the Encoder Unit.
- CAP line – CAP line to fire dynamite is connected to High Voltage post on Decoder Unit.
- GPS receiver – optional –External GPS receiver can be connected to Decoder Unit. GPS position can be acquired prior to shot. Position is sent back to Encoder Unit as part of the Ready Message and Shot Status Report. The Ready Message consists of the GPS position, Unit ID #, CAP resistance, and Geophone resistance.
- GPS PPS pulse from the GPS receiver is used to synchronize the time of the shots. The GPS PPS pulse and GPS unit is required when the BB3 is used in Autonomous mode.
- Autonomous Decoder Fire Switch (required when the BB3 is used in Autonomous mode)

3. Front Panel Description

Boom Box 3 Front Panel contains:
- 2 High Voltage terminals – connect to CAP wire for firing dynamite.
- Red Power/Status LED
    - Decoder Mode – flashes ON in short bursts.
    - Decoder Mode Charging – Flashes Fast when charged
- ARM toggle switch
    - Power up Boom Box 3 – single press powers the box "on"
    - Arm the dynamite CAP line – must hold switch to "ARM" high voltage terminals
    - The ARM switch in the normal position shorts the high-voltage line
- Charge toggle switch
    - Press Charge to charge the High Voltage Capacitor
- Test Push Button
    - Press Test button to test the Geophone
    - Press Test and ARM button to test the dynamite CAP
    - Test LED shows result of test
- GPS Push Button
    - Press GPS button to store the GPS position for the next shot
    - To reacquire GPS for the same shot, hold Charge button and then press GPS button
    - GPS LED shows status of GPS position

3.1.1 Display

```
ID:02 Cr:01 SC:0 DEC
Batt:12.2 GPS:Lock
---------------------------------
Cap Res =   2.0 Ohm
Geo Res = 275 Ohm
Fr=30 Da=0.6 Sen=15.6
---------------------------------
```

The Boom Box 3 has a graphical display. The display is used to show the setup of the box at power on, the CAP and Geophone resistance, the ready message, the uphole information, and the shot status message. The display shows the following messages:

- **Unit ID #** - Unit ID of the Boom Box 3
- **Crew Code #** - The Crew # of the Encoder must match the Crew Code of the Decoder
- **Start Code #** - The Start Code # of the Encoder must match the Start Code of the Decoder
- **Operating mode:** "ENC"-Encoder, "DEC"-Decoder,"STN"-Standalone/Autonomous ,
              "AGD"-Air Gun Decoder "MON"-Monitor
- **Battery:** Battery voltage indicator
- **GPS:** Shows the following:
      Quality of the GPS '1': GPS Fix '2': Differential, p-PPS available
      Time Synchronization: "T: OK" –Time Synchronized, "T: NO" –No time sync
      Lock status: "Lock" -GPS position is locked for the next shot.
- **Cap Resistance**
  Decoder will display Geophone resistance when the Arm and Test button is pressed.
- **Geophone Resistance**
  Decoder will display Geophone resistance when the Test button is pressed.
  Geophone test also provides "Fr"-Frequency "Da"-Damping "Sen"-Sensitivity
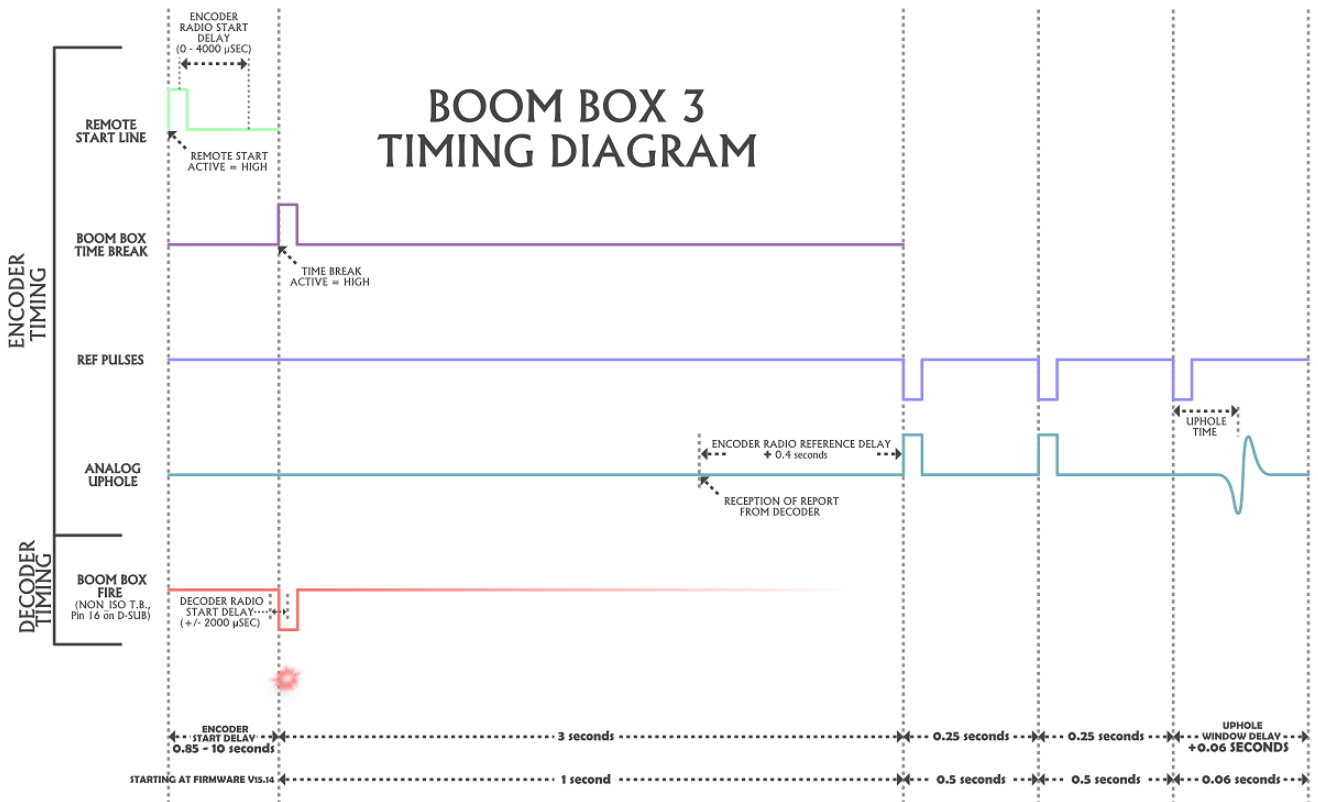
4. Encoder Operation

The following Encoders can be used to fire the Boom Box 3 Decoders via radio
- Universal Encoder 1 (in VP mode)
- Universal Encoder 2
- Boom Box 3 unit with SourceLink™ Software

The Boom Box 3 can be placed into encoder mode by changing the operating mode with either the Wi-Fi web interface or the SourceLink software.

4.1.1   Fire Sequence – Encoder – Following sequence occurs.

- The fire sequence can be started multiple ways.
    - A hardware pulse (Isolated Remote Start) from an external source. Recording System type is Generic Serial. Currently all unit IDs will be enabled to fire, not changed by the RTI sequence message.
    - Recording System type is SourceLink. SourceLink can fire the Boom Box 3 encoder.
    - Recording System type is Sercel. Place the Sercel recording system in SGDS dynamite mode. The Sercel recording system can now send the RTI message that tells the Boom Box 3 encoder which unit to fire. The same message will fire the Boom Box 3.
- The Encoder then sends the Start Code Radio transmission.
    - Wi-Fi, Standard Encoder, Auto Zero Time not selected. Timing of the radio Start Code Radio transmission determined by Encoder Start Delay and Encoder Radio Start Delay Time entries.
    - Wi-Fi, Standard Encoder, Auto Zero Time selected. GPS start time is in the Start Code Radio message and used to fire the shot.
- The Encoder then issues the Time Break at the end of the Encoder Start Delay Time. The time break signal should occur while the Shot is being fired by the Decoder Unit.
- After the Shot is fired the Encoder receives the Shot Status Report message from the Decoder.   The time when the message is received determines when the timing pulses will occur.
- The Encoder display will show 'PFS Rx !!' when the decoder post report is received.
- The Encoder generates reference pulses at 3, 3.25, and 3.5 seconds prior to firmware 15.14. Firmware 15.14 and newer the reference pulses are at 1, 1.5 and 2 seconds. These pulses should align with the timing pulses generated from the Decoder's Shot Status Report.
- The Encoder outputs the following timing pulses. These pulses are based on when the Shot Status Message is received.
    - Data reception pulse – Pulse that is generated if Shot Status Message is received. This pulse should be at 3 seconds plus one-way radio delay prior to firmware 15.14. Firmware 15.14 and after this pulse should be at 1 second plus one-way radio delay.
    - Confirmation Time Break – This pulse will be generated if current to CAP exceeded threshold.   This pulse is generated 0.25 seconds after Data Reception Pulse in firmware prior to 15.14. Firmware 15.14 and newer this pulse is generated 0.5 seconds after Data Reception Pulse.

- Uphole Data – The analog uphole data is reproduced exactly 0.5 seconds after the Data Reception Pulse in firmware prior to15.14.   Firmware 15.14 and newer the analog uphole data is reproduced exactly 1 second after the Data Reception Pulse.
- The SourceLink program is used to view the following
  - The Shot Status message from the Decoder
  - Shot Status Message download
  - GPS information before or after shot
  - View Resistance measurements before or after shot

BOOM BOX 3
TIMING DIAGRAM

4.1.2   Start Code

Three parameters must match for a valid start code to be recognized.
- **Start Code** – (0-3) – All Boom Box units must be set to the same number
- **Crew number** – (0-250) – All Boom Box units must be set to the same number.
- **Units** – Decoder unit ID number must be included in the list of units of the selected group within SourceLink.

5. Decoder Operation

5.1   Decoder Operation

The Decoder Mode of operation is used to detonate a blasting cap for seismic dynamite operation. Extreme caution needs to be exercised when working around dynamite and detonation equipment. Review and follow all safety guidelines.

The Decoder unit is connected to a detonation Cap, an uphole geophone, a radio, and a battery. Whenever the Decoder is connected to the CAP or whenever a radio is used, the CAP can fire at any time. The unit has been designed to only fire the CAP when both the ARM and the Charge buttons are held and a valid start code from the Encoder is received. However, potentially there is a chance that the CAP can accidentally fire from either RF noise or a hardware failure. The following is the normal A3/UE mode operation procedure:

- The Shooter receives a valid GPS position for the new shot point.
- The Shooter verifies that there is no danger in accidental firing of hole and that all personnel and livestock are clear of the shot hole.
- The "Shooter" connects the unit to the uphole geophone, and Cap at the new shot hole.
- The Shooter normally checks the resistance of both the geophone and the Cap.
- After all tests are satisfactory, the shooter either calls in that he is ready or uses the automatic ready signal to notify the recorder that he is ready to shoot.
- The Shooter then presses the "Arm" and "Charge" switches to get the box ready to fire.
- The Boom Box 3 will automatically send back a "Ready Message" if enabled.
- The Encoder then sends a start code and the Decoder fires the Shot.
- The shooter then releases the "Arm" and "Charge" switch and disconnects from the hole.
- The Decoder unit automatically sends the Shot Status Message to the Encoder.
- The Shooter can check the status of the Box immediately after the Shot is fired.
  - Test LED = Green when Confirmation Time Break is valid.
  - GPS LED = Green when Uphole time is valid
  - The display will show the Uphole time, CTB value, and battery voltage.

5.2   Detailed Decoder Operation

5.2.1 Uphole Geophone Test

- Press Test button on Front Panel to test Uphole Geophone
- Boom Box 3 Compares reading with internal limits
- Geophone Test includes
  - Resistance – measures DC resistance
  - Frequency – geophone must be planted in vertical position for frequency to pass
  - Damping - geophone must be planted in vertical position for damping to pass
  - Sensitivity -geophone must be planted in vertical position for sensitivity to pass
- Flashes Test LED green 4 times if result is within entered limits and there is a sensitivity reading.
- Flashes Test LED red 4 times if result is outside entered limits or there isn't a sensitivity reading.
- Geophone resistance will be shown on the Armed and Ready display.
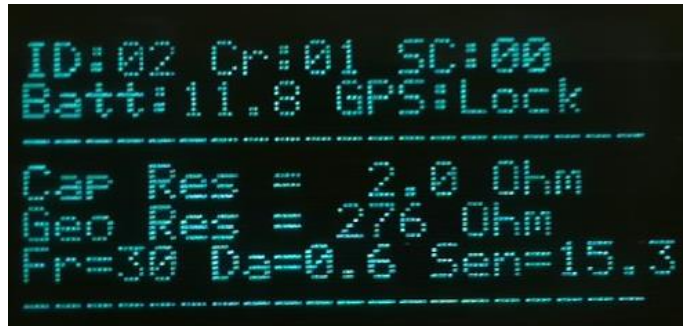
5.2.2 CAP Resistance Test

- Press Test button and ARM switch on Front Panel to test CAP resistance
- Boom Box 3 Compares reading with internal limits
- Flashes Test LED green 2 times if result is within entered limit
- Flashes Test LED red 2 times if result is outside entered limits
- CAP resistance will be shown on the Armed and Ready display.


5.2.3 GPS Test

- Press GPS button to acquire new GPS position – 10 seconds.
- GPS LED is RED for the first 4 seconds to show the GPS button was pressed.
- Solid green GPS LED with a differential position.
- Flashing green GPS LED with a non-differential position.
- Solid red GPS LED when a bad position was received.
- No GPS LED when no GPS information is received within 10 seconds of pressing the GPS button.
- The GPS LED's will stay this way until pressing the GPS button again or taking the next shot.
- Note: Boom Box 3 is normally set up for GPS receivers using 19.2 k baud

```
ID:02 Cr:01 SC:00
Batt:11.8 GPS:Lock
_____
Cap Res =  2.0 Ohm
Geo Res = 276 Ohm
Fr=30 Da=0.6 Sen=15.3
_____
```

5.2.4 Fire Sequence – VP/UE Mode - Decoder

- Press both the Arm and Charge switch to Arm Boom Box 3 and charge internal capacitor.
- If the Ready Message is enabled the Ready Message will be automatically sent when the high voltage capacitor is fully charged, and box is ready to fire.
- When valid Start Code is received from the Encoder unit, the shot sequence is started, and the High Voltage is applied to the Cap line the Shot is fired.
- Test LED will flash green for 4 seconds after shot if Confirmed Time Break is OK
- Test LED will flash RED after shot if Confirmed Time Break is not detected
- GPS LED will flash green after shot if first break is detected on Uphole geophone
- GPS LED will flash red after shot if first break is not detected
- The display will show Uphole time, CTB value, and Battery voltage.


```
ID:02 Cr:01 SC:00
Batt:11.8 GPS:Lock
_____
Uphole Time = 20.0 ms
CTB = 3.7 us

_____
```
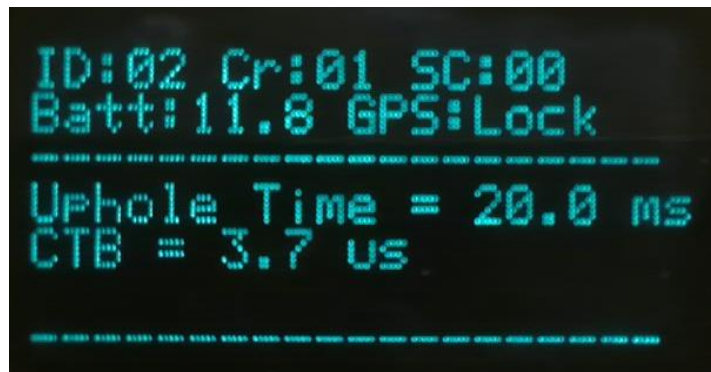
5.3   OSEIS Decoder Operation

5.3.1   OSEIS Decoder Operation

The OSEIS Decoder Mode of operation is used to detonate an OSEIS blasting cap for seismic dynamite operation. Extreme caution needs to be exercised when working around dynamite and detonation equipment. Review and follow all safety guidelines. The OSEIS mode requires the Boom Box 3 unit with the internal Orica blaster board. The Boom Box 3 unit requires the switch behind the front panel to be in OSEIS position to fire OSEIS blasting caps. The Boom Box 3 unit needs to be placed into OSEIS mode. This can be done several ways.

- Connect a computer directly to the Boom Box 3, run the SourceLink program, Encoders/Decoders, Boombox Parameters, and change Boombox Mode from Standard to OSEIS.
- Connect a computer to a Universal Encoder II, run the SourceLink program, Encoders/Decoders, Boombox Parameters, and change Boombox Mode from Standard to OSEIS over the radio link.
- Wi-Fi Web Interface select PARAMS and Cap mode. Select Orica. Apply changes.

When the unit is in OSEIS mode the middle led will be green with the normal red flashes, when in standard mode the middle led will only flash red.

The Decoder unit is connected to a detonation Cap, an uphole geophone, a radio, and a battery. Whenever the Decoder is connected to the CAP or whenever a radio is used, the CAP can fire at any time. The unit has been designed to only fire the CAP when both the ARM and the Charge button are held and a valid start code from the Encoder is received. However, potentially there is a chance that the CAP can accidentally fire from either RF noise or a hardware failure. The following is the normal operation procedure:

- The Shooter receives a valid GPS position for the new shot point.
- The Shooter verifies that there is no danger in accidental firing of hole and that all personnel and livestock are clear of the shot hole.
- The "Shooter" connects the unit to the uphole geophone, and Cap at the new shot hole.
- The Shooter normally checks the resistance of the geophone and the serial number of the OSEIS Cap.
- After all tests are satisfactory, the shooter either calls in that he is ready or uses the automatic ready signal to notify the recorder that he is ready to shoot.
- The Shooter then presses the "Arm" and "Charge" switches to get the box ready to fire.
- The Boom Box will automatically send back a "Ready Message" if enabled.
- The Encoder then sends a start code and the Decoder fires the Shot.
- The shooter then releases the "Arm" and "Charge" switch and disconnects from the hole.
- The Decoder unit automatically sends the Shot Status Message to the Encoder.
- The Shooter can check the status of the Box immediately after the Shot is fired.
  - Test LED = Green when Confirmation Time Break is valid.
  - GPS LED = Green when Uphole time is valid
  - The display will show the Uphole time, CTB value, and battery voltage.
- Shooter can check uphole time by pressing the Charge and GPS switch and looking at the information on the display.

5.4   Detailed OSEIS Decoder Operation

5.4.1   Uphole Geophone Resistance Test

- Press Test button on Front Panel to test Uphole Geophone
- Boom Box 3 Compares reading with internal limits
- Geophone Test includes
  - o   Resistance – measures DC resistance
  - o   Frequency – geophone must be planted in vertical position for frequency to pass
  - o   Damping - geophone must be planted in vertical position for damping to pass
  - o   Sensitivity -geophone must be planted in vertical position for sensitivity to pass
- Flashes Test LED green 4 times if result is within entered limits and there is a sensitivity reading.
- Flashes Test LED red 4 times if result is outside entered limits or there isn't a sensitivity reading.
- Geophone resistance will be shown on the Armed and Ready display.

5.4.2   OSEIS CAP Test

- Press Test button and ARM switch on Front Panel to test CAP
- Flashes Test LED green 2 times if result is within entered limits
- Flashes Test LED red 2 times if result is outside entered limits
- CAP results will be shown on the display.

5.4.3   GPS

- Press GPS button to acquire new GPS position – 10 seconds.
- GPS LED is RED for the first 4 seconds to show the GPS button was pressed.
- Solid green GPS LED with a differential position.
- Flashing green GPS LED with a non-differential position.
- Solid red GPS LED when a bad position was received.
- No GPS LED when no GPS information is received within 10 seconds of pressing the GPS button.
- The GPS LED's will stay this way until pressing the GPS button again or taking the next shot.

5.4.4   Fire Sequence – OSEIS Decoder

- Press both the Arm and Charge switch to Arm the Boom Box and the OSEIS blasting cap. Arming the OSEIS blasting cap takes between 4 to 6 seconds.
- If the Ready Message is enabled the Ready Message will be automatically sent when the high voltage capacitor is fully charged, and box is ready to fire.
- When valid Start Code is received from the Encoder unit, the shot sequence is started, and the fire message is sent to the Cap line and the Shot is fired.
- Test LED will flash green for 4 seconds after shot for Confirmed Time Break is OK
- GPS LED will flash green after shot if first break is detected on Uphole geophone
- GPS LED will flash red after shot if first break is not detected
- The display will show Uphole time, CTB value, and Battery voltage.

6. Autonomous Decoder Operation

See Autonomous Mode Setup section of this manual

6.1 Autonomous Decoder Operation

The Autonomous Decoder Mode of operation is used to detonate a blasting cap for seismic dynamite operation. Extreme caution needs to be exercised when working around dynamite and detonation equipment. Review and follow all safety guidelines.

The Decoder unit is connected to a detonation Cap, an uphole geophone and a battery. Whenever the Decoder is connected to the CAP or whenever a radio is used, the CAP can fire at any time. The unit has been designed to only fire the CAP when both the ARM and the Charge button are held. However, potentially there is a chance that the CAP can accidentally fire from either RF noise or a hardware failure. The following is the normal operation procedure:

- The Shooter receives a valid GPS position for the new shot point.
- The Shooter verifies that there is no danger in accidental firing of hole and that all personnel and livestock are clear of the shot hole.
- The "Shooter" connects the unit to the uphole geophone, and Cap at the new shot hole.
- The Shooter normally checks the resistance of both the geophone and the Cap.
- After all tests are satisfactory, the shooter calls in that he is ready(optional)
- The Shooter sets the Line/Station information of the shot either manually or automatically using the Wi-Fi or Computer interface.
- The Shooter then presses the "Arm" and "Charge" switches to get the box ready to fire.
- The Shooter then presses the Autonomous Decoder Fire switch to initiate the sequence (For added safety).
- The Boom Box 3 will start looking for the next available GPS time Slot, based on the preprogrammed Unit List and Record Length.
- The Unit will pick the nearest available time slot, but if the next slot is less than 10 seconds away, this slot is ignored and the next to next slot (calculated based on units, record length) is picked instead, for safety reasons.
- The Boom Box 3 display will update the remaining seconds for the Fire Slot.
- The Shot will be fired at the Fire Slot GPS Time if the Arm & Charge button are held.
- The Arm & Charge switch must be held at least for the last 4 seconds before the fire, for the fire to happen. If not, the shot will be cancelled for safety reasons.
- The shooter then releases the "Arm" and "Charge" switch and disconnects from the hole.
- The Decoder unit automatically saves the GPS Time, Position, Line/Station information, uphole information in the Flash Card.
- The shot information is updated in the Wi-Fi Interface Software.
- The Shooter can check the status of the Box immediately after the Shot is fired.
    - Test LED = Green when Confirmation Time Break is valid.
    - GPS LED = Green when Uphole time is valid
    - The display will show the Uphole time, CTB value, and battery voltage.

BOOM BOX3 AUTONOMOUS (JUNGLE MODE) OPERATION SEQUENCE

Sample with four Boom Box 3 Units
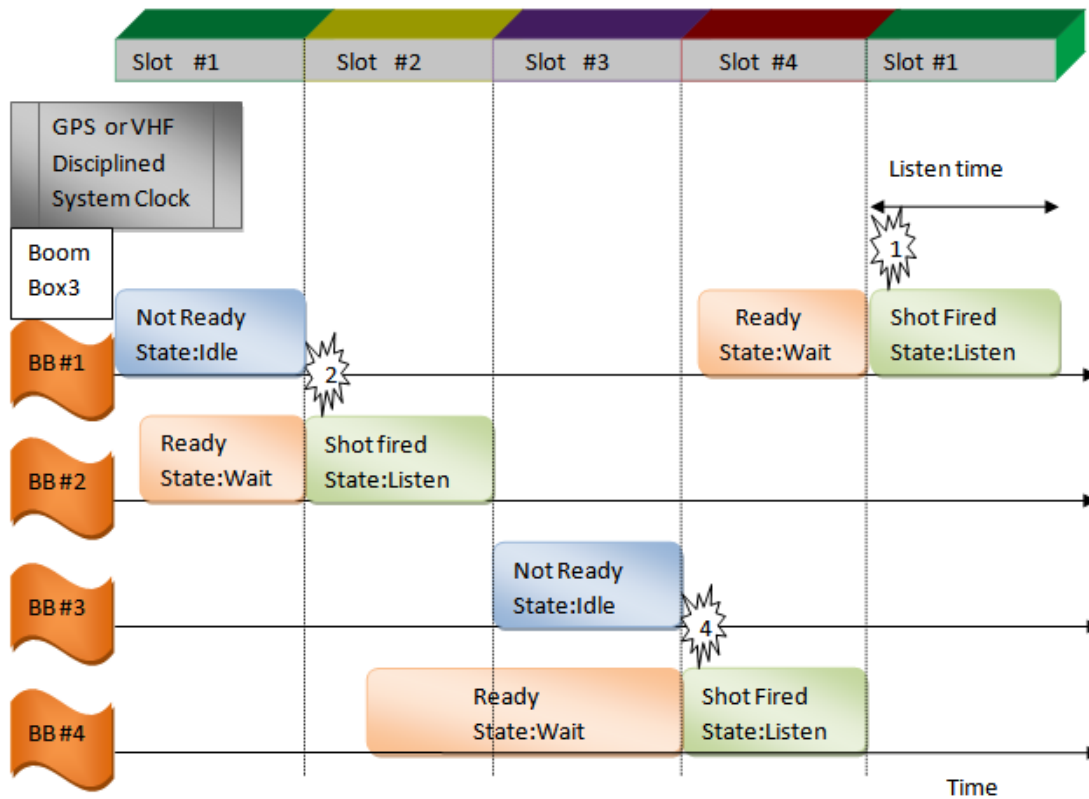
## 6.2. Detailed Autonomous Decoder Operation

6.2.1 Uphole Geophone Resistance Test

- Press Test button on Front Panel to test Uphole Geophone
- Boom Box 3 Compares reading with internal limits
- Geophone Test includes
    - Resistance – measures DC resistance
    - Frequency – geophone must be planted in vertical position for frequency to pass
    - Damping - geophone must be planted in vertical position for damping to pass
    - Sensitivity -geophone must be planted in vertical position for sensitivity to pass
- Flashes Test LED green 4 times if result is within entered limits and there is a sensitivity reading.
- Flashes Test LED red 4 times if result is outside entered limits or there is not a sensitivity reading.
- Geophone resistance will be shown on the Armed and Ready display.

6.2.2 CAP Resistance Test

- Press Test button and ARM switch on Front Panel to test CAP resistance
- Boom Box 3 Compares reading with internal limits
- Flashes Test LED green 2 times if result is within entered limit
- Flashes Test LED red 2 times if result is outside entered limits
- CAP resistance will be shown on the display.

6.2.3 GPS Test

- Press GPS button to acquire new GPS position – 10 seconds.
- GPS LED is RED for the first 4 seconds to show the GPS button was pressed.
- Solid green GPS LED with a differential position.
- Flashing green GPS LED with a non-differential position.
- Solid red GPS LED when a bad position was received.
- No GPS LED when no GPS information is received within 10 seconds of pressing the GPS button.
- The GPS LED's will stay this way until pressing the GPS button again or taking the next shot.

6.2.4 Fire Sequence -Autonomous Decoder

- Set the Line/Station information of the shot either manually or automatically using the Wi-Fi or Computer interface (refer corresponding sections in manual for details).
- Press both the Arm and Charge switches to Arm the Boom Box 3 and charge the internal HV capacitor.
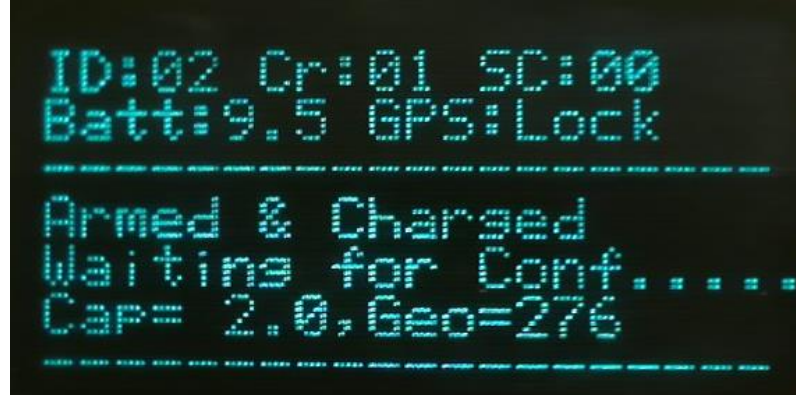
- Press the Autonomous decoder fire switch.

- The Boom Box 3 Unit will fire the shot in the correct GPS time slot.
- The Shooter can check the status of the Box immediately after the Shot is fired.
  - Test LED = Green when Confirmation Time Break is valid.
  - GPS LED = Green when Uphole time is valid
  - The display will show the Uphole time, CTB value, and battery voltage.
- The display will show Uphole time, CTB value, and Battery voltage.
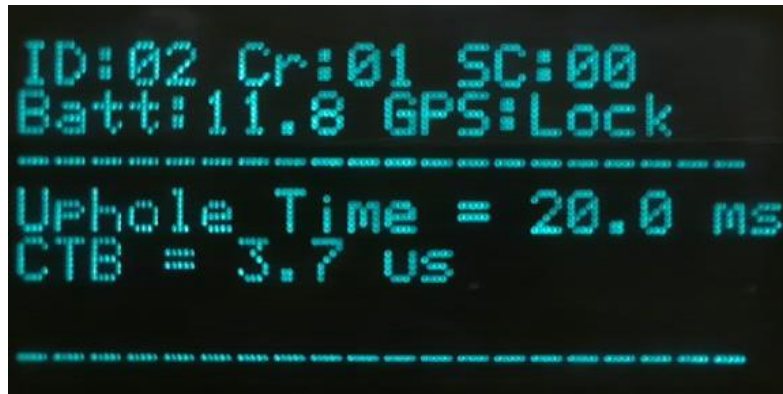
7. A3 Repeater Encoder and A3 Repeater Operation

7.1 A3 Repeater Encoder Operation

The Boom Box 3 system can be used in an A3 Repeater Encoder/Repeater Mode. This Mode is used when the radio reception from the Encoder to the Decoder requires a radio repeater. This is typically a problem in very mountainous areas.
In this mode, one Boom Box 3 is selected to be in A3 Repeater Encoder Mode. Another Boom Box 3 or the Boom Box can be used as the repeating decoder.

- The Boom Box 3 can be placed into the A3 Repeater Encoder mode by changing the operating mode with the Wi-Fi web interface, SourceLink or Source Control F3.
- The Wi-Fi web interface, SourceLink or Source Control F3 can be used to select the repeater ID of the Repeater Decoder Unit ID.
- The Crew ID of the A3 Repeater Encoder must match the repeating Decoder and shooting Decoder.
- A3 Repeater Encoder requires the Encoder Start Delay to be 1500 or more.

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7.2 Fire Sequence – A3 Repeater Encoder – Following sequence occurs.

- The fire sequence can be started multiple ways.
    - A hardware pulse (Isolated Remote Start) from an external source. Recording System type is Generic Serial. Currently all unit IDs will be enabled to fire, not changed by the RTI sequence message.
    - Recording System type is SourceLink. SourceLink can fire the Boom Box 3 A3 Repeater Encoder.
    - Recording System type is Sercel. Place the Sercel recording system in SGDS dynamite mode. The Sercel recording system can now send the RTI message that tells the Boom Box 3 in A3 Repeater Encoder mode which unit to fire. The same message will cause the Boom Box 3 to send the radio repeater start code.
- A3 Repeater Encoder transmits the A3 Repeater Start Code to start the A3 Repeater Unit. (Timing of transmission is determined by Encoder Start Delay and Encoder Radio Start Delay time)
- A3 Repeater Encoder issues a Time Break at the end of the Encoder Start Delay time.
- After the Shot is fired the A3 Repeater Encoder receives the Shot Status Report message from the Decoder (if in radio range) and the Repeater Unit. The time when the message is received determines when the timing pulses will occur.
- The A3 Repeater Encoder display will show 'PFS Rx !!' when the decoder post report is received.
- The A3 Repeater Encoder generates reference pulses at 1, 1.5, 2, 2.5, 3, and 3.5 seconds. These pulses should align with the timing pulses generated from the Decoder's Shot Status Report.
- The A3 Repeater Encoder will output the following timing pulses. These pulses are based on when the Shot Status Message is received from the Decoder (if in radio range).
    - Data reception pulse – Pulse that is generated if Shot Status Message is received. This pulse should be at 1 second after time break plus one-way radio delay.
    - Confirmation Time Break – This pulse will be generated if current to CAP exceeded threshold. This pulse is generated 0.5 seconds after Data Reception Pulse.
    - Uphole Data – The analog uphole data is reproduced exactly 1 second after the Data Reception Pulse.
- The A3 Repeater Encoder will output the following timing pulses. These pulses are based on when the Shot Status Message is received from the repeater Decoder.
    - Data reception pulse 2 – Pulse that is generated if Shot Status Message is received. This pulse should be at 2.5 seconds after time break plus one-way radio delay.
    - Confirmation Time Break 2 – This pulse will be generated if current to CAP exceeded threshold. This pulse is generated 0.5 seconds after Data Reception Pulse 2.
    - Uphole Data 2 – The analog uphole data is reproduced exactly 1 second after the Data Reception Pulse 2.
- The SourceLink program is used to view the following:
    - The Shot Status message from the Decoder.
    - Shot Status Message download.
    - GPS information before or after the shot.
    - View Resistance measurements before or after the shot.

7.3 A3 Repeater Operation

A Boom Box 3 or Boom Box in Decoder operating mode can be used as an A3 Repeater. The Boom Box Decoder would need to be in Ready Message type Vib Pro.

The Boom Box 3 and Boom Box Decoder unit becomes an A3 Repeater whenever an A3 Repeater start code message is received with the correct conditions. The Decoder Crew ID must match the A3 Repeater start code message Crew ID and the Decoder Unit ID must match the A3 Repeater start code message Repeater ID.

If the same Unit ID is shared among more than one box, the A3 Repeater mode will not operate properly.

7.4 Fire Sequence – A3 Repeater – Following sequence occurs.

- The A3 Repeater Boom Box 3 or Boom Box Decoder unit is powered on and connected to a radio. No switches or buttons need to be pressed to be in repeater mode.
- When a valid A3 Repeater Start Code is received from the A3 Repeater Encoder unit, the Repeater generates the Decoder Start Code from the A3 Repeater Start Code.
- The A3 Repeater Decoder receives the Shot Status Report message from the shooting pack Decoder.
- The received Shot Status Report is re-transmitted over the radio to the A3 Repeater Encoder.

BOOM BOX 3 A3 REPEATER TIMING DIAGRAM
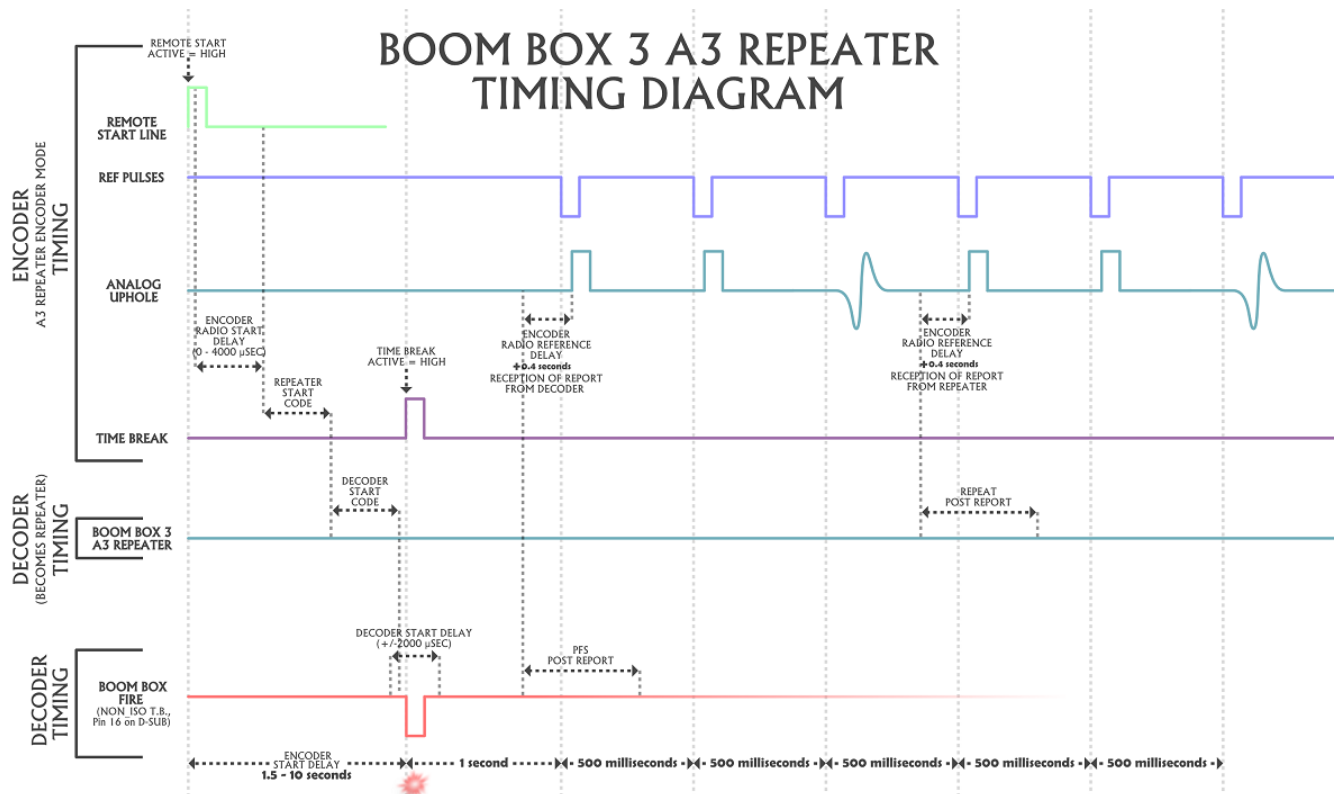
8. Monitor

The Boom Box 3 can be placed into the Monitor mode by changing the operating mode to Monitor through the Wi-Fi, SourceLink or Source Control F3 program.

The Monitor receives the radio start code from the BB3 Encoder and issues a Time Break pulse and Recorder Start pulse 100 milliseconds before the Time Break pulse.

The Time Break and Recorder Start signals are adjustable by the Encoder Zero Time Adjust entry.
- Encoder Zero Time Adjust entry set to 2000 is the same as no delay.
- Encoder Zero Time Adjust lower than 2000 is a negative delay.
- Encoder Zero Time Adjust greater than 2000 is a positive delay.

9. BB3/UE3 Encoder Operation

The Boom Box 3 can be placed into the BB3/UE3 Encoder mode by changing the operating mode with the Source Control F3 software or the SourceLink v.22 and newer software. Then the main encoder parameters are changed by Source Control F3 program or the SourceLink v.22 program, Parameters and Encoder Parameters. The BB3/UE3 Encoder mode does encoder operation differently from the original BB3Encoder mode above. The BB3/UE3 Encoder mode operates like the UE3.
When the BB3 is in BB3/UE3 Encoder operation, SourceLink needs to be set to UE3.
Encoder/Decoders -> Connections -> Encoder/Decoder… Universal Encoder 3

The Boom Box 3 firmware needs to be 15.23 or newer in the Boom Box 3 encoder and decoder for this functionality to work.

9.1.1 Fire Sequence – Encoder – Following sequence occurs.

- The fire sequence can be started multiple ways.
  - Using Source Control F3. Encoder Parameters, Recording System type is any of the settings. Start Mode set to Start Message. Source Control F3 can fire the Boom Box 3 BB3/UE3 encoder.
  - Encoder Parameters, Recording System type is Sercel. Place the Sercel recording system in SGDS dynamite mode. Setup the BB3/UE3 sequence table with Source Control F3 v.22 or v.21. The Sercel recording system can now send the sequence RTI message that tells the Boom Box 3 encoder which sequence to use to make the Start Code.
    - Source Control F3: Start Mode set to Start Message. SourceLink v22 or newer: Start Mode set to Start on Shot Message (Source Link). The same Sercel sequence (fire) message will fire the Boom Box 3 encoder.
    - Source Control F3: Start Mode set to Pulse Falling Edge. SourceLink v.22+: Start Mode set to Start on External Pulse Falling Edge. The Sercel sequence (fire) message must be received. Then the BB3 remote start line must be toggled for the BB3 encoder to send the radio start code.
  - Using SourceLink v.22+. Encoder Parameters, Recording System Type – SourceLink. Start Mode: Start on Shot Message (Source Link).
- The Encoder then sends the Repeater Start Code Radio transmission to the repeater unit.
  - Source Control F3 program or SourceLink v.22+ program, Encoder Parameters, Auto Zero Time not selected. Timing of the time break is determined by Start Delay and Zero Time Adjust entries.
  - Source Control F3 program or SourceLink v.22+ program, Encoder Parameters, Auto Zero Time selected. GPS start time is in the Start Code Radio message and used to fire the shot. The time break timing is dependent on the Start Delay.
- The Encoder then issues the Time Break at the end of the Encoder Start Delay Time. The time break signal should occur while the Shot is being fired by the Decoder Unit.
- After the Shot is fired the Encoder receives the Shot Status Report message from the Decoder. The time when the message is received determines when the timing pulses will occur.
- The Encoder display will show 'PFS Rx !!' when the decoder post report is received.
- The Encoder generates reference pulses at 1, 1.5 and 2 seconds. These pulses should align with the timing pulses generated from the Decoder's Shot Status Report.

- The Encoder outputs the following timing pulses. These pulses are based on when the Shot Status Message is received.
  - Data reception pulse – Pulse that is generated if Shot Status Message is received. This pulse should be at 1 second plus one-way radio delay.
  - Confirmation Time Break – This pulse will be generated if current to CAP exceeded threshold. This pulse is generated 0.5 seconds after Data Reception Pulse.
  - Uphole Data – The analog uphole data is reproduced exactly 1 second after the Data Reception Pulse.
  - Source Control F3 program or SourceLink v.22+ program, Encoder Parameters, Similarity Delay entry is used to align the Data reception pulse with the one second Reference pulse.
- The Source Control F3 program or SourceLink v.22+ program can be used to view the following
  - The Shot Status message from the Decoder
  - GPS information before or after shot
  - View Resistance measurements before or after shot

BB3 UE3 TIMING DIAGRAM
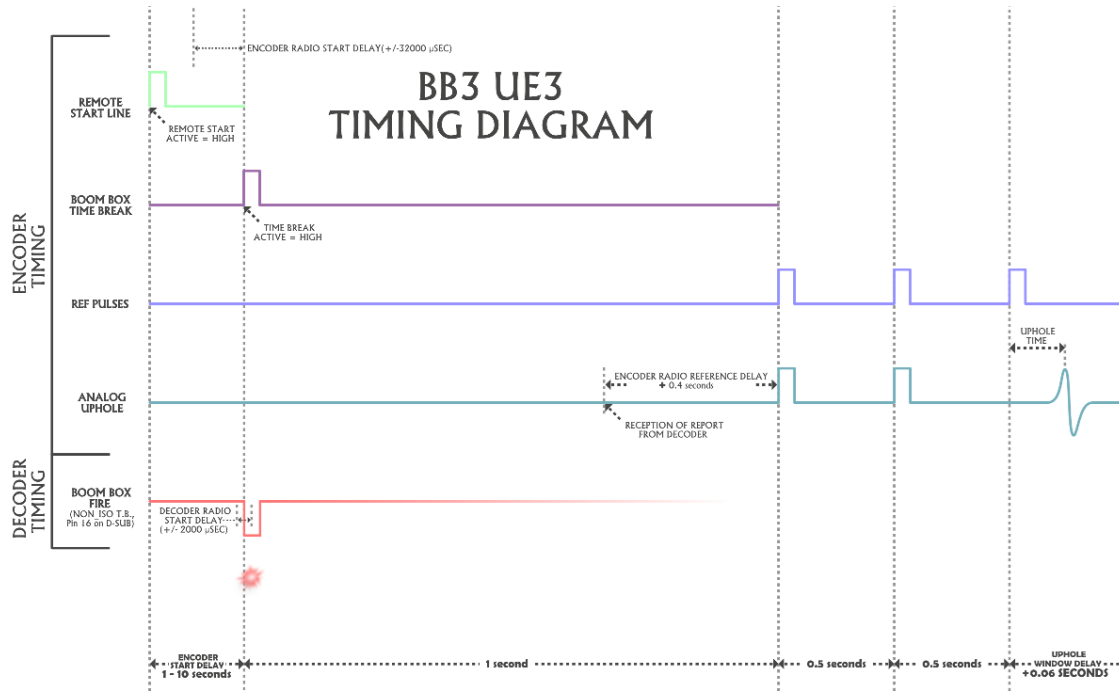
9.1.2 Start Code

Three parameters must match for a valid start code to be recognized.
- **Start Code** – (0-3) – All Boom Box units must be set to the same number
- **Crew number** – (0-250) – All Boom Box units must be set to the same number.
- **Units** – Decoder unit ID number must be included in the list of units of the selected sequence within Source Control F3 program.

9.2.1 BB3/UE3 Repeater Encoder Operation

The Boom Box 3 system can be used in an BB3/UE3 Repeater operation. This operation is used when the radio reception from the Encoder to the Decoder requires a radio repeater. This is typically a problem in very mountainous areas.

The BB3/UE3 repeater operation requires one Boom Box 3 in BB3/UE3 Encoder with Repeater ID set to any number above zero. Another Boom Box 3 decoder with firmware 15.23 or later to be the repeating decoder and a Boom Box 3 decoder with firmware 15.23 for the shooting decoder.

- The BB3/UE3 Repeater Encoder operation is set by making the BB3 Sequence, Repeater ID to any number besides 0. The Repeater ID must match a BB3 decoder unit ID that is in the radio network. The Source Control F3 program version 3.22 or version 3.21 can be used to setup the BB3 sequence table.
- The BB3/UE3 Encoder requires the Start Delay to be 1100 or more for repeater functionality to work.
- The BB3/UE3 Encoder Repeater operation can also be setup with SourceLink v.22 and newer within the Group entry Repeater ID.

9.2.2 Fire Sequence – BB3/UE3 Repeater Encoder – Following sequence occurs.

- The fire sequence can be started multiple ways.
    - Using Source Control F3. Encoder Parameters, Recording System type is any of the settings. Start Mode set to Start Message. Source Control F3 can fire the Boom Box 3 BB3/UE3 encoder.
    - Encoder Parameters, Recording System type is Sercel. Place the Sercel recording system in SGDS dynamite mode. Setup the BB3/UE3 sequence table with Source Control F3 v.3.22 or v.3.21. The Sercel recording system can now send the sequence RTI message that tells the Boom Box 3 encoder which sequence to use to make the Start Code.
        - Source Control F3: Start Mode set to Start Message. SourceLink v22 or newer: Start Mode set to Start on Shot Message (Source Link). The same Sercel sequence (fire) message will fire the Boom Box 3 encoder.
        - Source Control F3: Start Mode set to Pulse Falling Edge. SourceLink v.22+: Start Mode set to Start on External Pulse Falling Edge. The Sercel sequence (fire) message must be received. Then the BB3 remote start line must be toggled for the BB3 encoder to send the radio start code.
    - Using SourceLink v.22+. Encoder Parameters, Recording System Type – SourceLink. Start Mode: Start on Shot Message (Source Link).
- The Encoder then sends the Repeater Start Code Radio transmission to the repeater unit.
    - Source Control F3 program or SourceLink v.22+ program, Encoder Parameters, Auto Zero Time not selected. Timing of the time break is determined by Start Delay and Zero Time Adjust entries.
    - Source Control F3 program or SourceLink v.22+ program, Encoder Parameters, Auto Zero Time selected. GPS start time is in the Start Code Radio message and used to fire the shot. The time break timing is dependent on the Start Delay.
- The Encoder then issues the Time Break at the end of the Encoder Start Delay Time. The time break signal should occur while the Shot is being fired by the Decoder Unit.
- The Encoder generates reference pulses at 1, 1.5, 2, 2.5, 3, and 3.5 seconds. These pulses should align with the timing pulses generated from the Decoder's repeated Shot Status Report.

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- The Encoder will output the following timing pulses. These pulses are based on when the Shot Status Message is received from the repeater Decoder.
  - Data reception pulse – Pulse that is generated if Shot Status Message is received. This pulse should be at 2.5 seconds after time break plus one-way radio delay.
  - Confirmation Time Break – This pulse will be generated if current to CAP exceeded threshold. This pulse is generated 0.5 seconds after Data Reception Pulse.
  - Uphole Data – The analog uphole data is reproduced exactly 1 second after the Data Reception Pulse.
- The Source Control F3 program or SourceLink v.22+ program can be used to view the following
  - The Shot Status message from the Decoder
  - GPS information before or after shot
  - View Resistance measurements before or after shot

9.2.3   BB3/UE3 Repeater Operation

A Boom Box 3 in Decoder operating mode can be used as a BB3/UE3 Repeater.

The Boom Box 3 Decoder unit becomes a BB3/UE3 Repeater whenever a BB3/UE3 Repeater start code message is received with the correct conditions. The Decoder Crew ID must match the BB3/UE3 Repeater start code message Crew ID and the Decoder Unit ID must match the BB3/UE3 Repeater start code message Repeater ID.

If the same Unit ID is shared among more than one box, the BB3/UE3 Repeater operation will not operate properly.

9.2.4 Fire Sequence – BB3/UE3 Repeater – Following sequence occurs.

- The Boom Box 3 Decoder unit is powered on and connected to a radio. No switches or buttons need to be pressed to be in repeater mode.
- When a valid BB3/UE3 Repeater Start Code is received from the BB3\UE3 Encoder unit, the Repeater generates the Decoder Start Code from the BB3/UE3 Repeater Start Code.
- The BB3/UE3 Repeater Decoder receives the Shot Status Report message from the shooting pack Decoder.
- The received Shot Status Report is re-transmitted over the radio to the BB3\UE3 Encoder.

BB3 UE3 REPEATER
TIMING DIAGRAM
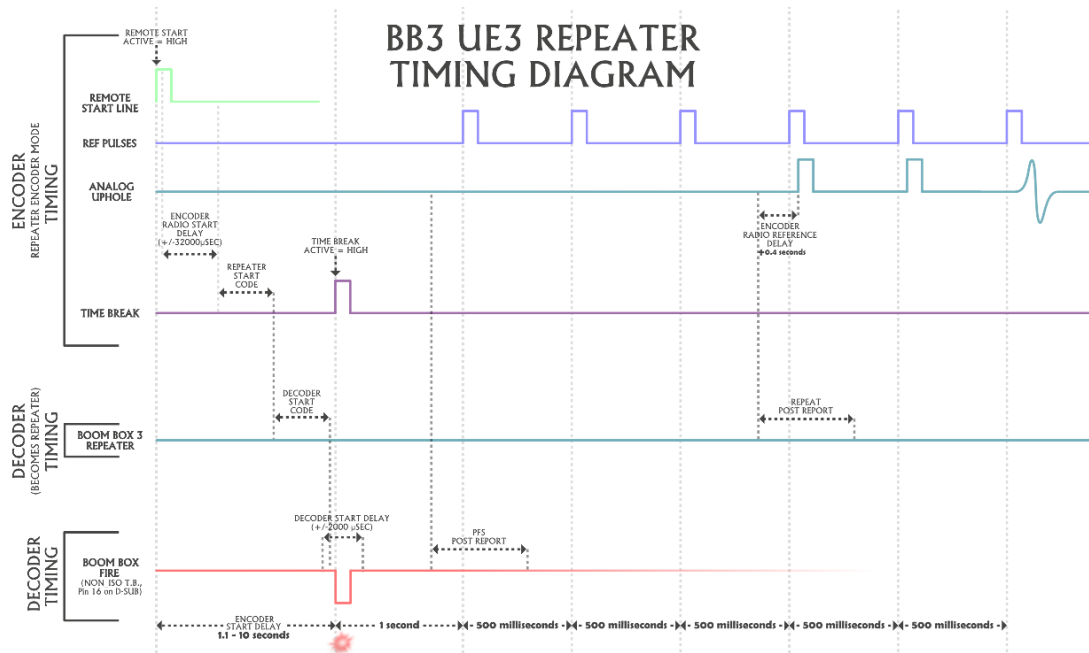
10. Boom Box 3 Weight Drop

The Boom Box 3 Unit can be used in weight drop mode like the RTM3 Unit. The connections with the Boom Box 3 have to be done through the 37 DSUB connector.

10.1 Boom Box 3 in RTM Mode Systems

10.2.1 Basic Connections

The Basic RTM mode features the following:

Display – shows basic operation and setup of the system. The display can be used to show status of the radio telemetry plus GPS and hardware interface.

10 pin Female connector – Ethernet Port. Connect the 10 pin to RJ45 cable to this connector and plug the RJ45 into any windows computer. SourceLink software can be used to setup and display the operational parameters.

10 pin Male connector – Power/ Radio/GPS. This connector is used to connect the DC power (10 to 30 volts DC input), the Radio Interface (5 pin connector), and the GPS connector (4 pin connector).

37 pin connector – This connector is used primarily to connect the Boom Box 3 encoder to the recording system. This connector is also used to connect the Boom Box 3 in RTM decoder mode to the hammer switch.

10.2.2 Autonomous Configuration

10.2.2.1 BOOM BOX 3 in RTM mode Autonomous Equipment

The Basic BOOM BOX 3 (in RTM decoder mode) Autonomous system includes the following:
- BOOM BOX 3 unit
- RTM 3 Decoder Cable set
- GPS module

10.2.3 Managed Configuration

Two BOOM BOX 3 systems are required. One BOOM BOX 3 system must be set up as an RTM Encoder and one BOOM BOX 3 must be setup as a RTM Decoder

10.2.3.1 Block Diagram
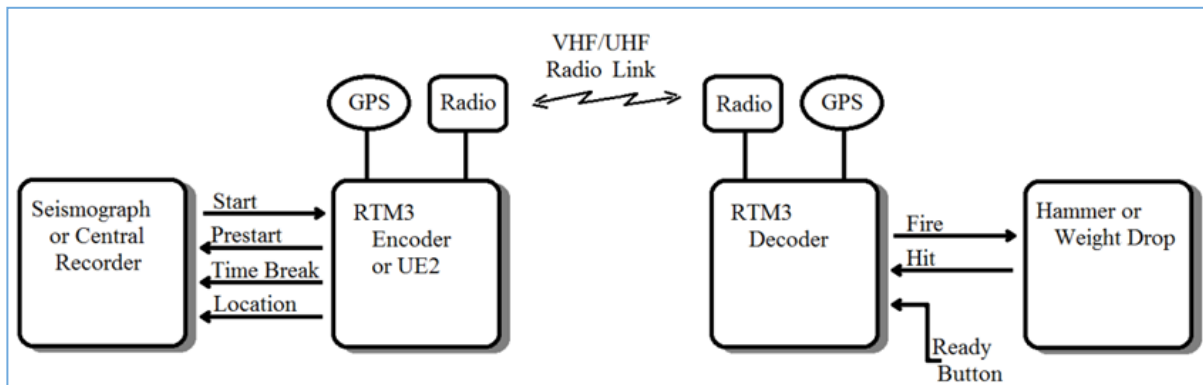
10.2.3.2 BOOM BOX 3 in RTM Encoder mode Encoder Equipment

The Basic BOOM BOX 3 (in RTM encoder mode) Encoder system includes the following:

- BOOM BOX 3 unit
- BOOM BOX 3 Encoder Cable set
- GPS module
- Radio and Antenna

10.2.3.3 BOOM BOX 3 in RTM Decoder mode Decoder Equipment

The Basic BOOM BOX 3 (in RTM decoder mode) Decoder system includes the following:

- BOOM BOX 3 unit
- BOOM BOX 3 RTM Decoder Cable set
- GPS module
- Radio and Antenna

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10.3 BOOM BOX 3 in RTM decoder Display Description
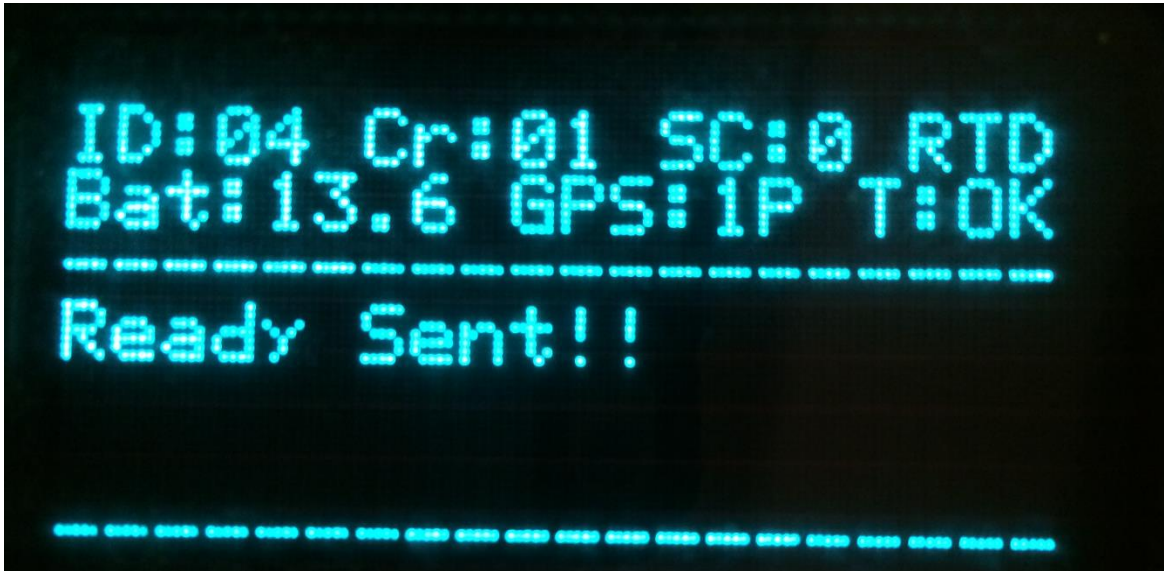
The BOOM BOX 3 has a graphical display. The display is used to show the setup of the box at power on,. The display shows the following messages:

- **Unit ID #**: Unit ID of the RTM 3, SourceLink references this number.
- **Crew Code #:** The Crew # of the Encoder must match the Crew Code of the Decoder
- **Start Code #**: The Start Code # of the Encoder must match the Start Code of the Decoder
- **Operating mode**:
    - o "ENC"..............BB3 Encoder Mode
    - o "DEC"..............BB3 Decoder Mode
    - o "STN"..............BB3 Autonomous Mode
    - o "AGD".............Marine Air Gun Decoder Mode
    - o "MON" ....Monitor Radio for Start Codes
    - o **"RTE" ....RTM Encoder Mode**
    - o **"RTD".............RTM Decoder Mode**
- **Battery**: Battery voltage indicator
- **GPS**: Shows the following:
    - o Quality of the GPS lock: '1' - GPS Fix; '2' - Differential GPS; 'P' - PPS available
    - o Time Synchronization: "T:OK" - Time Synchronized; "T:NO" - No time sync; (BB3 only: "Lock" - GPS position is locked for the next shot)

10.4 BOOM BOX 3 in RTM encoder mode Encoder Description
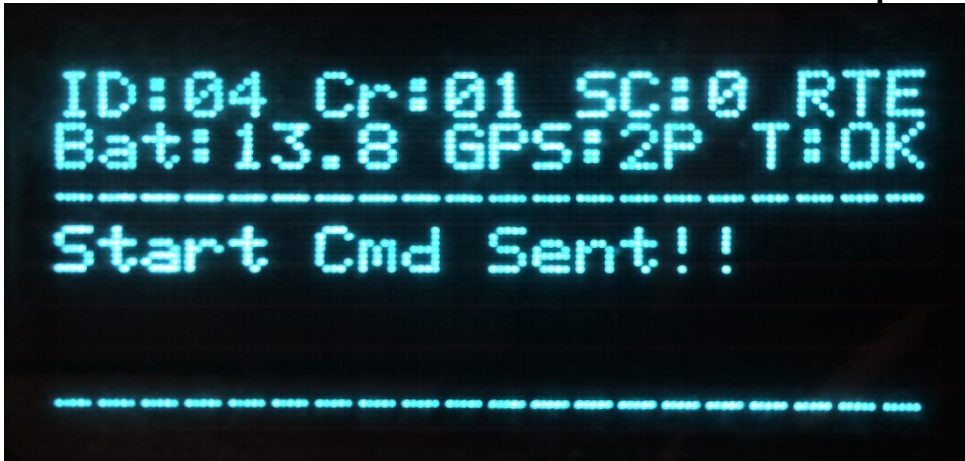
The BOOM BOX 3 (in RTM encoder mode, RTE) Encoder unit acts as an interface to the recorder or central system and the radio. The Encoder can receive and convey the decoder ready message, start the decoder via radio by sending a start command, receive and process the hit detection and QC messages from RTM 3 Decoder.

10.5 BOOM BOX 3 in RTM decoder mode Decoder Description
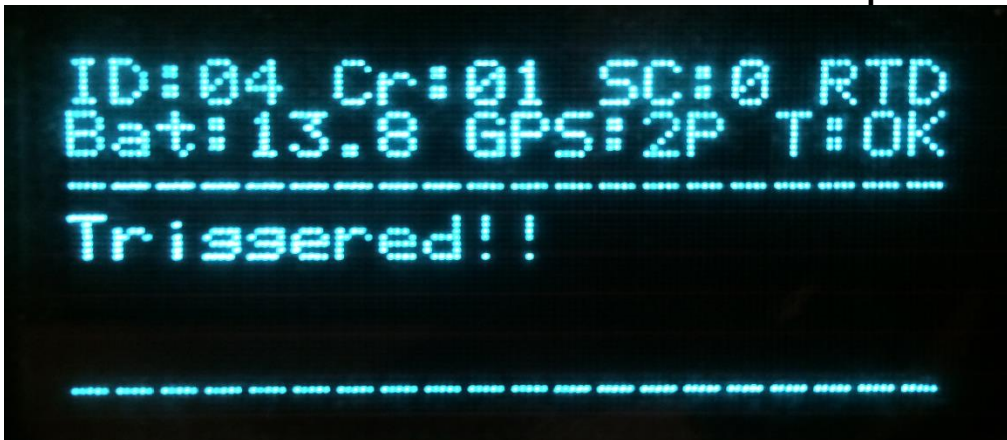
The BOOM BOX 3 (in RTM decoder mode, RTD) Decoder unit typically acts as the interface to the energy source (typically impulsive source) and the radio. The Decoder can convey to the Encoder about Ready status with GPS position, Start the energy source based on a start command from encoder and/or detect the hit/event time and convey the hit and QC message to Encoder.

10.6 BOOM BOX 3 in RTM decoder mode Operation

10.6.1 Autonomous Operation

10.6.1.1 Autonomous Timing
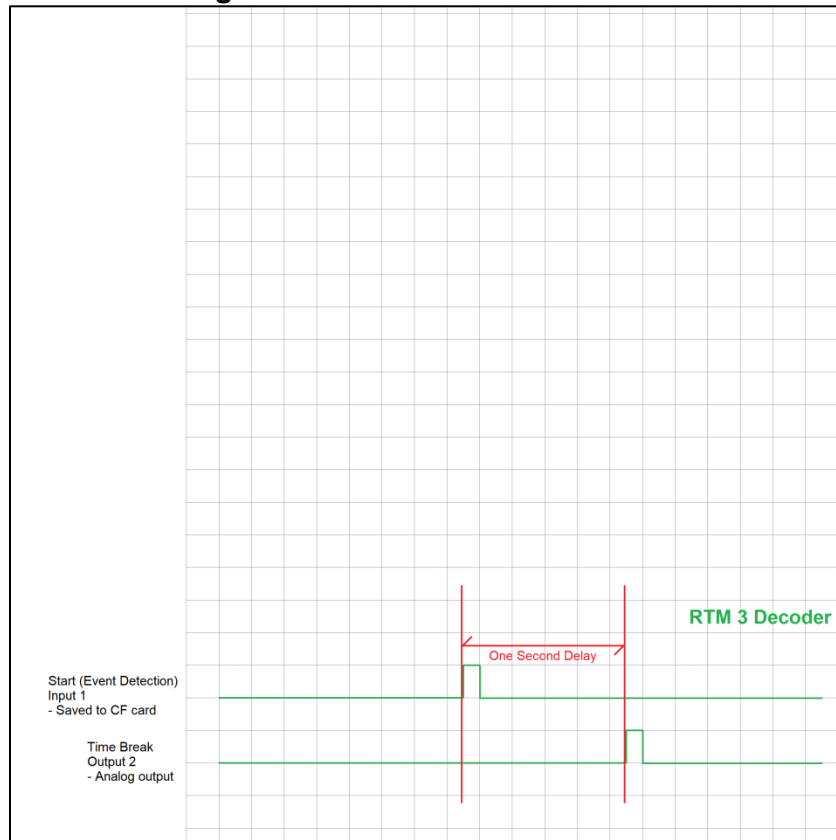
10.6.1.2 Autonomous Operation

1) The Decoder waits for a switch closure, or a voltage level change, on the "START" hardware logic line. This line is normally connected to a "hammer switch", mounted on the sledgehammer handle or the baseplate of the AWG/EWG. The exact time of the Hit is calculated.
2) The Decoder saves the Hit time, the last GPS position received before the Hit occurred, and three channels of analog input data starting at the hit time, plus the PFS data, to the internal CF memory card.
3) This data is later downloaded to SEG-Y files from the BOOM BOX 3 internal memory.
4) Exactly one second after the hit event is detected, a pulse is sent on the Time Break line.

10.6.2 Source-Driven Operation

10.6.2.1   Source-Driven Timing
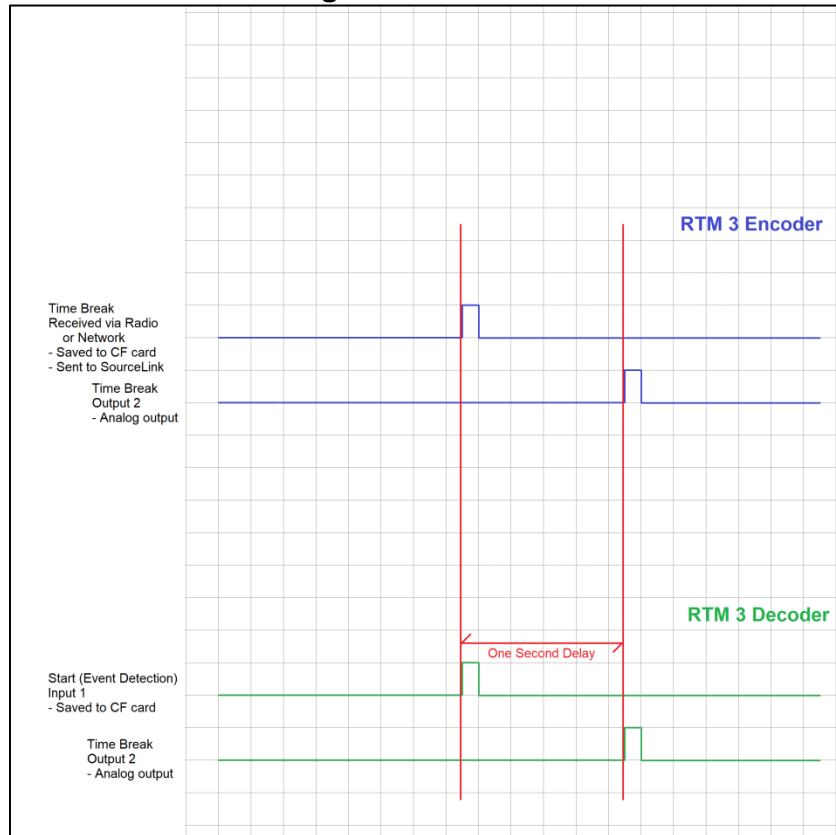
10.6.2.2 Source-Drive Operation

1) The Decoder waits for a switch closure, or a voltage level change, on the "START" hardware logic line. This line is normally connected to a hammer switch, mounted on the sledgehammer handle or the baseplate of the AWG/EWG. The exact time of the Hit is calculated.
2) The Decoder saves the Hit time, the last GPS position received before the Hit occurred, and three channels of analog input data starting at the hit time, plus the PFS data, to the internal CF memory card.
3) The Decoder sends a message via radio to the BOOM BOX 3 (in RTM encoder mode) Encoder. This message includes the Hit time, GPS position, and other Quality Control information.
4) The Encoder outputs the digital Hit Message to the Ethernet port.
5) Both the Encoder and Decoder output a Time Break signal on the "Time Break" hardware lines, exactly 1 second after the Event time determined by the Decoder.

10.6.3 Decoder-Driven Operation

10.6.3.1   Decoder-Driven Timing
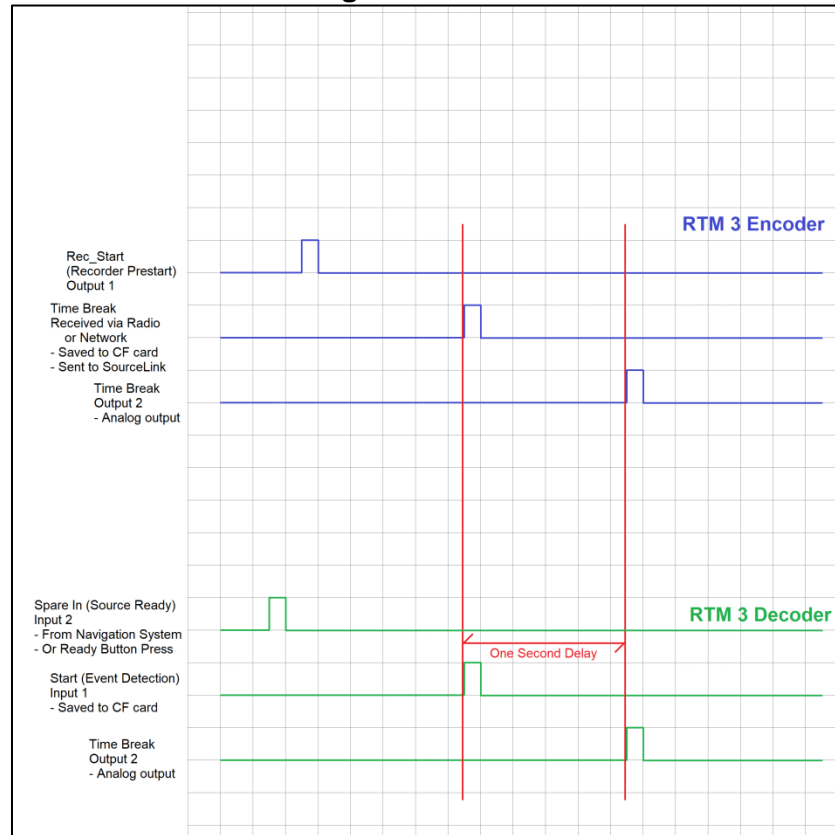
10.6.3.2   Decoder-Driven Operation

1) BOOM BOX 3 (in RTM decoder mode) Decoder Receives a "Ready" command. This is initiated by a hardware command, e.g., a voltage change from a navigation system or a Ready Button switch closure, on the "Spare In" line.
2) The Decoder sends a message via radio to the BOOM BOX 3 (in RTM encoder mode) Encoder. This message includes the Hit time, GPS position, and other Quality Control information.
3) When the Ready message is received by the BOOM BOX 3 (in RTM encoder mode) Encoder, the Encoder outputs a logic level on the "RecStart" logic line. It also output an Ethernet Ready Message.
4) After the Decoder unit has received the hardware start command, it waits for a pre-determined local start delay and outputs fire signal on the "RecStart" line.
5) The Decoder then waits for a hardware event on the "START" hardware logic line. The exact time of this event is calculated from the GPS.
6) The Decoder saves the Hit time, the last GPS position received before the Hit occurred, and three channels of analog input data starting at the hit time, plus the PFS data, to the internal CF memory card.
7) The Decoder sends a Hit message via radio to the Encoder. This message includes the Hit time, GPS position, and other Quality Control information.
8) The Encoder outputs the digital Hit Message in the Ethernet port.
9) Both the Encoder and Decoder output a Time Break signal on the "Time Break" hardware lines, exactly 1 second after the Event time determined by the Decoder.

10.7 BOOM BOX 3 RTM Encoder Cable - 37 pin

10.8 BOOM BOX 3 RTM Decoder Cable - 37 pin
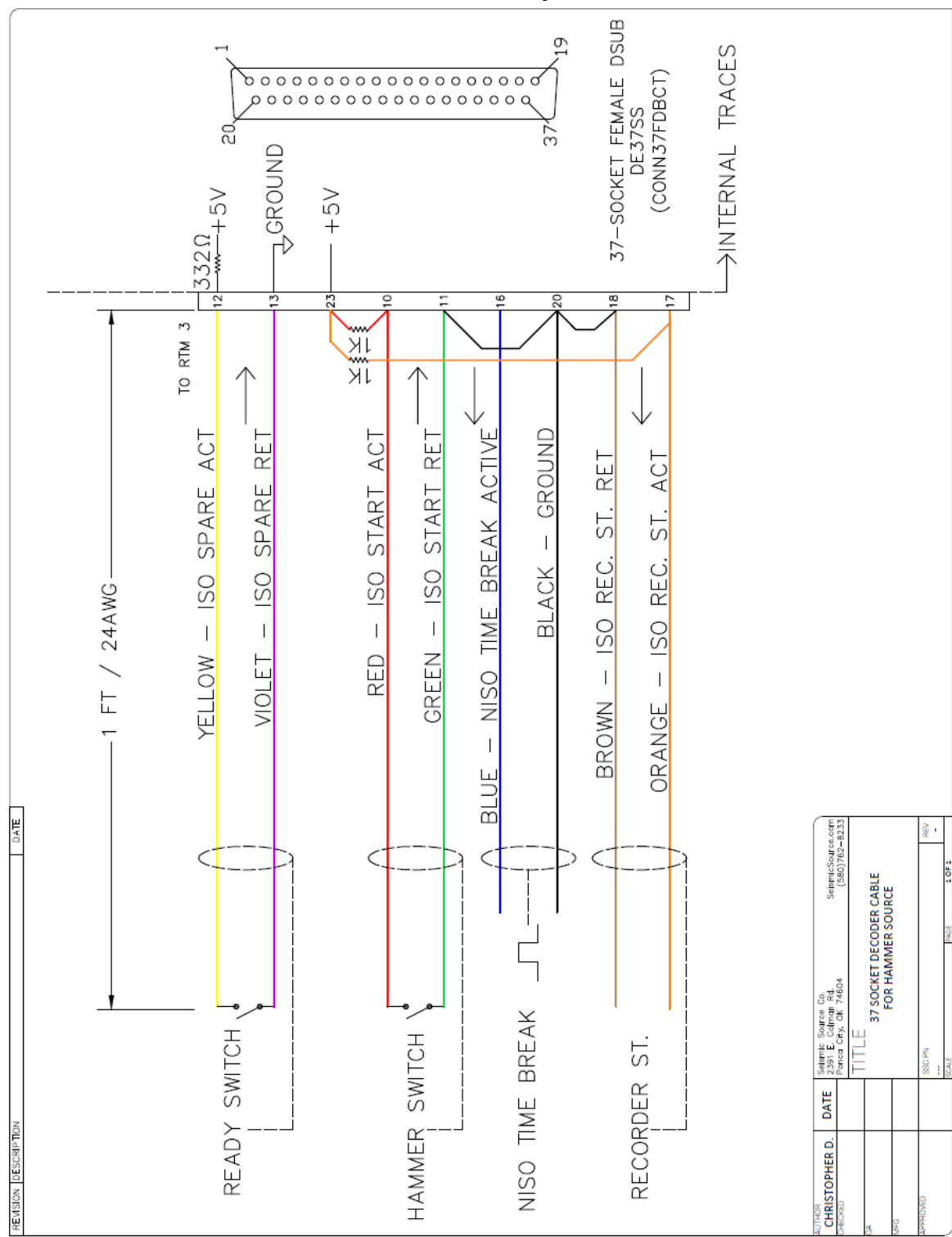
11. Boom Box 3 Parameters

The Boom Box 3 Unit uses internally stored parameters to determine the operation of the unit. All of the parameters are stored in nonvolatile memory and only need to be changed when an operational parameter change. The internal parameters can only be modified using an external computer. Two different programs and methods are available for changing the operational parameters.

- Cell Phone/Tablet Wi-Fi interface –Refer Wi-Fi Interface section of the manual
- Windows Computer interface – Refer Computer Interface section of the manual

11.1.1 Boom Box 3 Parameters

- **Unit ID (1-32)** – Used to set Box ID – ID # is used to identify records.
    - Requested Unit ID in Fire Command from Encoder must match Decoder Unit ID to Fire shot.
    - Other Brand Compatible Mode – When the other brand Encoder has Box ID number 15 in the start code that is sent to the Boom Box 3, the Boom Box 3 decoder will accept any decoder box ID.
- **Crew ID (0-250)** – Used to set Crew ID.
    - Requested Crew ID in Fire Command from Encoder must match Decoder Unit ID to Fire shot.
    - Other Brand Compatible Mode – Crew ID 15 in Decoder will allow any Crew ID in the Fire Command.
- **Start Code (0-3)** – Used to set Start Code.
    - Requested Start Code in Fire Command from Encoder must match Decoder Unit Start Code to Fire shot.
- **Password (8 digit)** – Allows Software program to hide the Advanced entries from user.
    - "Boom Box3" – Always allows the user to enter the Advanced entries. Case sensitive password.
- **Decoder Start Delay** – (0 – 4,000 microseconds) used by Decoder Boom Box 3..
    - Allow individual Decoders to be delayed.
    - Normally set to zero.
- **Uphole Blank Time** – 0 – 99 msec, in1 msec increments.
    - Sets the Uphole data to zero for the selected amount of time.
    - Typically set = 0 msec.
- **Uphole Window Delay** – 0 – 127 msec.
    - Delays when the 60 msec Uphole window is recorded. Entry allows recording data up to 127+60=187 msec.
    - Entry of 255 allows automatic Uphole Window Delay. The first pick is placed in the middle of the 60 msec window sent back to the Encoder.
    - Typically set = 0 msec.
- **Operating Mode**
    - Standard Encoder   (ENC)
    - A3 Repeater Encoder (ERT)
    - Standard Decoder   (DEC)
    - Autonomous Decoder (AUT)
    - Air Gun Decoder   (AGD)
    - Monitor   (MON)

- - BB3/UE3 Encoder   (EF3)
- **Repeater ID** – (1 – 64) used with A3 and F3 Repeater Encoder.
- **Auto Shut Down** – (0-255 minutes)
    - Decoder unit will automatically power down after this time to conserve battery power.
    - Any switch movement will reset the time to shut down.
    - 0 is always ON.
    - Normally set to 10 minutes.
- **First Break Threshold**
    - 10% of peak Threshold (Data Peak/10 with Backup)
    - 20% of peak Threshold (Data Peak/5 with Backup)

- **Interface Function:**
    - Recorder Start Active.
        - High
            - Low to high transition on Non-isolated Recorder Start.
            - Open on Isolated Recorder Start
        - Low
            - High to low transition on Non-isolated Recorder Start.
            - Closed on Isolated Recorder Start
    - Time Break Active.
        - High
            - Low to high transition at time 0 when shot is fired on Non-isolated Time Break.
            - Open on Isolated Time Break.
        - Low
            - High to low transition at time 0 when shot is fired on Non-isolated Time Break.
            - Closed on Isolated Time Break.
        - Decoder always-active LOW.
    - Remote Start Active – signal to Boom Box 3 from the Recorder, which starts the Fire Command sequence.
        - High – low to high starts fire command sequence.
        - Low – high to low starts fire command sequence.
    - Speaker Polarity – selects speaker polarity for the radio reception. Typically, the Boom Box 3 will receive data better on one polarity than the other. A distance test should be performed to determine optimum performance.
    - Microphone Polarity – Sometimes it is better to switch microphone polarity than speaker polarity.
        - Normally set to Normal.
- **Geophone Limit Min** (0 – 870) ohm. Sets minimum limit in ohms for the uphole geophone resistance measurement. Determines if the Boom Box 3 Decoder test the uphole geophone as good or bad. Flashes Test LED 4 times green for good or flashes 4 times red for bad.
    - Typical = 50 ohm – depends on uphole geophone.
- **Geophone Limit Max** (0 – 870) ohm. Sets maximum limit in ohms for the uphole geophone resistance measurement. Determines if the Boom Box 3 Decoder test the uphole geophone as good or bad. Flashes Test LED 4 times green for good or flashes 4 times red for bad.

- o Typical = 500 ohm – depends on uphole geophone.
- **Cap Limit Min** (0 – 100) ohm. Sets minimum limit in ohms for the blasting cap resistance measurement. Determines if the Boom Box 3 Decoder test the blasting cap as good or bad. Flashes Test LED 2 times green in good or flashes 2 times red for bad.
  - o Typical = 2 ohm
- **Cap Limit Max** (0 – 100) ohm. Sets maximum limit in ohms for the blasting cap resistance measurement. Determines if the Boom Box 3 Decoder test the blasting cap as good or bad. Flashes Test LED 2 times green for good or flashes 2 times red for bad.
  - o Typical = 30 ohm

12. Hardware Installation
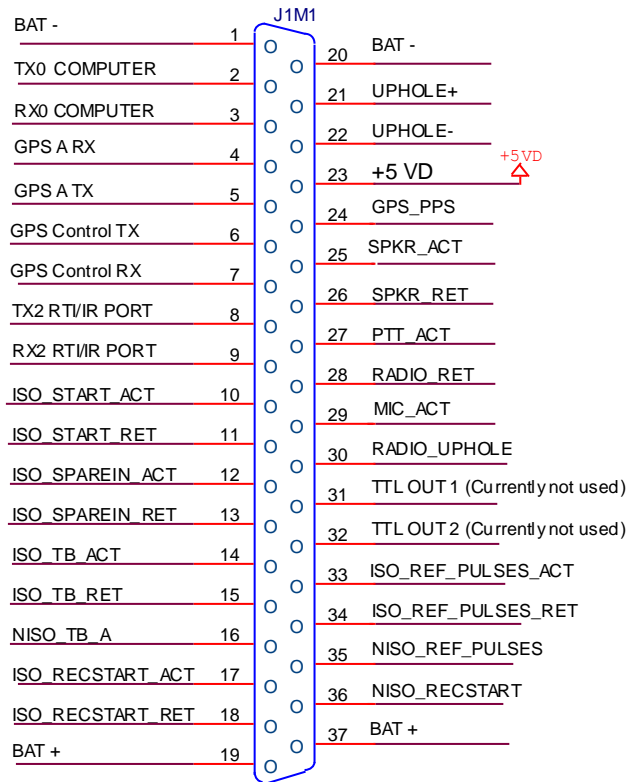
CONEC 4 STF37 PCT05S20 X

BOOM BOX 3 37-PIN CONNECTOR

PIN	FUNCTION
1	**BAT -** - Battery Ground.
2	**TX0 COMPUTER –** RS-232 serial output. Data from Boom Box 3 to Computer. Connect to COM port of computer running the BBview program. 19200 BAUD.
3	**RX0 COMPUTER** – RS-232 serial input. Data to Boom Box 3 from Computer. Connect to COM port of computer running the BBview program. 19200 BAUD.
4	**See GPS connections at end of this chapter**.
8	**TX2 RTI/IR PORT** – RS-232 output. Data from Boom Box 3 to Recording System. Recording system selected by software menu.
9	**RX2 RTI/IR PORT** – RS-232 input. Data to Boom Box 3 from Recording System. Recording system selected by software menu.
10	**ISO_START_ACT** – Isolated input. Isolated Start Active. Recorder remotely starts the Boom Box 3 in Encoder mode. Isolated with ACPL-M61L opto coupler. Polarity selected by software menu.
11	**ISO_START_RET** - Isolated Start Return.
12	**ISO_SPARE_IN_ACT** – Isolated input. Isolated Spare IN Active. Used in Weight Drop Mode to start the Weight Drop process. Connected to the start switch. Isolated with ACPL-M61L opto coupler. Polarity selected by software menu.

13	**ISO_SPARE_IN_RET** – Isolated Spare IN Return.
14	**ISO_TB_ACT** – Isolated output. Isolated Time Break Active. Used in Encoder and Decoder modes. Isolated with 4N32 opto coupler. Polarity selected by software menu in Encoder Mode. Polarity is always active low in Decoder mode.
15	**ISO_TB_RET** – Isolated Time Break Return.
16	**NISO_TB_A** – Non-isolated Time Break. Used in Encoder and Decoder modes. Polarity selected by software menu in Encoder Mode. Polarity is always active low in Decoder mode. +3.3 volts to 0 volts.
17	**ISO_RECSTART_ACT** – Isolated output. Isolated Recorder Start Active. Pre-Start pulse in Encoder, Master, Repeater, and Slave modes. Isolated with 4N32 opto coupler. Polarity selected by software menu.
18	**ISO_RECSTART_RET** – Isolated Recorder Start Return.
19	**BAT +** - Not connected on Version 2 cards - Jumper J12 on board if needed.
20	**BAT -** - Battery Ground.
21	**UPHOLE +** - Input. Uphole Geophone connection. –1.566 volts to +1.526 volts.
22	**UPHOLE -** - Input. Uphole Geophone connection.
23	**+5VD** – Output. +5 volts digital.
25	**SPKR_ACT** – Input. Speaker Active to Boom Box 3 from external radio speaker output.
26	**SPKR_RET** – Speaker return. Speaker return from external radio speaker return.
27	**PTT_ACT** – Output. Push to Talk Active from Boom Box 3 to external radio.
28	**RADIO_RET** – Radio return. Radio return from external radio ground
29	**MIC_ACT** – Output. Microphone Active from Boom Box 3 to external radio microphone input.
30	**RADIO_UPHOLE** – AUX 1 output. Encoder, Master, and Repeater produce the Uphole signal after the decoder fires the shot and returns the post report. -1.65 volts to +1.65 volts.
31	**TTL_OUT 1** – Not currently used.
32	**TTL_OUT 2** - Not currently used.
33	**ISO_REF_PULSES_ACT** – AUX 2 isolated output. Reference pulses Active. Occurs in Encoder, Master, and Repeater modes after the Fire sequence. Uses a 4N32 opto-coupler.
34	**ISO_REF-PULSES_RET** – Reference pulses Return.
35	**NISO_REF_PULSES** – AUX 2 non-isolated output. Reference pulses. Occurs in Encoder, Master, and Repeater modes after the Fire sequence. 0 to +3.3 volts.
36	**NISO_RECSTART** – Non-isolated output. Recorder Start Active. Pre-Start pulse in Encoder, Master, Repeater, and Slave modes. Polarity selected by software menu. +3.3 volts to 0 volts.
37	**Not connected on Version 1.03 boards -BAT +** - - Battery positive – DC power input on Boom Box 3 (10-37 volts DC). Jumper J11 on board if needed.

GPS Connections:
External GPS with external corrections.

4	**GPS A RX** – Not used.

5	**GPS A TX** – RS-232 serial input, 19200 BAUD. GPS data from external GPS Receiver to Boom Box 3. GGA, RMC strings required.
6	**GPS Control TX –** Not used.
7	**GPS Control RX –** Not used.
24	**GPS_PPS** – Input. PPS pulse (Active High) from external GPS receiver.

BOOM BOX 3 10-PIN CONNECTOR

PIN	FUNCTION
A	**GPS_PPS-**Input. PPS pulse (Active High) from external GPS receiver.
B	**BAT** + - - Battery positive – DC power input on Boom Box 3 (10-37 volts DC).
C	**MIC_ACT** – Output. Microphone Active from Boom Box 3 to external radio microphone input.
D	**UPHOLE -** - Input. Uphole Geophone connection.
E	**GPS A TX** – RS-232 serial input, 19200 BAUD. GPS data from external GPS Receiver to Boom Box 3.
F	**UPHOLE** + - Input. Uphole Geophone connection. –1.566 volts to +1.526 volts.
G	**SPKR_ACT** – Input. Speaker Active to Boom Box 3 from external radio speaker output.
H	**BAT -** - Battery Ground.
J	**PTT_ACT** – Output. Push to Talk Active from Boom Box 3 to external radio.
K	**SPKR_RET** – Speaker return. Speaker return from external radio speaker return.

13. Wi-Fi Web Interface

The Boom Box 3 Wi-Fi Interface can be used to
- Load operating parameters
- View uphole data
- View current status of resistance test
- Load and store all uphole information from Boom Box 3

13.1. Software Installation and Setup

Boom Box3 Wi-Fi interface does not need any installation. The built in Wi-Fi interface of Boom Box3 unit can communicate with Web Browsers (Internet Explorer, Safari, Google Chrome, etc.) in most common Cell phones, Tablets and Computers with Wi-Fi connectivity.

13.1.1 Connecting to a Unit through Web Browser

- Open the Wireless network selection menu in your Cell Phone/Tablet/Computer.
- Connect to the Network with the SSID - "BoomBox6xxx".
- Open your web browser (Internet Explorer, Safari, Google Chrome, etc.)
- Type in 192.168.1.1 into your web browser and open the page.
- It is recommended to add this 192.168.1.1 page to your favorites and create an icon.
- Boom box Wi-Fi interface software will be ready to use now.
- For changing any advance parameters, a password may be required. The factory set password is "BoomBox3". Password is case sensitive.

13.2. PFS Information Display

After each shot Boom Box3 automatically sends the PFS Information through Wi-Fi interface which can be analyzed in a web browser and stored for future reference.
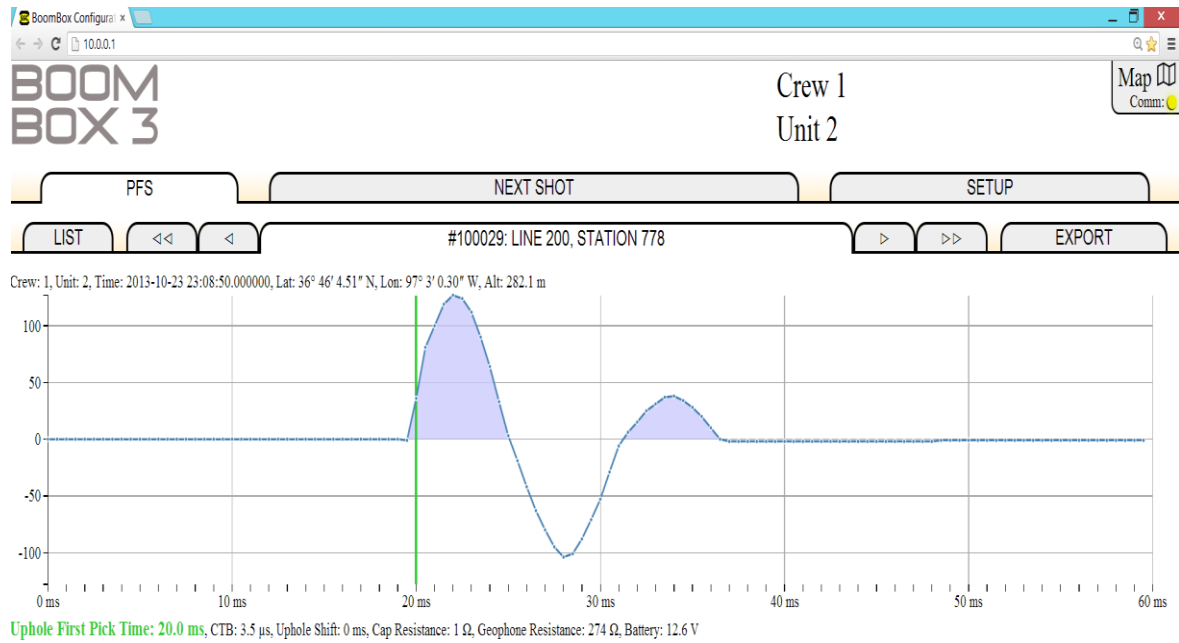
13.3. Parameter setup

Boom Box3 parameters can be received and sent through the Wi-Fi interface. To set advanced parameters, the software requests a password. The factory set password is "BoomBox3".

Below is an example of the A3 Repeater Encoder mode settings. When wanting to change which Boom Box 3 or Boom Box decoder to be the A3 repeater, just change the Repeater ID in the below Wi-Fi menu and send to the A3 Repeater Encoder.

Operating mode:	A3 Repeater Encoder ∨
Repeater ID:	1 ▲▼
Encoder start delay:	1500 ▲▼ ms
Encoder zero time adjust:	1705 ▲▼ µs
Encoder radio reference delay:	4250 ▲▼ µs
Recorder type:	Sercel serial ∨
Encoder interface:	Microphone normal polarity ∨
	Speaker normal polarity ∨
	Remote Fire active low ∨
	Time Break active high ∨
	Recorder Start active high ∨
	Aux In active low ∨
	Auto Zero Time disabled ∨

For a detailed description of parameters please refer to Boom Box Parameters section of the manual.

13.4. Autonomous Mode Setup

Autonomous mode operation allows shooters to fire shots independently based on dedicated GPS time slots. This mode involves more shooter interaction with user interface software than other conventional modes.

First the Boom Box3 parameters can be set, with the standard parameters and the mode selected to "Autonomous Decoder".

PARAMS	ID	FLEET	IMPORT

Operating mode:	Autonomous Decoder ▾
Decoder start delay:	0 ▲▼ µs
Uphole blank time delay:	2 ▲▼ ms
Uphole window delay:	0 ▲▼ ms
Cap mode:	Standard BoomBox ▾
Auto shutdown:	0 ▲▼ minutes
First break threshold:	10% of peak ▾
Decoder interface:	Microphone normal polarity ▾
	Speaker normal polarity ▾
	Remote Fire active low ▾
	Time Break active high ▾
	Recorder Start active high ▾
	Aux In active low ▾
Geophone limits:	200 ▲▼ - 300 ▲▼ Ω
Cap limits:	0 ▲▼ - 20 ▲▼ Ω

13.4.1 Fleet Units Assignment

Once the Operation mode is set to Autonomous Decoder, the Units in the fleet and the record length (typically listen time) needs to be setup. This allows the Boom Box3 unit to calculate GPS time slots for firing the shots.
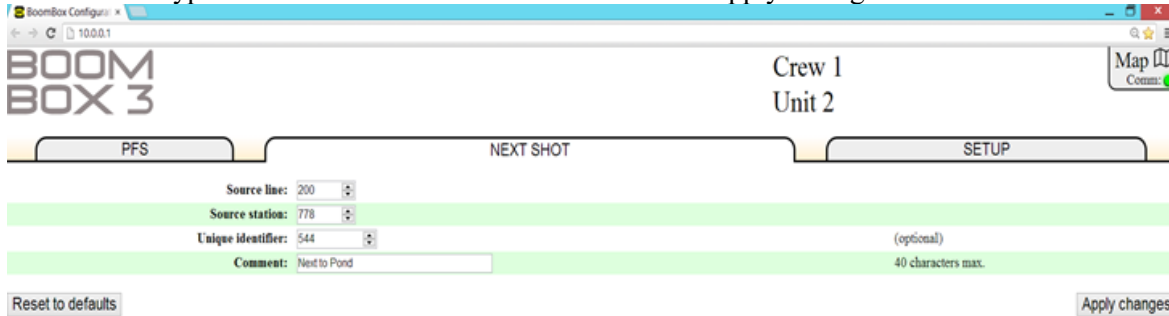
13.4.2 Next Shot Assignment

Before each shot the Shooter needs to assign Line/Station associated with the shot. This can be done manually or automatically using the Map feature.

Web Interface Manual:
The user can type in the Next Shot Line/Station and Click "Apply Changes".

Web Interface Automatic:
If a Shot point file is imported into Web interface, then the nearest flag will be displayed in the top of the screen with the distance to the flag. The nearest flag will be automatically filled in the Line/Station text boxes. The user can just verify the numbers and click "Apply" , and no need to type in the Line/Station.

The user has the option to override this selection if needed, by typing in a Line/Station value manually and click Apply.

Boom Box3 Internal:
Alternatively, the Source Points can also be loaded into Boom Box3 hardware memory directly using SourceLink Software. In which case the BB3 display, will show the nearest flag and assign near flag before shot. This operation is explained in detail in the Source Link section. The user can also use the Web interface to modify the source point selected by BB3.

Source Link Harvest Automatic:
Alternatively, SourceLink software can also pick near shot points after the shots are taken, based on the Shot GPS location. This is typically done during download process.

13.4.3 Importing SP1 file into web interface

The SP1 files can be loaded into web interface which allows finding near flag automatically. Open Setup->Import and either locate the SP1 file or paste the contents into the text box field and apply changes.

It is recommended to follow the SEG P1 standard as described by SEG.
Please download official SEG P1 documentation from SEG website for further reference:

Direct Download Link as of 8/1/2014:
http://www.seg.org/documents/10161/77915/seg_p1_p2_p3.pdf

Though there are no limits to the number of points that can be loaded. We recommend only loading a few hundred source points that are relevant to this shooter.

13.5 Wi-Fi Remote GPS position lock
In some terrains where it is difficult to carry the Shooting pack or the Shooting pack mounted on a vehicle near the shot hole, the Boom Box3 Wi-Fi interface has an option to lock GPS position in the Tablet/Mobile device and then transfer it to the Boom Box3 unit.
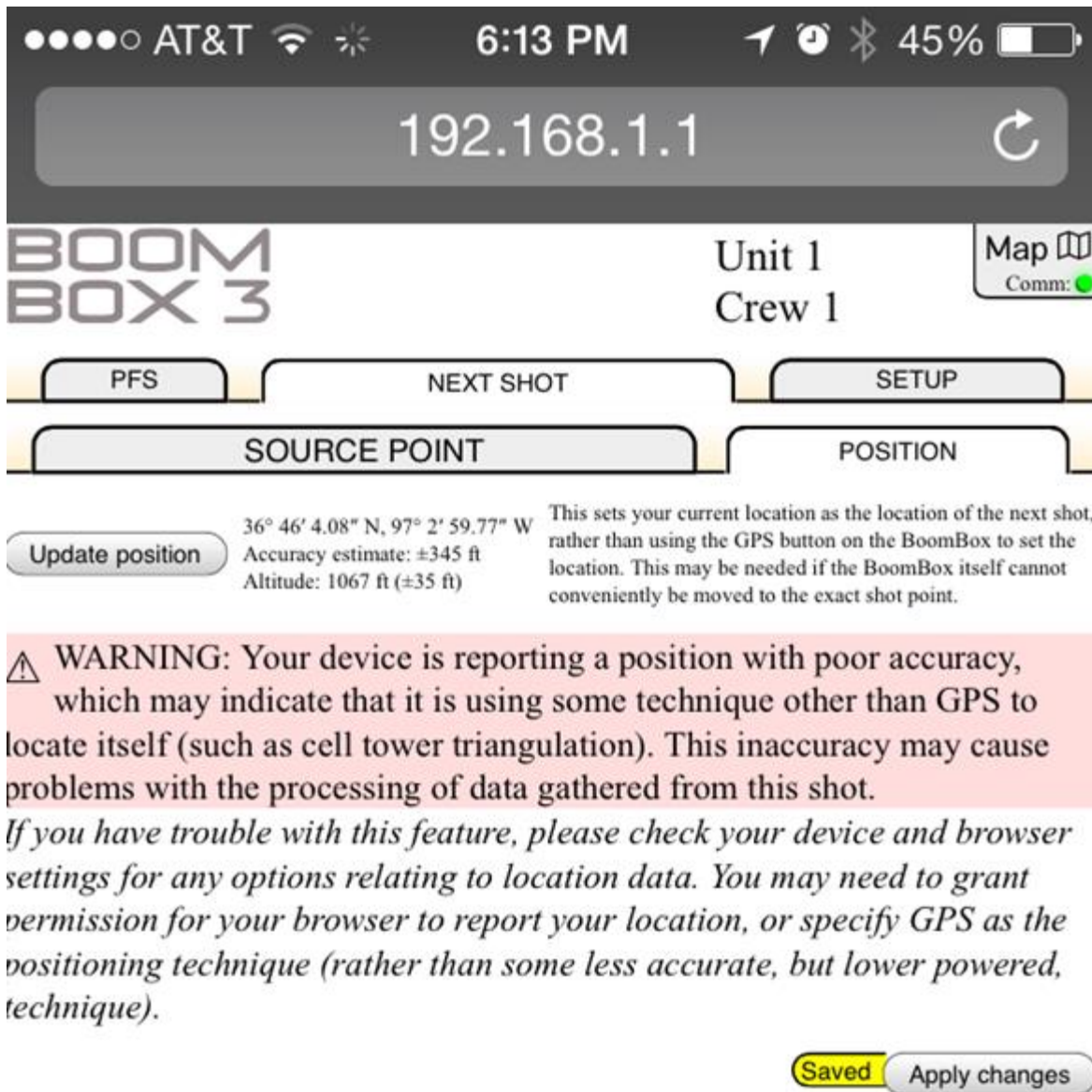
To perform this operation, go to Next Shot->Position tab and click "Update position". This position will be stored in the tablet. The accuracy of the GPS position is also displayed. After the storing process, the user can go back to the Boom Box3 vicinity and assign this GPS position to the shot by clicking the Apply button.

13.6 PFS recollection through web interface

If the user wants to pull the last N shots PFS, it can be easily done by going to the PFS->Lists and clicking "Reload from Boom Box". This is a very useful feature, especially in Autonomous operation, where user can go to the Boom Box3 at the end of the day and pull the shot information, this information (Line, Station, GPS, time, position) can be exported to a CSV file. However, it should be noted that this method of collecting shot information should only be used in order to do a quick quality control check of your data, and not as a method for downloading nodal system data.

13.7 Exporting Shot information CSV file

The Web interface can export all the information in the PFS like Line, Station, GPS time of shot, GPS position of shot, Uphole, etc. into a Comma Separated Value file. To export the logs go to Export tab, click generate data and then click Download as .CSV file.
The file will be downloaded to default browser file download location.

14. Computer Software

Boom Box3 can be directly interfaced by connecting to a computer through the Ethernet port using the 10-pin to RJ45 cable.

14.1 SourceLink Software setup

SourceLink software can be used to communicate with BoomBox3 directly. SourceLink software has a wide variety of features to support all recording system requirements.

Boom Box 3 to RJ45 cable needs to be connected to the computer and the Boom Box 3.
The IP Address of the computer needs to be assigned a static IP address as 10.x.x.x and Subnet Mask 255.0.0.0.
All Firewalls and Anti-Virus programs which could block Ethernet communication needs to be turned off.

For complete instructions please refer to SourceLink Reference Manual.

14.1.1 SourceLink Prospect, Group, and Process Setup

Open SourceLink and create a new Dynamite Prospect.For Autonmous operation ,creating an Autonomous Boom Box3 prospect is recommended.
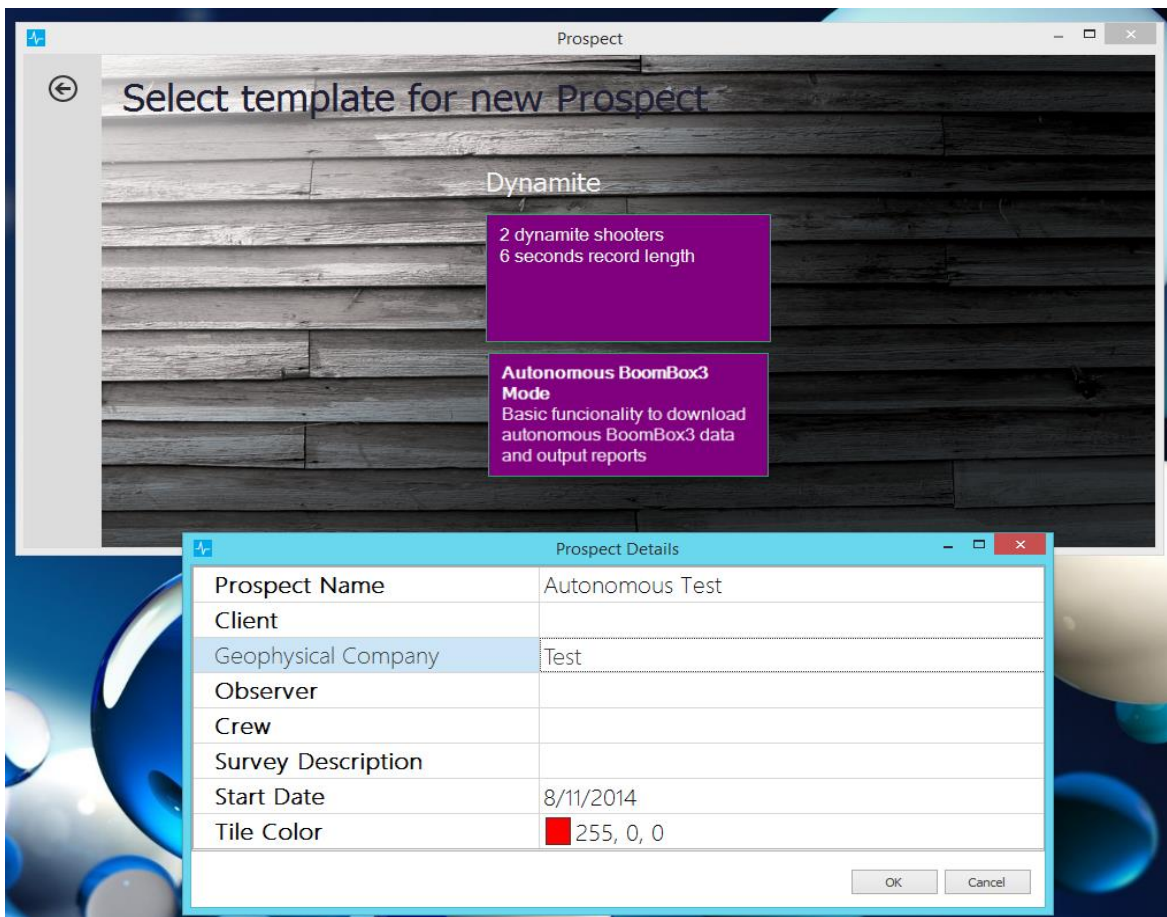
Create a new Prospect day for each production day/shift.

Go to Encoder/Decoder ->Groups and add new groups.
Only one shooter should be added to each group. It is recommended to give the group number to be same as the shooter number. Before assigning the units to groups make sure to select the Source Type to "Dynamite".

Groups must be defined as dynamite group as in the above-mentioned step first before assigning units to group.

Crew Number: select the crew ID of the shooting pack

Start Code: select the start code of the shooting pack.

Process: Select or make a dynamite process

Encoder: Select the encoder IP address of the encoder to be used with this group.

Aux Channel: 1

Radio Port: Analog Radio Channel

Use Repeater: If using a repeater BB3 unit in F3 protocol mode. Then select this entry.

Repeater ID: This entry selects which BB3 unit to use as the repeater.
OK: click OK to leave this menu.
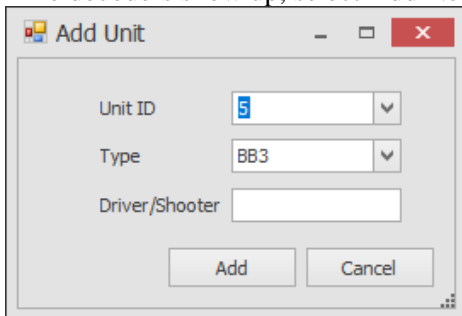
To select the units, click on **Units** from above.

Click on the group that is being modified.
If no decoders show up, select Add New Decoder and add units.

Place in the Unit ID desired. Select Type, BB3. If a name is desired for the shooter, place in Driver/Shooter. Click on Add.
Select the BB3 ID desired for this group.
After the units are completed in the groups, click on the X in the upper right corner of the menu to exit.

To create a dynamite process, select File, Process Maintenance.
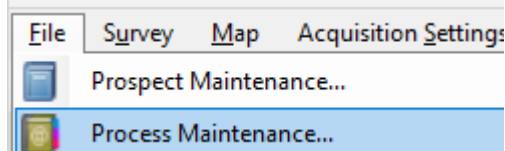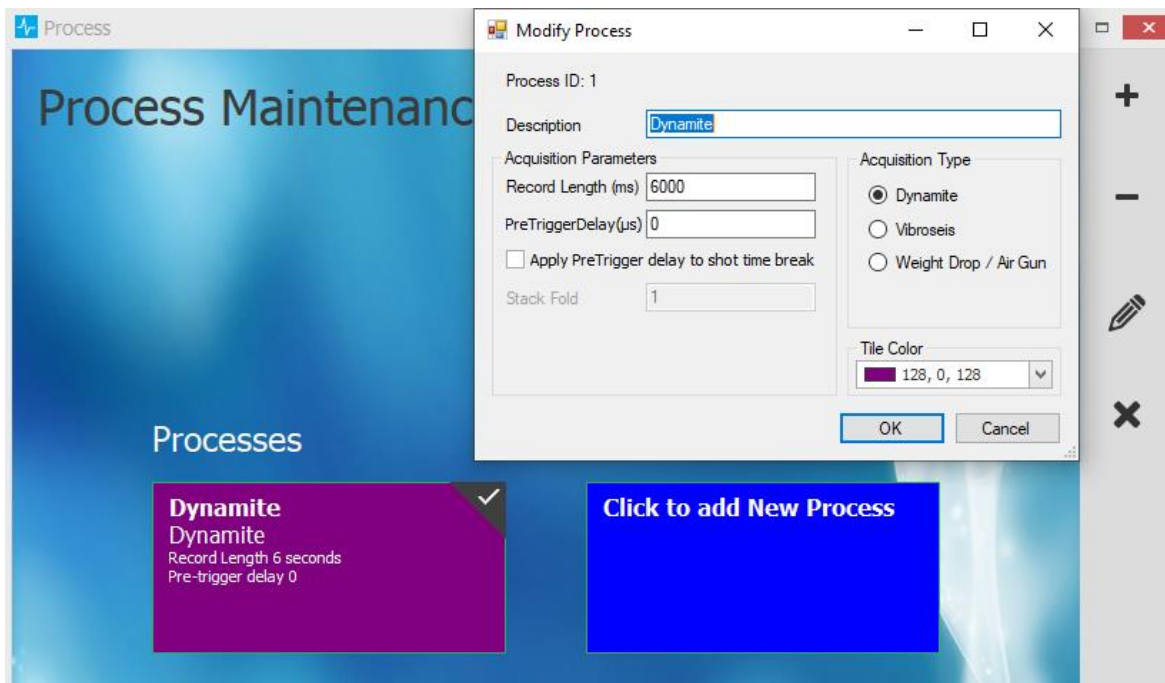
An existing process can be modified by right clicking in the upper right of a current Process. Then select the pencil icon to the right of the menu.

Or Click to Add New Process.

Description: Dynamite

Record Length (ms): Make Record Length 3000ms or greater for non-repeater and 5000ms or greater for repeater operation.

PreTriggerDelay (us): zero. Do not use Apply PreTrigger delay to shot time break. This is for weight drop operation.

Acquisition Type: Dynamite

Click on OK to leave this menu.

14.1.2 Parameter Setup

Open Encoder/Decoder->BoomBox Parameters in SourceLink. You can receive/send or compare parameters. Make sure the Unit ID/Crew ID matches the connected Boom Box.

14.1.2.1 BB3/RTM3 Decoder Parameters

Most of the entries are described in Section 11.1.1 Boom Box 3 Parameters.

Decoder Ready Repeater ID: The BB3 decoder will place this value into the radio ready message repeater field. The BB3 with the Unit ID that matches this value will turn into a repeater and repeat the ready message.

Cap Mode: This entry selects what type of detonator to fire.
- Standard is the electric detonator and use the high voltage. The front panel hardware switch must be on Standard.
- OSEIS uses the internal Orica board (if installed) and fires the OSEIS detonators. The front panel hardware switch must be on OSEIS.
- Austin uses the external E-Star blaster for Austin detonators. The front panel hardware switch must be on Standard.
- Dyno uses the internal DYNO board (if installed) and fires the Dyno electronic detonators. The front panel hardware switch must be on OSEIS.

- Maxam Int. uses the internal MAXAM board (if installed) and fires the MAXAM electronic detonators. The front panel hardware switch must be on OSEIS. (Source Control F3 v.3.26 or newer must be used for this entry)

Send/Receive/Compare Parameters: Select the Unit ID of the unit connected to the computer. Place in the Crew ID of the unit connected.
**Send:** Send these menu items to the Boom Box 3 unit.
**Receive:** Receive these menu items from the Boom Box 3 unit.
Compare: Receive these menu items from the Boom Box 3 unit to compare against program items.
Close: Close this window.

14.1.2.2 BB3/RTM3 Encoder Parameters

Encoder Start Delay, (ms): Amount of time between recording system toggling Boom Box 3 Encoder Remote Start line and Time Break occurs.
Encoder Radio Start Delay, (us): This entry adjusts when the radio start code is sent to line up encoder and decoder time break signals.
Encoder Radio Ref Delay, (us): This entry adjusts the timing of the data reception pulse that is created from the radio received shot status report.

BOOM BOX 3 Dynamite Controller

Recorder Type: Sercel Serial.
Repeater ID: Not used in BB Encoder mode
GPS PPS Active: Not used
Recorder Start, Time Break Active, Remote Start Active, Speaker Polarity and Microphone Polarity are discussed in the Boom Box 3 Parameter section.
Option Input: Not used in Encoder mode
Auto Zero Time: When selected the GPS time stamp is placed in the start code and used to start the decoder fire sequence. When unselected, the timing of the radio start code is used to start the decoder fire sequence. Zero Time Adjust is required to line up the time breaks.

Send/Receive/Compare Parameters: Select the Unit ID of the unit connected to the computer. Place in the Crew ID of the unit connected.
Send: Send these menu items to the Boom Box 3 unit.
Receive: Receive these menu items from the Boom Box 3 unit.
Compare: Receive these menu items from the Boom Box 3 unit to compare against program items.
Close: Close this window.

14.1.2.3 BB3/RTM3 Encoder Parameters
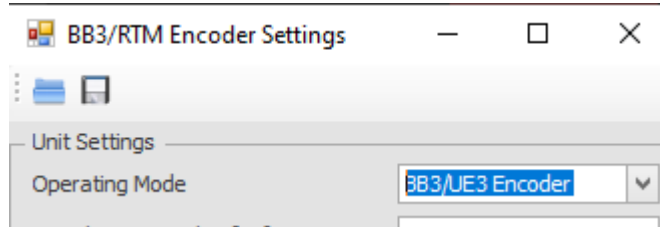
The BB3/UE3 Encoder setting requires changing the SourceLink connection to Universal Encoder 3.
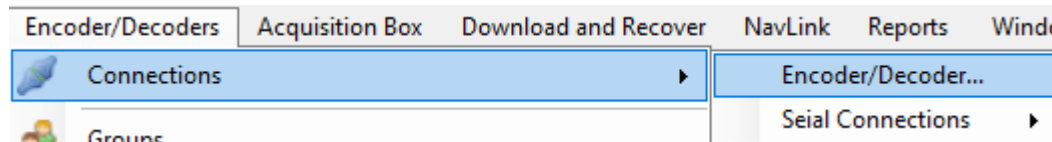
Select Universal Encoder 3 and click on Set.
Wait for the pop up to say it is done. Then click on Close.
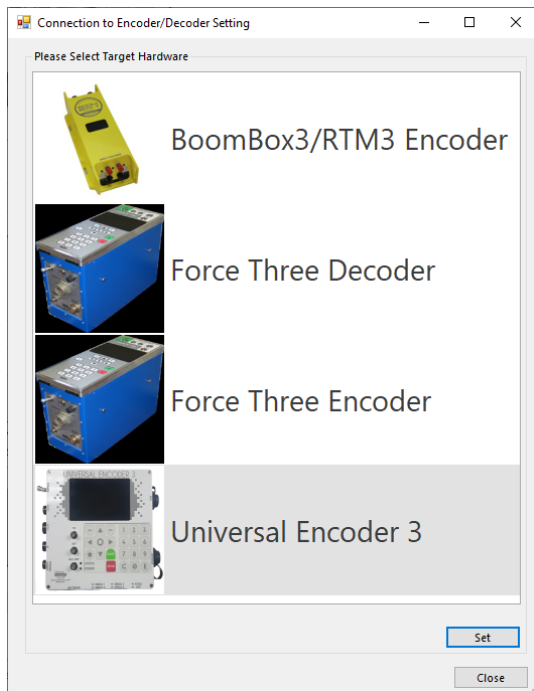
The BB3/UE3 Encoder setting requires setup in another Encoder parameter window. Click on Encoder/Decoders, Encoder Settings…

Click on Enable Critical Parameters to change the Encoder Parameters.

Auto Zero Time: When selected the GPS time stamp is placed in the start code and used to start the decoder fire sequence. When unselected, the timing of the radio start code is used to start the decoder fire sequence. Zero Time Adjust is required to line up the time breaks.

Zero Time Adjust, usec: This entry adjusts when the radio start code is sent to line up encoder and decoder time break signals.

Start Delay, msec: Amount of time between recording system toggling Boom Box 3 Encoder Remote Start line and Time Break occurs.

Similarity Delay, usec: This entry adjusts the timing of the data reception pulse that is created from the radio received shot status report (PFS).

Start Mode: Different start modes

- Start on Shot Message (Source Link) – SourceLink or Sercel sends start command and starts BB3 encoder.
- Start on External Pulse Rising Edge – SourceLink sends the start message and the BB3 encoder waits for Remote Start high going low pulse to start. If Sercel, the Sercel sequence message must come first.
- Start on External Pulse Falling Edge – SourceLink sends the start message and the BB3 encoder waits for Remote Start low going high pulse to start. If Sercel, the Sercel sequence message must come first.

Recorder Start, Time Break Active, Speaker Polarity and Microphone Polarity are discussed in the Boom Box 3 Parameter section.

Recorder Type:

- SourceLink – SourceLink controls the BB3 encoder

- Sercel OVC +SGDS Using F3 Messages – Sercel sends sequence (fire) serial message to BB3 encoder. The BB3 encoder uses the sequence number to select which BB3 encoder sequence to use for the start code. Sends F3 protocol start codes over the radio.
- Sercel SGDS Using A3 Messages – Sercel sends sequence (fire) serial message to BB3 encoder. The BB3 encoder uses the sequence number to select which BB3 encoder sequence to use for the start code. Sends older A3 protocol start codes over the radio. Works with original Boom Box decoder and ShotPro decoder.

Source Signature Sample Interval: Use 2 ms
Mode: Regular.
Configuration: These items are for the Universal Encoder 3
Receive: Receive these menu items from the Boom Box 3 unit.
Compare: Receive these menu items from the Boom Box 3 unit to compare against program items.
Send: Send these menu items to the Boom Box 3 unit.
Save: Save the parameter file
Close: Exit this menu.

14.1.3 Autonomous mode parameters

Open Encoder/Decoder->BoomBox Parameters in SourceLink. Set Boombox mode to Autonomous decoder. Send this mode to the unit. Assign the Autonomous mode units and Listen Time (or Record Length) to program slots using the Autonomous Mode settings.

14.1.4 Shot Information (PFS) Download-SourceLink

SourceLink can be used to download the Shot information from multiple BoomBox3 units, process, and export advanced reports.

Open Download and Recover, Download Shots from Boombox 3 menu option. Press detect button. SourceLink will detect the BoomBox3 unit connected to it directly.

Download Time Interval:
All – downloads all the records out of the BB3 unit.
Today – downloads the records shot that day.
Interval - Specify the time and date range for the download. Time is the local time of the computer.
Prospect's Day – downloads all the records taken since the current SourceLink prospect was started.

If needed SourceLink can find the nearest Source Flag automatically for all the downloaded shots based on the Shot GPS position. Select Use GPS position for near source point.
Source Points must be imported into SourceLink as described in Importing Source Point Flags Section.

The feature Only when Line/Station is 0/0 means SourceLink will apply the Source Flag information if the information in the BB3 line/station is zero.

The feature Create Source Point if none found will create the source point from the Line and Station entry below if there is not a Line or Station value found within the Max Distance (m) value.
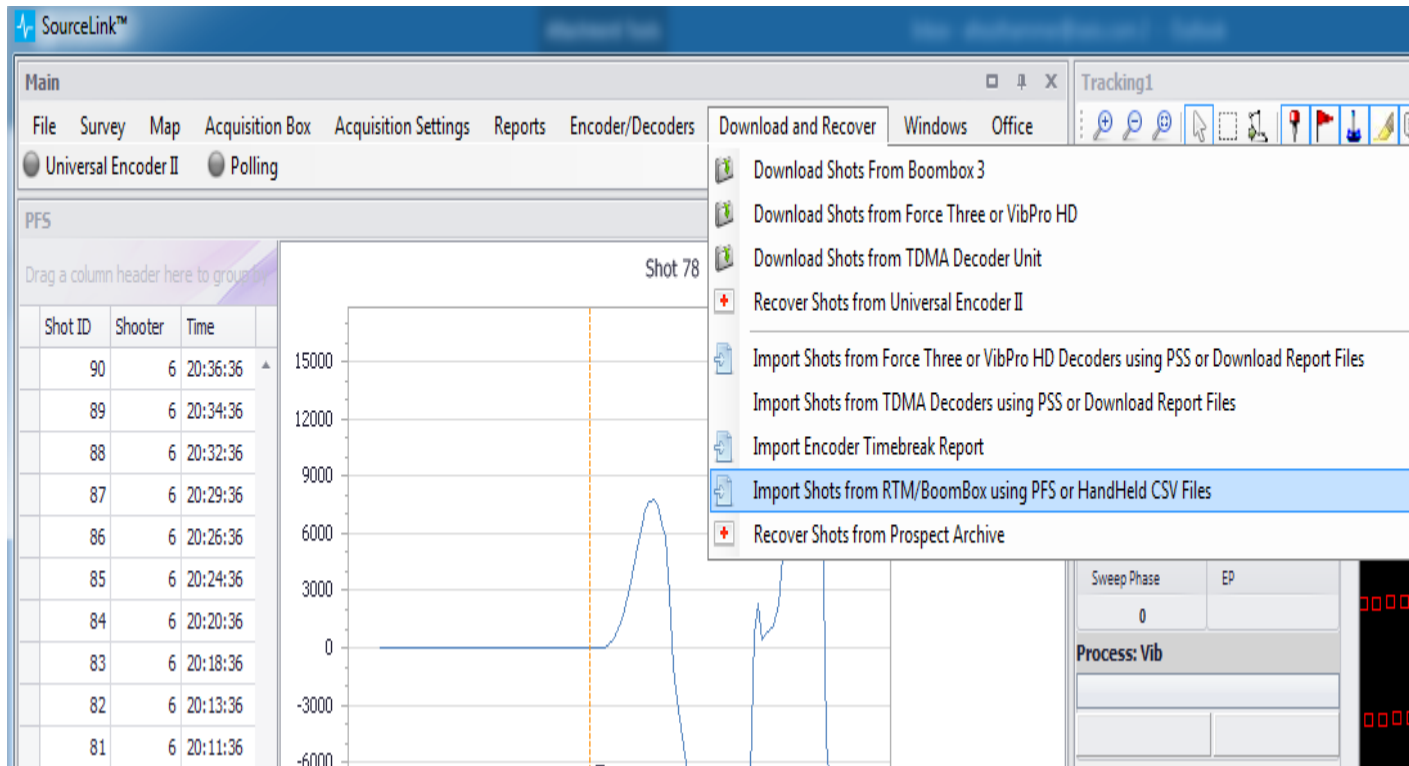
SourceLink can also be used to download the Shot information from downloaded files.

Open Download and Recover.
Select Import Shots from RTM/Boombox using PFS or Handheld CSV Files

Click on Import:

BoomBox3 Direct Download

Unit ID
6157   Detect

IP Address (Auto-fill from Serial Number)
10.0.61.57

Decoder Type
BoomBox3

Download Time Interval
◉ All   ○ Today
○ Interval   ○ Prospect's Day

From (Local) 1/1/2009   12:00:00 AM
To (Local)   6/8/2022   11:59:59 PM

Process
1 - Dynamite

SEG-Y
☑ Save reference files   ☑ Compress files to ZIP
C:\Data\SEGY   Browse

Rules
◉ Clear shots before import
○ Merge shots

☑ Use GPS position for near source point
☐ Only when Line/Station is 0/0
☐ Create Source Point if none found

Line 1   Station 104
Max Distance [m]   25

Import   Close

Select individual files or an entire folder to add the files to import.

Import Files Dlg

Clear List

Add all Files in Folder   Add Files

○ Merge imported data

◉ Clear before import

Import   Cancel
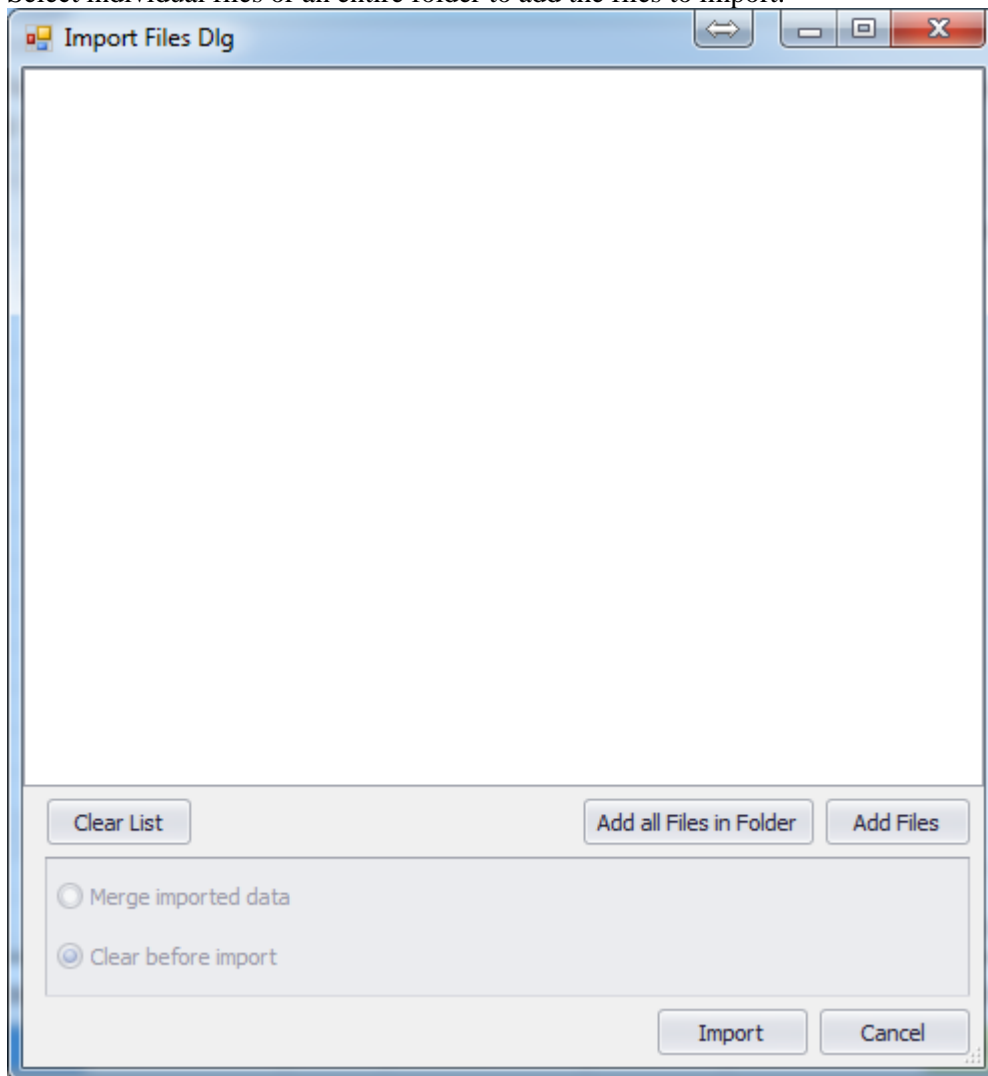
You will see the list of files that will be loaded:
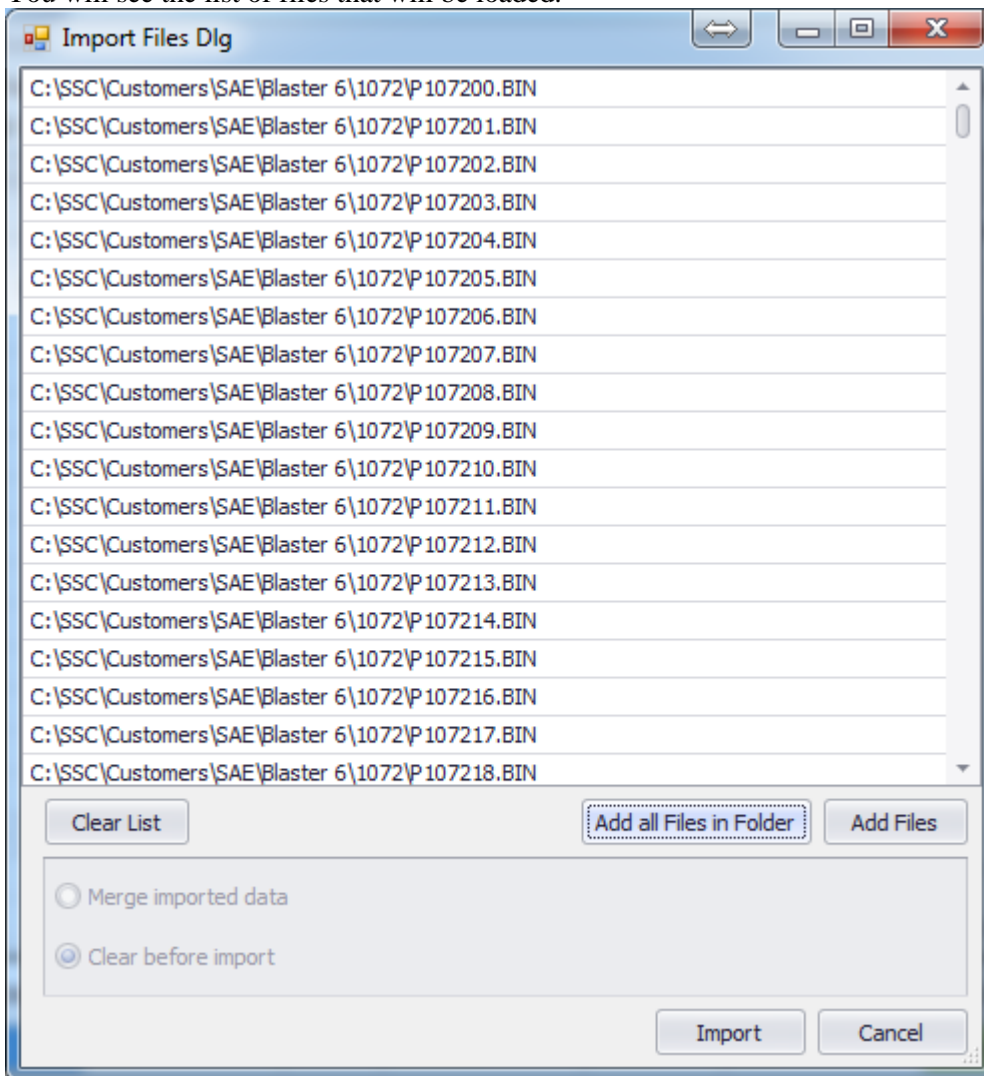
Click Import

The acquired shots and PFS information will be populated. The reports feature can be run on the newly populated data.

14.1.5 Importing Source Point Flags

SourceLink allows the user to import Source Flags into its map.
To avail the automatic near point pick feature in the Shot Information (PFS) download, the source points need to be imported to SourceLink first.

This can be done using the following step:
Survey ->Script Import Wizard
Open one-shot point Highlight the columns and press Get from Selection to have SourceLink load the points. It is recommended to press the preview first and then press the import button.
.

14.1.6 Uploading Source Points into BB3 Internal Memory

BoomBox3 allows loading Source Points to its internal memory. When the points are loaded into the BB3 memory, BB3 can find the nearest shot point and distance real time and display/use the Source point for reporting. Alternatively, the user can also use the Tablet/Mobile device to find or set the Source Point, in which case loading the flags into BB3 internal memory is not necessary.

14.1.6.1 Using Selection window

Ctrl +Click on the points that are to be loaded into a Boom Box 3 and then hit upload.

14.1.6.2 Source Points Setup

Auto Near Point Selection – BB3 selects the nearest Source Point within the BB3 GPS position.

Allow Shooting Without Near Point – BB3 will shoot without any Source Points loaded.

Use Double Button To Lock GPS – Makes the BB3 operator to press the Charge and GPS buttons to store the GPS position.

Max Distance to Source Point [m] – The maximum distance the BB3 can be from a Source Point and still be valid.

Click on Send Setup to send the Source Points setup to the BB3.

14.1.6.3 Using map
Select point using rectangular or polygon selection toolbar and then choose "Sources", when the sources are highlighted, right click and choose Upload to BoomBox3.
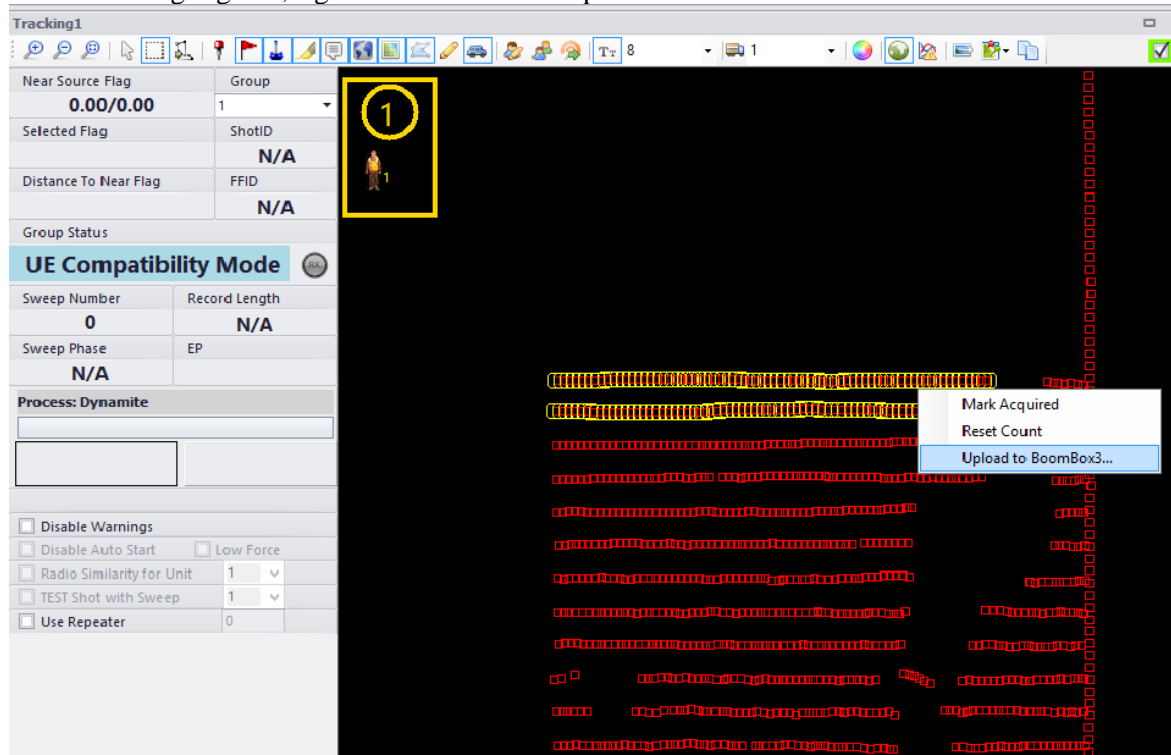

14.1.6.4 BB3 Display updates
When the Shot points are loaded into BB3 memory, BB3 will automatically display the nearest flag and its distance in the display updated every 5 seconds while the shooter is moving to the location. If the user has navigated to the point and then reached the flag, user has to press the GPS button as part of the standard shooting sequence, now if the shooter holds the ARM & Charge buttons, the display will show the actual point selected for this shot and the distance to the point.
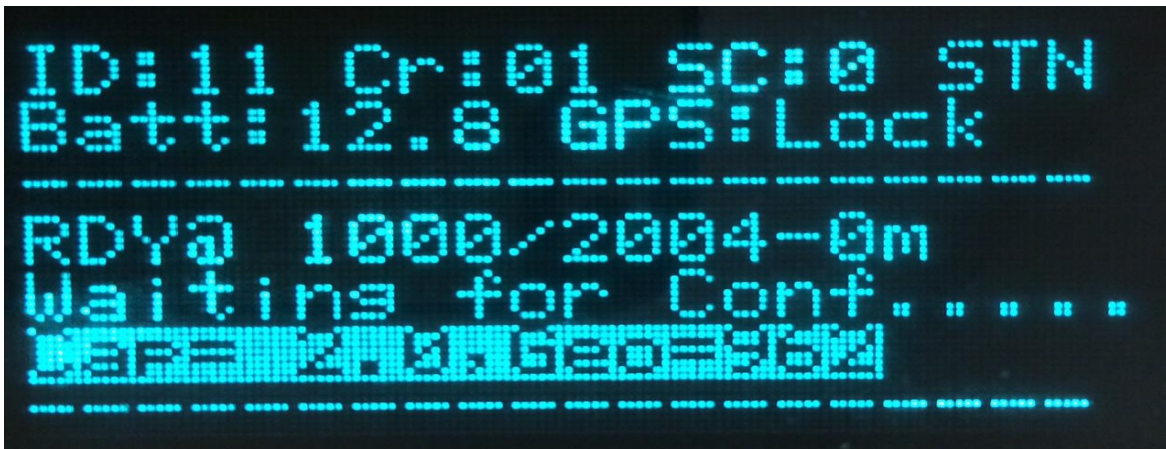
### 14.1.7 Shot Information (PFS) display

After a BoomBox3 Shot information (PFS) download, the PFS information can be analyzed using SourceLink. The acquired shots window will provide a list view of the Shot ID, Source Flag and Shot GPS time. The PFS window will provide the full QC information of each shot.
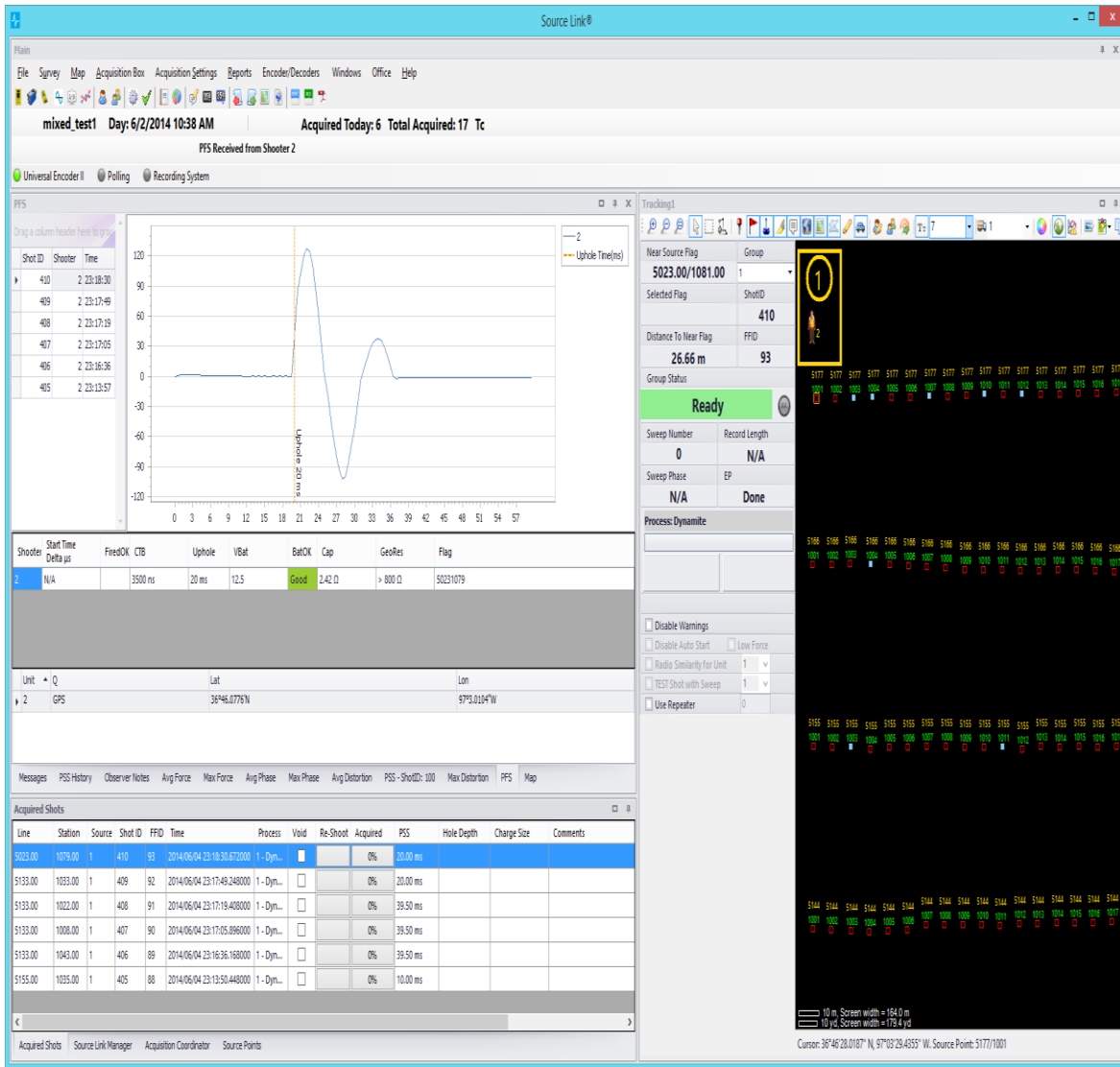
The map window will also display the acquired shot positions.

14.1.8 Report generation

To export all the shot information to the required recording system report formats, click on the reports icon and open the reports window. Select the output directory and click "Save Reports".
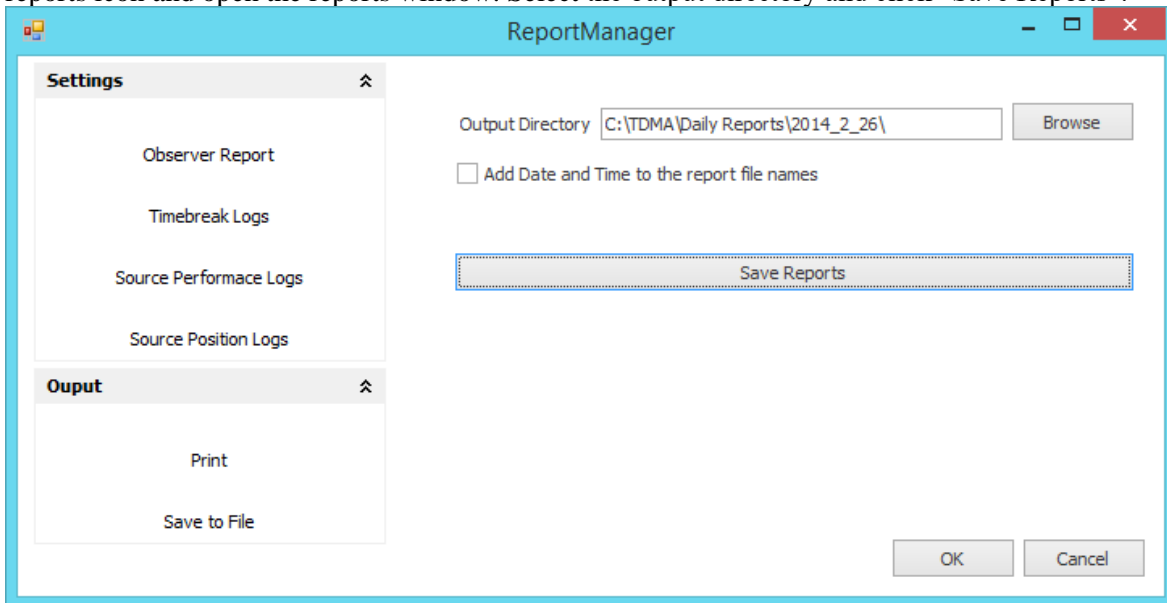
14.2 Source Control F3 Software setup

Source Control F3 software can be used to communicate with the Boom Box 3 directly.

Boom Box 3 to RJ45 cable needs to be connected to the computer and the Boom Box 3. The IP Address of the computer needs to be assigned a static IP address as 10.x.x.x and Subnet Mask of 255.0.0.0.
All Firewalls and Anti-Virus programs which could block Ethernet communication needs to be turned off.
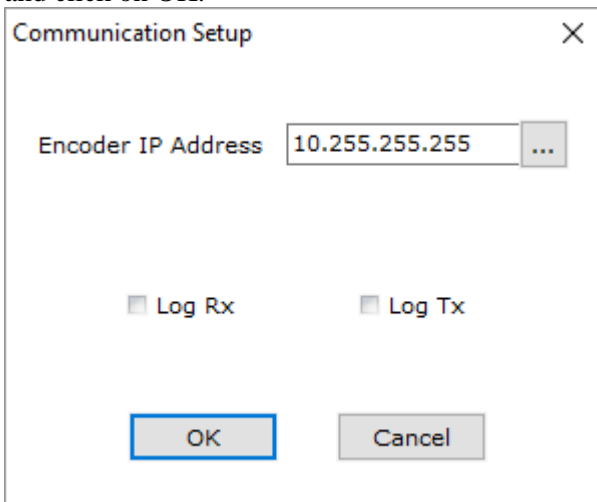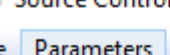
14.2.1 Source Control F3 Start and Setup

To start the Source Control F3 program, click on the Source Control F3 icon .
Click on Setup and Encoder Comm Settings…
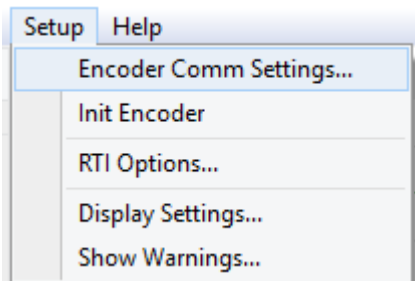
The Communication Setup window will pop up. Set the Encoder IP Address to 10.255.255.255 and click on OK.

The bottom of the Source Control F3 program will show the connection and connected BB3 serial number. Also, the BB3 firmware level will be shown.

14.2.2 Source Control F3, BoomBox3 Parameters Setup

Click on Parameters, then BoomBox3 Parameters…

14.2.2.1 Operating mode: BB Encoder

Unit ID – match the connected Boom Box 3 Unit ID.

Crew – match the connected Boom Box 3 Crew ID.

Start Delay, msec: Amount of time between recording system toggling Boom Box 3 Encoder Remote Start line and Time Break occurs.

Encoder Radio Start Delay, usec: This entry adjusts when the radio start code is sent to line up encoder and decoder time break signals.

Radio Ref Delay, usec: This entry adjusts the timing of the data reception pulse that is created from the radio received shot status report.

Recorder Type: Sercel, Generic and SourceLink serial

Repeater ID: Not used in BB Encoder mode

Option Input: Not used in BB Encoder mode

Send: Send these menu items to the Boom Box 3 unit.

Receive: Receive these menu items from the Boom Box 3 unit.

Compare: Receive these menu items from the Boom Box 3 unit to compare against program items.

Save: Save these menu items into a file.

Open: Open a saved menu file.

Close: Close this window.

14.2.2.2 Operating mode: BB Repeater

A3 Repeater Encoder

Start Delay – Recorder Type: Same as BB Encoder.

Repeater ID: must match the unit ID of the BB3 decoder to be used as the repeater.

Option Input: Not used in BB Repeater mode.

## 14.2.2.3 Operating mode: Standard Decoder

Boom Box 3 Parameters section describe these entries.

Cap Type: This entry selects what type of detonator to fire.
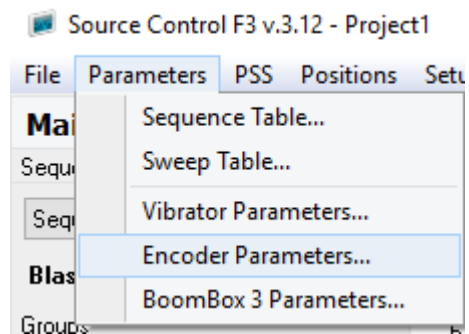- Standard is the electric detonator and use the high voltage. The front panel hardware switch must be on Standard.
- OSEIS uses the internal Orica board (if installed) and fires the OSEIS detonators. The front panel hardware switch must be on OSEIS.
- Austin uses the external E-Star blaster for Austin detonators. The front panel hardware switch must be on Standard.
- Dyno uses the internal DYNO board (if installed) and fires the Dyno electronic detonators. The front panel hardware switch must be on OSEIS.
- Maxam Int. uses the internal MAXAM board (if installed) and fires the MAXAM electronic detonators. The front panel hardware switch must be on OSEIS. (Source Control F3 v.3.26 or newer must be used for this entry)

14.2.2.4 Operating mode, BB3/UE3 Encoder

Boom Box 3 Parameters

Operating Mode   BB3/UE3 Encoder

Use Encoder Parameters

to set up this mode
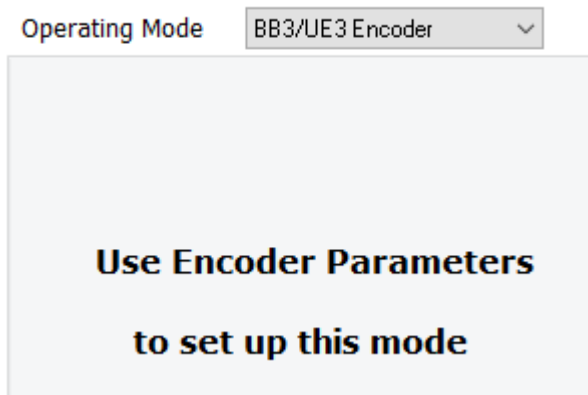
The BB3/UE3 Encoder setting requires setup in another Encoder parameter window. Click on Parameters, Encoder Parameters…

Source Control F3 v.3.12 - Project1

File   Parameters   PSS   Positions   Setu

Mai
Sequ
Seq

Blas

Groups

Sequence Table…
Sweep Table…
Vibrator Parameters…
Encoder Parameters…
BoomBox 3 Parameters…

Click on Enable Critical Parameters to change the Encoder Parameters.

Auto Zero Time: When selected the GPS time stamp is placed in the start code and used to start the decoder fire sequence. When unselected, the timing of the radio start code is used to start the decoder fire sequence. Zero Time Adjust is required to line up the time breaks.

Zero Time Adjust, usec: This entry adjusts when the radio start code is sent to line up encoder and decoder time break signals.

Start Delay, msec: Amount of time between recording system toggling Boom Box 3 Encoder Remote Start line and Time Break occurs.

Similarity Delay, usec: This entry adjusts the timing of the data reception pulse that is created from the radio received shot status report (PFS).

Recorder Type:
- Sercel – Sercel sends sequence (fire) serial message to BB3 encoder. The BB3 encoder uses the sequence number to select which BB3 encoder sequence to use for the start code. Sends F3 protocol start codes over the radio.
- Sercel Legacy – Sercel sends sequence (fire) serial message to BB3 encoder. The BB3 encoder uses the sequence number to select which BB3 encoder sequence to use for the start code. Sends older A3 protocol start codes over the radio. Works with original Boom Box decoder and ShotPro decoder.

Start Mode: Different start modes
- Start Message – Source Control F3 sends start command and starts BB3 encoder.

- Pulse Low/Closed – Source Control F3 sends start command and BB3 encoder waits for Remote Start high going low pulse to start.
- Pulse High/Open – Source Control F3 sends start command and BB3 encoder waits for Remote Start low going high pulse to start.

Recorder Start, Time Break Active, Speaker Polarity and Microphone Polarity are discussed in the Boom Box 3 Parameter section.

Ref Sample Rate: Use 2000.

Send: Send these menu items to the Boom Box 3 unit.

Receive: Receive these menu items from the Boom Box 3 unit.

**Compare:** Receive these menu items from the Boom Box 3 unit to compare against program items.

Save: Save these menu items into a file.

Open: Open a saved menu file.

14.2.3 Source Control F3, Sequence Table Setup

The Sequence table is used to setup which blaster(s) to fire, the Start Code and Crew ID to use. Also, if to use a repeater to pass along the start code. Use Source Control F3 v.3.22 or v.3.21 to modify the sequence table with current BB3 firmware.

Click on Parameters, then Sequence Table
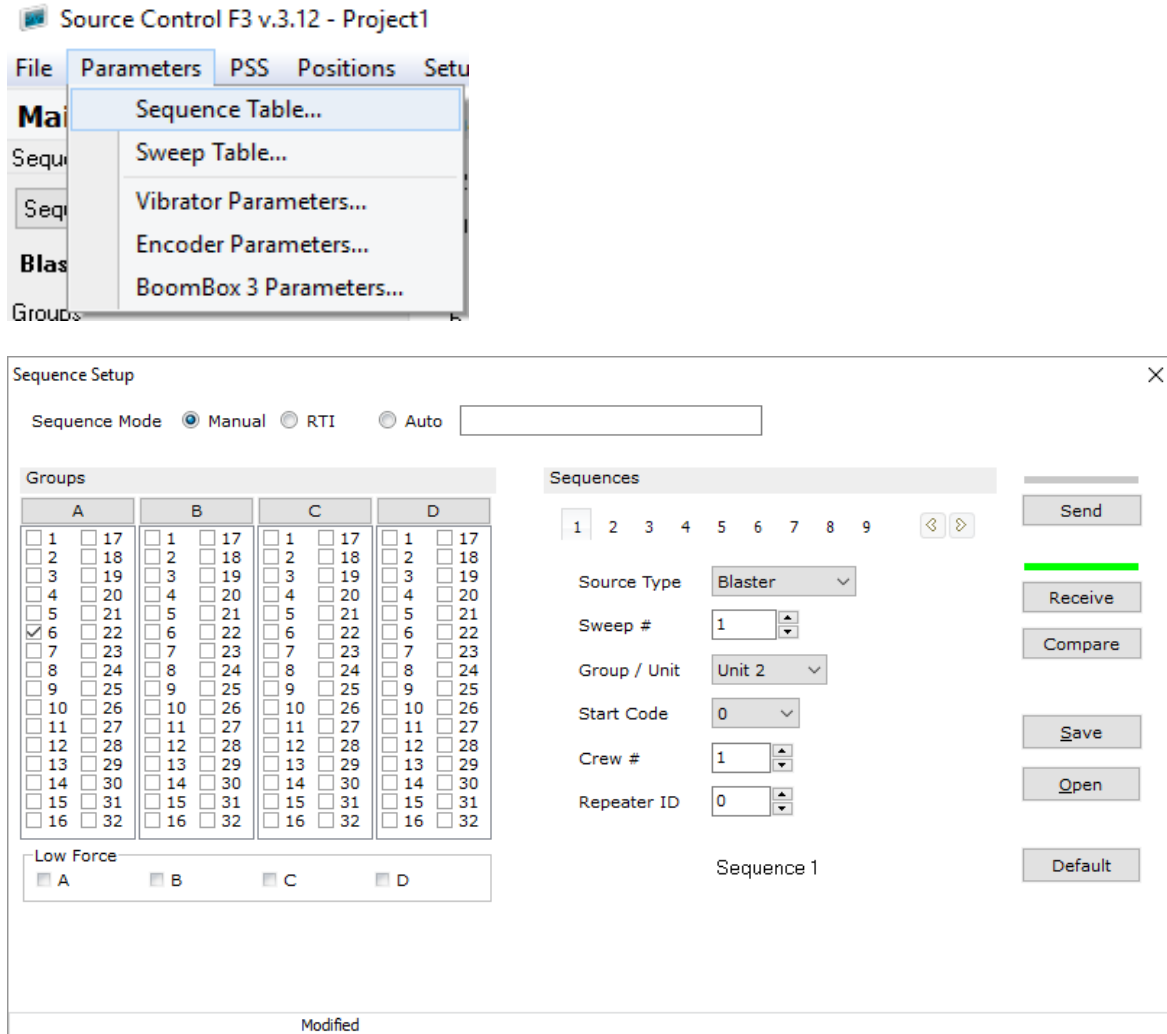
Source Type: Use Blaster for dynamite work.
Sweep #: Ignore Sweep # for dynamite work.
Group/Unit: Selects the units to fire.
- Individual units can be selected by the drop-down arrow.
- Multiple units can be selected in the four groups, A, B, C and D. Then select the appropriate group by the drop-down arrow.

**Start Code:** The Start Code must match the shooting pack (decoder) Start Code.
Crew #: The Crew # must match the shooting pack (decoder) Crew number.
Repeater ID: When zero the repeater functionality is turned OFF. If the number is greater than zero, then the repeater functionality is turned ON. The Repeater ID has to match the BB3 decoder Unit ID to be used as the repeater.

Send: Send these menu items to the Boom Box 3 unit.

Receive: Receive these menu items from the Boom Box 3 unit.

Compare: Receive these menu items from the Boom Box 3 unit to compare against program items.

Save: Save these menu items into a file.

Open: Open a saved menu file.
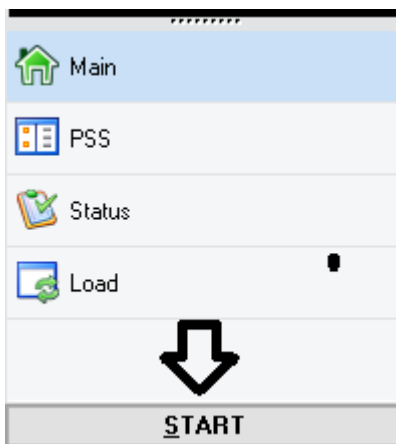
14.2.4 Source Control F3, Main

The Source Control F3, Main page will show the uphole records and give the ability to select the sequence for the BB3/UE3 Encoder. The Main page also can start a fire sequence through the BB3 Encoder in BB3/UE3 Encoder mode.
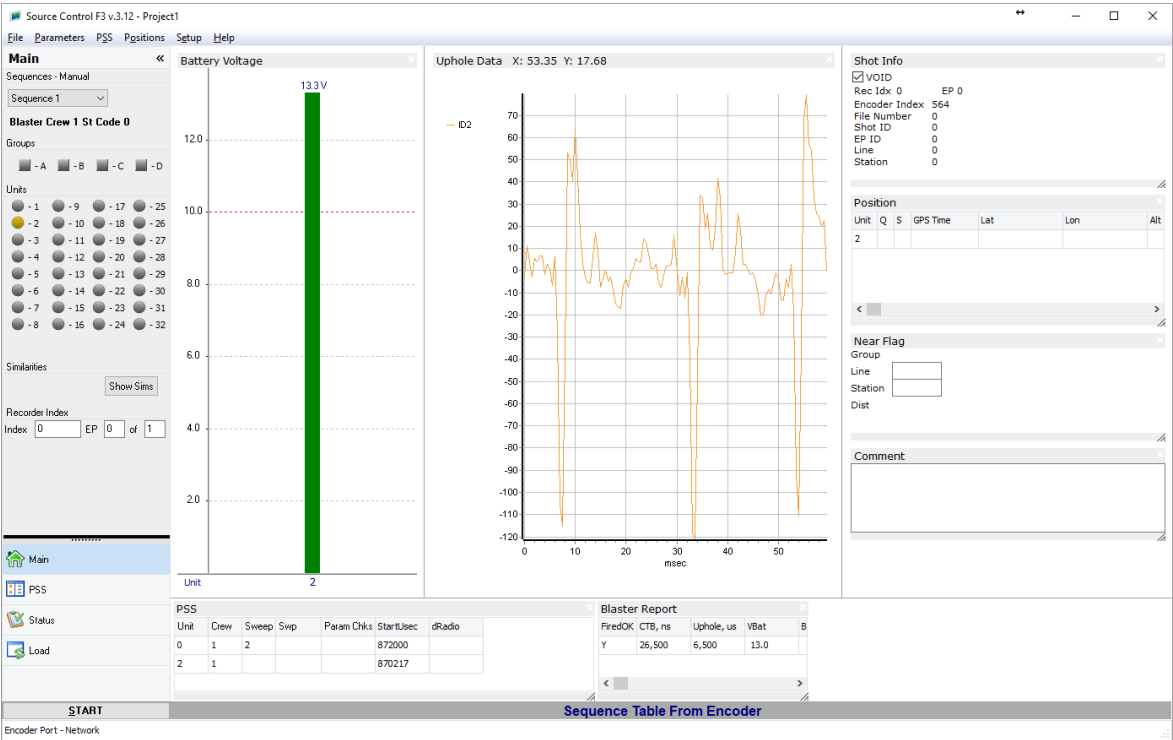
Source Control F3, Main page.
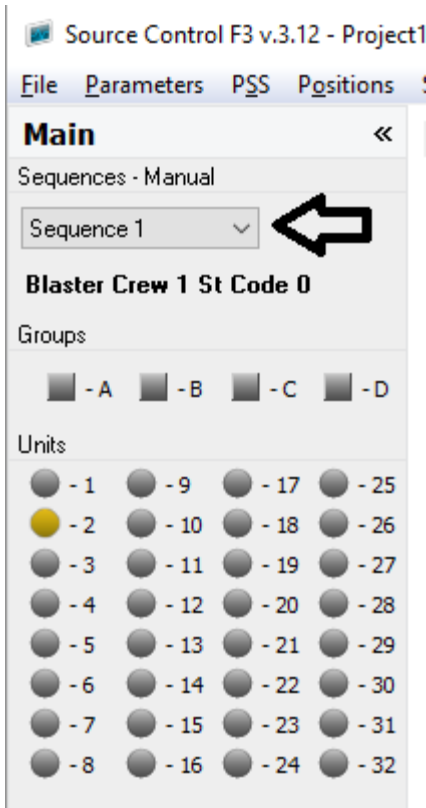
Select the sequence to send to the BB3 Encoder in BB3/UE3 Encoder mode.

Click on the START to send the start command to the BB3 Encoder in BB3/UE3 Encoder mode.

14.3 Source Control Software setup

Source Control software can be used to communicate with the Boom Box 3 Encoder directly and change original Boom Box decoder parameters over the radio.

Boom Box 3 to RJ45 cable needs to be connected to the computer and the Boom Box 3. The IP Address of the computer needs to be assigned a static IP address as 10.x.x.x and Subnet Mask of 255.0.0.0.
All Firewalls and Anti-Virus programs which could block Ethernet communication needs to be turned off.
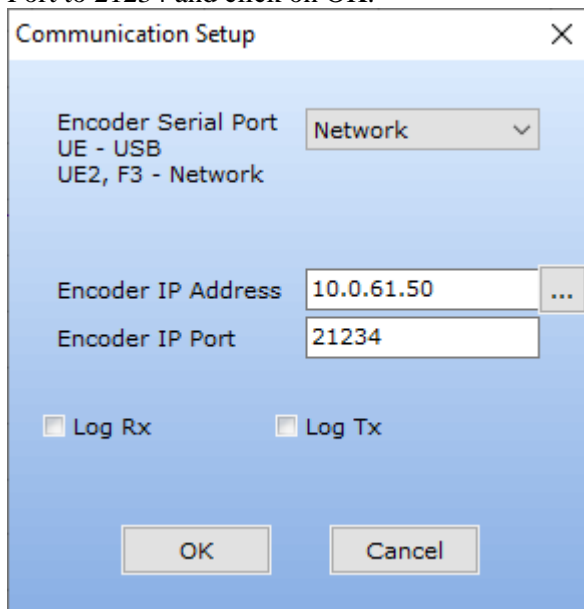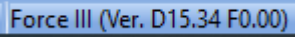
14.3.1 Source Control Start and Setup
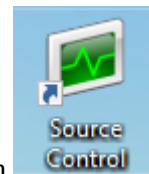
To start the Source Control program, click on the Source Control icon .
Click on Setup and Encoder Comm Settings…
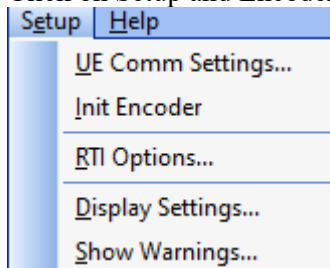
The Communication Setup window will pop up. Set the Encoder Serial Port to Network. Set the Encoder IP Address to the IP of the BB3 Encoder. This case it is 10.0.61.50. Set the Encoder IP Port to 21234 and click on OK.

The bottom of the Source Control program will show the connection as a Force III. Also, the BB3 firmware level will be shown. BB3 firmware 15.34 and newer will communicate with this Source Control program.

Force III (Ver. D15.34 F0.00)

14.3.2 Source Control, BoomBox Parameters Setup

Click on Parameters, then BoomBox3 Parameters…

Parameters   PSS   Positions   Setup

Sequence Table…

Sweep Table…

Vibrator Parameters…

Encoder Parameters…

BoomBox/WDC Parameters…
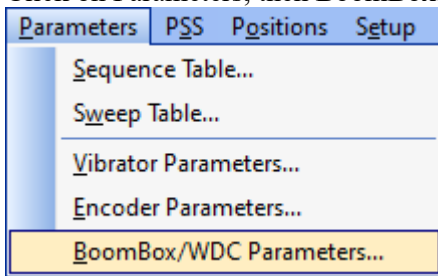
14.3.2.1 Operating mode: BB Dynamite Decoder

Boom Box / Weight Drop Parameters section is used to change the parameters over the radio of the original Boom Box and some parameters on the BB3 decoder. Only parameters for the Boom Box in dynamite decoder mode can be changed.

Boom Box / Weight Drop Parameters section describe these entries.
Operating Mode: Use BB Dynamite Decoder
Start Code: Start code for decoder, 0 – 3.
Start Delay, usec: Start delay is also called decoder delay. This is the amount of time the decoder waits to fire after receiving the radio start code.
Uphole Blank Time, msec: This entry is the amount of time to blank samples of the uphole wavelet.

Uphole Window Delay, msec: This entry is the amount of time to shift the uphole window that is sent back in PFS.

Auto Shut Down: This entry is the amount of time the Boom Box will stay on when no switches are pressed. Zero means the unit will not shut off.

Ready Message: This entry in the original Boom Box selects which radio protocol to use. Use Vib Pro when using with the BB3 Encoder.

Geophone Resistance: The next two entries set the internal values for the Boom Box geophone resistance test minimum and maximum values.

Cap Resistance: The next two entries set the internal values for the Boom Box blasting cap resistance test minimum and maximum values.

BoomBox Mode: This entry selects what type of detonator to fire.
- Standard is the electric detonator and use the high voltage. The front panel hardware switch must be on Standard.
- OSEIS uses the internal Orica board (if installed) and fires the OSEIS detonators. The front panel hardware switch must be on OSEIS.
- Austin uses the external E-Star blaster for Austin detonators. The front panel hardware switch must be on Standard.

Hardware Interface Settings:
- GPS PPS Active, not used.
- Recorder Start Active, not used in decoder mode
- Time Break Active, original Boom Box decoder this is always high going low. BB3 the time break line is selectable in the active state.
- Remote Start Active, not used in decoder mode
- Speaker Polarity selects which speaker polarity to use.
- Microphone Polarity selects which microphone polarity to use.
- Option Input not used in decoder mode.

Unit ID: This entry selects which Boom Box over the radio to send/receive parameters.

Crew: This entry selects the Boom Box Crew ID over the radio to send/receive parameters.

Send: Send these menu items over the radio to the Boom Box unit.

Receive: Receive these menu items over the radio from the Boom Box unit.

Compare: Receive these menu items over the radio from the Boom Box unit to compare against program items.

Save: Save these menu items into a file.

Open: Open a saved menu file.

14.3.3 Source Control, Sequence Table Setup

When using this Source Control with the BB3 Encoder, the Sequence Table is not used. The BB3 Encoder will use the Sequence number sent to it for the unit to fire field in the radio start code.

14.3.4 Source Control, Main

The Source Control, Main page will show the uphole records and give the ability to select the sequence for the BB3 Encoder. The Main page also can start a fire sequence through the BB3 Encoder.
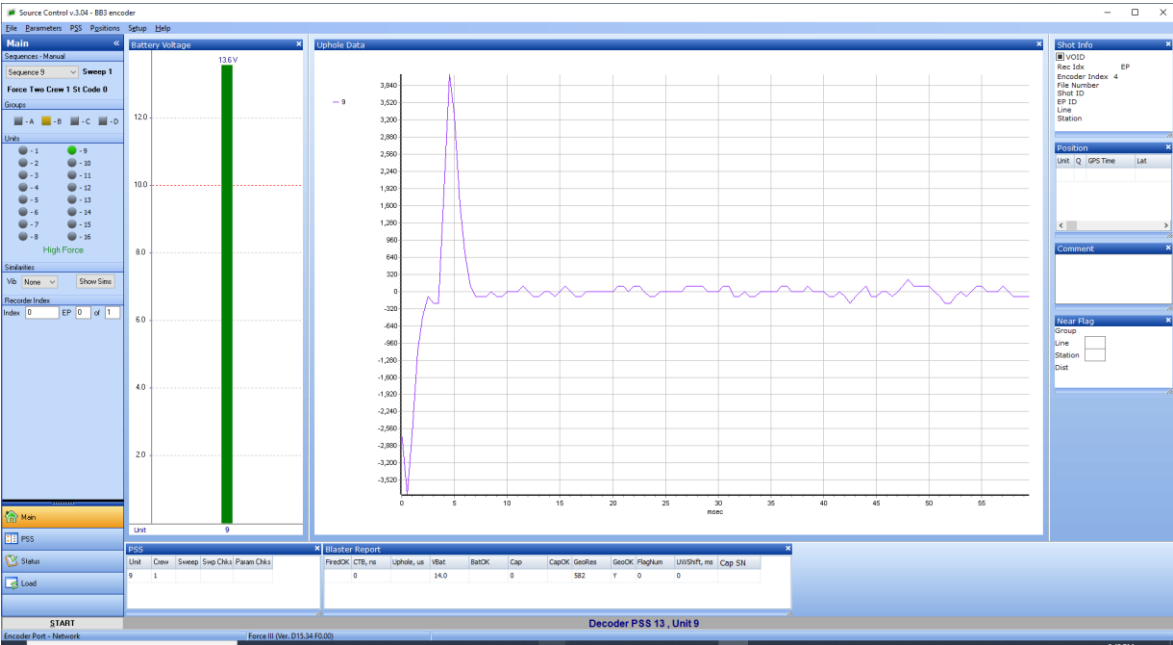
Source Control, Main page.
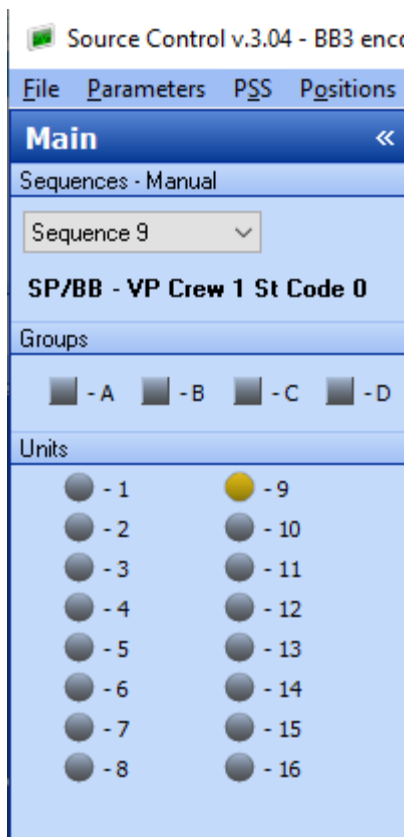
Select the sequence to send to the BB3 Encoder. The sequence number will be used in the units to fire field of the radio start code.

Click on the START to send the start command to the BB3 Encoder.

15. Cable & Interface Diagrams

15.1 –BB3 Decoder Cable
10 pin Decoder Cable

4 feet long

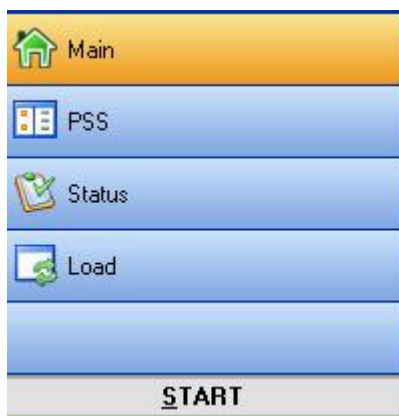|		
B Red	Battery plus	
H BLK	Battery minus	
F Red	Uphole +	
D BLK	Uphole –	
C Red	Mic Act	
A BLK	PPS Input	
J	White	PTT Active
	BLK	no connect
G Green	Speaker Pos	
K BLK	Speaker Return	

5 pin Radio Cable Wiring

Mic Active –	A
Radio Return -	C
Speaker Act-	B
Speaker Ret-	E
PTT	D

15.2 DECODER CABLE with GPS

10 pin Decoder Cable

4 feet long

B Red	Battery plus
H BLK	Battery minus

F Red	Uphole +
D BLK	Uphole –

GPS input

B White	Battery plus – (optional 9 pin Female) pin 9
H Shield	GND (Battery minus) - (optional 9 pin Female) pin 5
E BLK	GPS input to Boom Box 3 - (optional 9 pin Female) pin 2
A BLK	PPS Input

RADIO

C Red	Mic Act

J White	PTT Active
BLK	no connect

G Green	Speaker Pos
K BLK	Speaker Return

(Optional) 5 pin Radio Cable Wiring

Mic Active –	A
Radio Return -	C

Speaker Act-	B
Speaker Ret-	E

PTT	D

15.2.1 Boom Box 3 Decoder Cable
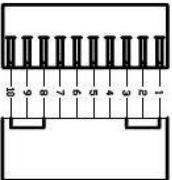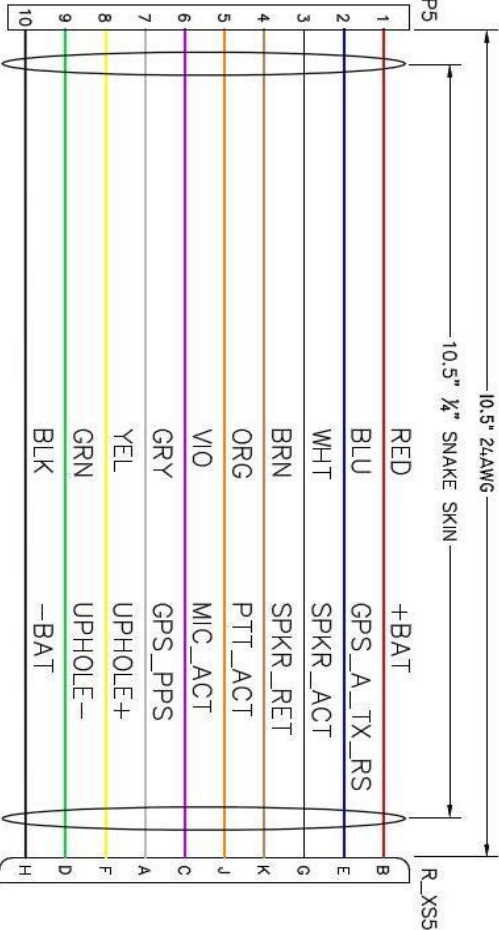
15.2.2 Boom Box 3 – 10 pin wiring

UNIVERSAL CONTROLLER SP5

10-SOCKET MOLEX
(CONN10FMOCNSL)
22-01-2107

10.5" ¼" SNAKE SKIN
10.5" 24AWG

Pin	Color	Signal	R_XS5
1	RED	+BAT	B
2	BLU	GPS_A_TX_RS	E
3	WHT	SPKR_ACT	G
4	BRN	SPKR_RET	K
5	ORG	PTT_ACT	J
6	VIO	MIC_ACT	A
7	GRY	GPS_PPS	C
8	YEL	UPHOLE+	F
9	GRN	UPHOLE-	D
10	BLK	-BAT	H

R_XS5

10-PIN MALE CONNECTOR
(CONN10MCRJG12)
851-07C12-10P50

BILL OF MATERIALS

QTY	PART #	DESC.
1	CONN10FMOCNS	10-SOCKET SMALL MOLEX CONNECTOR
1	CONN10MCRJG12	10-SOCKET MALE MOLEX CONNECTOR
10.5"	W24AWGRED	RED 24AWG WIRE
10.5"	W24AWGBLK	BLACK 24AWG WIRE
10.5"	W24AWGWHT	WHITE 24AWG WIRE
10.5"	W24AWGBRN	BROWN 24AWG WIRE
10.5"	W24AWGBLU	BLUE 24AWG WIRE
10.5"	W24AWGORG	ORANGE 24AWG WIRE
10.5"	W24AWGVIO	VIOLET 24AWG WIRE
10.5"	W24AWGGRY	GREY 24AWG WIRE
10.5"	W24AWGYEL	YELLOW 24AWG WIRE
10.5"	W24AWGGRN	GREEN 24AWG WIRE
5"	WSKTUBE1_8	⅛" BLACK SHRINK
10	P8-50S	SMALL MOLEX PINS
10.5"	WEXP1_4BLK	¼" SNAKE SKIN
4"	WSKTUBE3_8	3/8" HEAT SHRINK BLACK

15.3. BB3 Ethernet (10 pin to RJ45) cable

BOOM BOX 3 Dynamite Controller
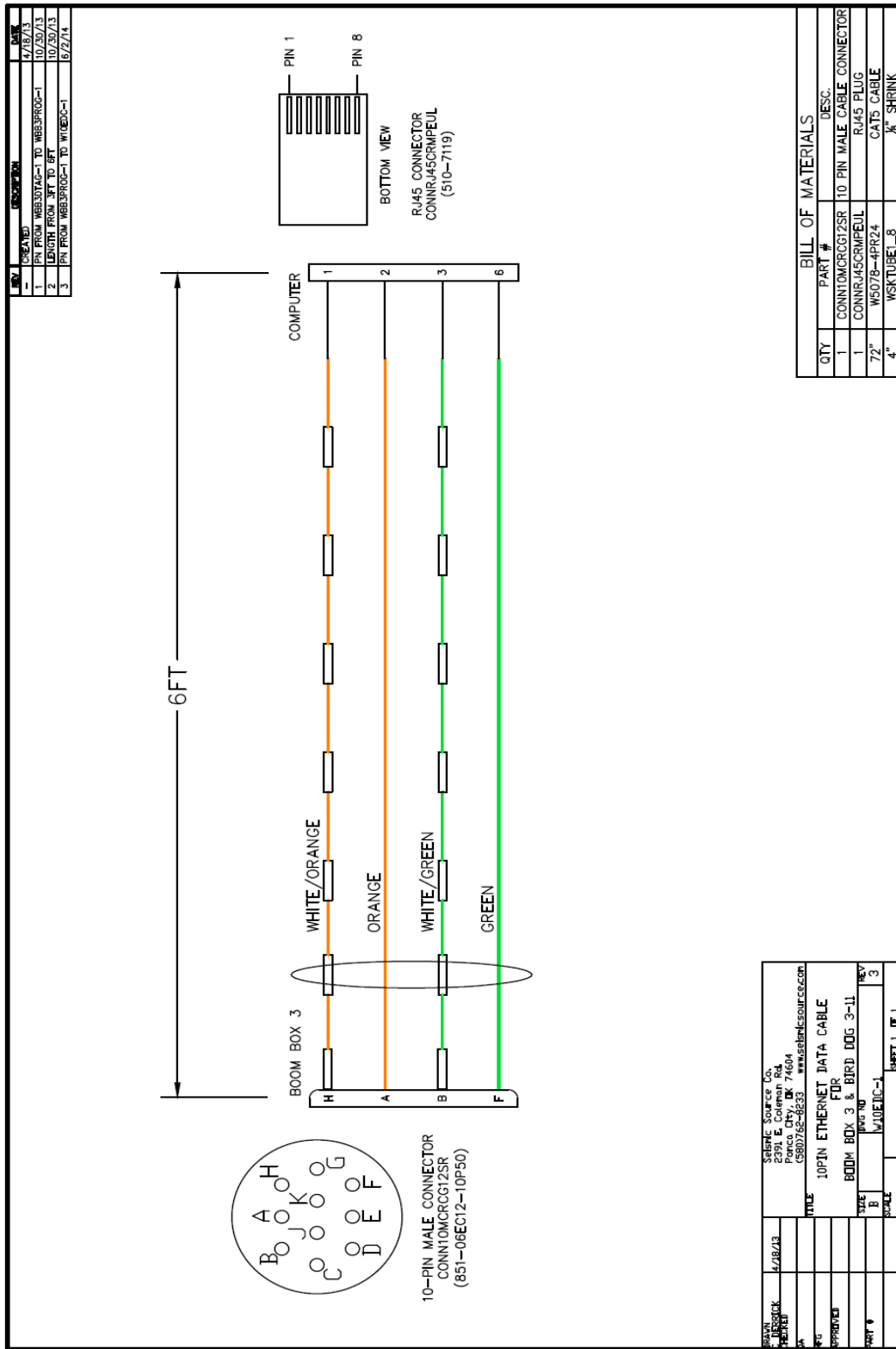
15.4. BB3 Autonomous fire switch cable

CORD MOUNT PUSH BUTTON SWITCH
WCRDSWTCH

6FT

TO BB3

10-PIN MALE CONNECTOR
CONN10MCRCG12

CREATED | DESCRIPTION | DATE

AUTHOR
CHRISTOPHER D. | 10/11/13
CHECKED

Seismic Source Co.   SeismicSource.com
2391 E. Coltman Rd.   (580)762-8253
Ponca City, OK 74604

TITLE
BB3 AUTONOMOUS FIRE CABLE

SSCI-PN
WBB3AFIRE-1

REV
-

1 OF 1