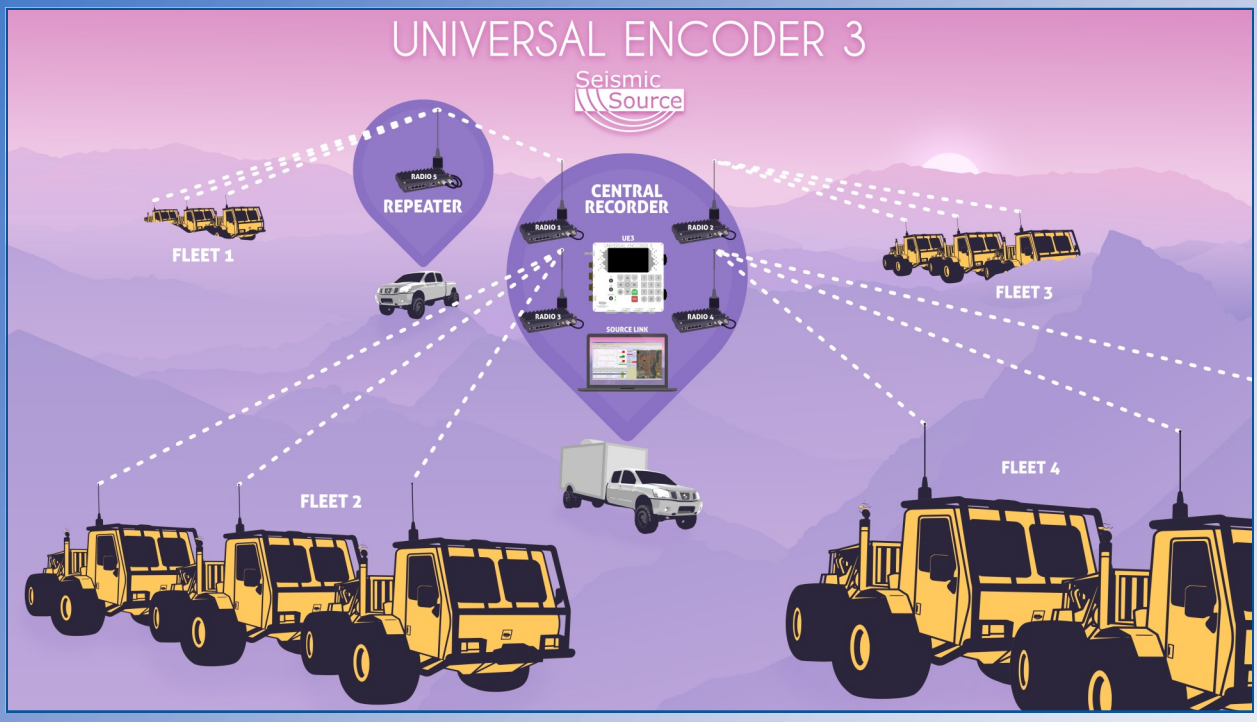
Source Control System

Ultra-High Production Acquisition



Ultra-High Production Vibroseis

Ultra-**H**igh **P**roduction **V**ibroseis (***UHPV***) means:

- More sweeps per shift
- Better data per sweep
- More vibrators per crew
- Better communications with fleets of vibrators
- Better data quality control
- More robust acquisition
- Better production reports and information tracking
- Crews equipped with **UHPV** technology have eclipsed 50,000 shots per each 24-hour day.

UHPV requires: SourceLink software; one or more Universal Encoder 3 units; and vibrators equipped with Force 3 controllers.

SourceLink, UE 3 and More

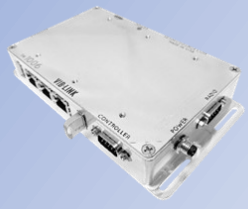
SourceLink, the **Universal Encoder 3,** and the **Force 3** Vibrator controller form the **UHPV** system; to increase the overall quality and quantity of data.

SourceLink has a simplified QC interface and an intuitive COG display for improved operation of multiple fleets of vibrators.

Universal Encoder 3 interfaces between the **SL** and the **Force 3** units to improve communications.

Force 3 decoder controls the vibrator and stores timebreaks and accelerometer signals when unit is out of radio communication range.

This system can include both the **Boom Box 3** for explosives and the **Remote Trigger Module 3** for mechanical impulsive sources.



Introducing VibLink & NavLink

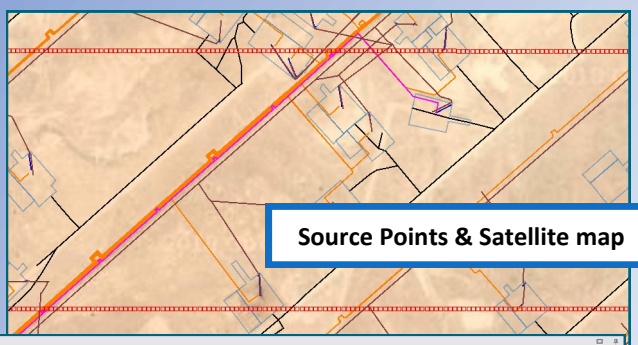
VibLink is a communication system help vibrators and the Central Recorder communicate easier and faster. **VibLink** is capable of delivering messages across many nodes without collisions. With NavLink individual vibrators can make decisions based on time/distance rules autonomously. Together, they increase the field crew's data production.

SourceLink Software

A Ultra High-Productivity Solution

Ultra-High Production Vibroseis (UHPV) means more vibrators doing more sweeps per shift than ever before. The **UHPV** technique requires new and improved hardware and efficient software to accommodate these new production levels.

SourceLink Software together with the **UE 3** is a breakthrough in technology that allows the **UHPV** technique to be implemented.



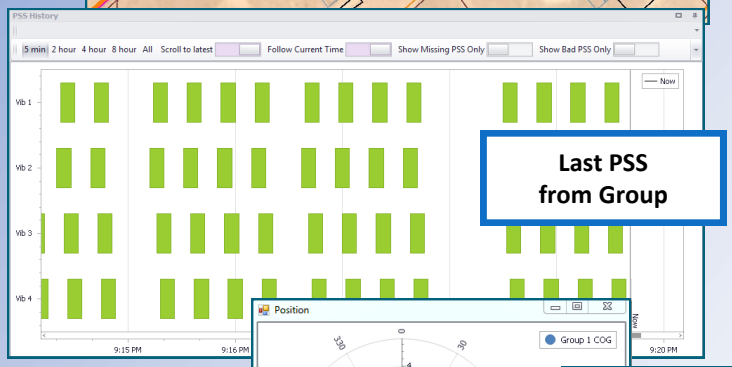
Acquire Data Fast

UHPV demands met by:

- Simplified QC interface
- Intuitive COG displays
- Improved operations of large fleets
- UE3 group cluster support

SourceLink features:

- PSS view time domain
- Last X PSS for a given unit
- PSS overview for all vibrators and fleets
- Source Coordinator
- Groups “at a glance”
- COG targeting



Acquire Data Efficiently

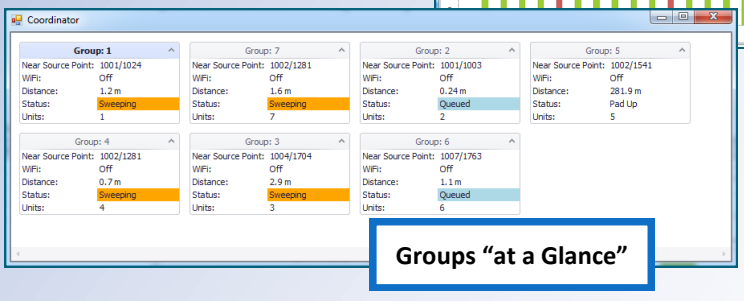
SourceLink Software:

- Complete crew control and management
- Connects to the encoder
- Easy switch between source types
- Includes queuing for maximum efficiency
- Provides source locations for accuracy
- Processes PSS and PFS messages for quality control
- Generates End-Of-Day and End-Of-Project reports for confidence

A Complete System

Everything Required for Acquisition:

- SourceLink Acquisition Management Software
- Universal Encoder 3
- Force 3 Vibrator Controller
- Plus the other SSC Decoders



Universal Encoder 3 - UE3

A Ultra High-Productivity Solution

UE3 Features:

- **Compatibility** – UE3 is 100% compatible with the Force 3 system. Boards can be used as spares for the Force 3 system
- **Reference Flexibility** - Multiple Digital and Analog References
- **GPS Discipline** - GPS timing and assures starts on even sample boundaries for all continuous recording systems
- **Multiple Radio Support** - UE3 can connect simultaneously to 4 High Speed TDMA radios. These multiple high speed radios assure reliable and efficient communication to all of the vibrator units used in High Production Vibroseis Mode.
- **Digital Radio Support** - UE3 supports the latest Digital Radios
- **Analog Radio Support** - UE3 also supports legacy analog radios
- **Ethernet Radios Support** - The UE3 includes support for low-power VHF-Ethernet radios. These radios have good speed and work well in many applications
- **Digital Radio Sims** - Digital Radio Similarities are now available for UE3 and Force 3 or VibPro HD vibrator controllers
- **External USB Port** - Use USB thumb drive to offload data from remotely operated UE3 units.

Universal Encoder 3 Specifications

Features

Timing	GPS Disciplined
Sweep Resolution	24 bit
Internal Network	100 Mbit Ethernet
Internal Memory	8 Gbytes (expandable)
Acquisition Techniques	Conventional Slip-Sweep (Shell) HFVS (ExxonMobil) ZenSeis (ConocoPhillips) Variable Slip with Distance Interleaved (Flip-Flop) Starts ISSS
Compatibility	Cabled and Nodal Systems
Autonomous Support	Yes
GPS	Dedicated Port
RTCM	Dedicated Port

Source Numbers

Radio Serial Ports	4
Radios per UE3	4
Fleets per Radio	4 (16 fleets total per UE3)
UE3 units per crew	unlimited

Radio Options

Supported Radio Types	Analog, Digital, and Ethernet
50 watt VHF Digital	15+ miles @ 4800 baud OTA
5 watt VHF IP	10+ miles @ 9600 baud OTA
5 watt 900Mhz IP	10+ mile @ 1Mbps OTA

Source Start Protocol Options

Crew Number Range	1 to 250
Start Code Range	0 to 255
Unit ID Range	1 to 64
Sims Range	1 to 63

Physical

Size	11¼ x 9½ x 2¼ inches - 286 x 242 x 57 mm
Weight	5.9 lbs - 2.7 kg
Power Input	10 to 30 volts DC
Power Draw	0.2 amps

Force 3 Controller - F3

A Ultra High-Productivity Solution

Compatible with P-Wave
and Shear-wave Vibrators

Use with SSC's *Universal Encoder 3*

Complete Vibrator Control System
Fully compatible with all servo-hydraulic vibrators
Maximum Force output with minimum distortion
Stable, Fault tolerant system
Automatic Vibrator Calibration
Dual Accelerometer circuits

Meshed Wireless Ethernet System
High speed wireless communication
Vibrator Group messages
Automated group Center of Gravity (COG)
Source Driven operation
Wireless Digital Similarities
Upload Custom Sweeps

GPS Location and System Timing
GPS time synchronization
Use Standard accuracy GPS modules
Satellite-Augmentation and RTK GPS available

Vibrator Navigation Software
SSC Navigator program
Allows Stake-less Navigation

Includes Legacy Mode
Compatible with Standard Radios
Compatible with Standard Timing
Compatible with Standard Crews

Force 3 Vibrator Decoder Specifications

General	
Number of sweeps stored in library	64 standard, custom or linked
Sweep resolution	24 bit
Control system sample rate	250 micro second
Sweep Length	0-65.535 seconds
Sweep Steps	1 millisecond
Sweep Types	Linear, dB/Hz, dB/Oct, T-Power, Random, Pulse, Blaster, Stored, Pause
Sweep Tapers	0-65.535 Seconds (Cosine or Blackman)
Timing synchronization	Set by GPS time or VHF radio message
GPS Compatibility	Standard, Satellite-Based Augmentation Service, Real-Time Kinematic
T0 Accuracy	± 1 microsecond (GPS PPS synched)

Physical	
Size	16" x 12" x 6" (406 x 305 x 152 mm)
Weight	22 lbs (10 kg)
Power	9-36 VDC
Data Storage (Internal 8GB CF)	20,000 12 sec sweeps
External Storage	USB Flash
Built-in Ethernet speed	100 Mbit
Max Number of Vibrators	64
Built-in Ethernet speed	100 Mbit
Radio Compatibility	Analog, Digital, or Ethernet

Force 3 Controller - F3

A Ultra High-Productivity Solution

Featuring:

Autonomous Mode

No Radios
No Repeaters
No Problem!

Force 3 Features

Integrated Radio Interface – Force 3 can be used with almost any radio: Analog, Digital or Ethernet

Integrated GPS Interface – Force 3 can be used with almost any GPS: Standard, Satellite Augmented, or RTK. F3 sends source location back to recording system

Equipped with internal memory – can operate autonomously without radio

Integrated WiFi – Setup and operate Force 3 unit with web browser from phone or tablet

Integrated Ethernet – Control Force 3 directly with SourceLink software

Advanced Acquisition Electronics

The Force 3 Vibrator Control System, or Force 3, is the newest generation of vibrator control system. It is designed to control individual vibes, or synchronize entire fleets of trucks. Using GPS, or VHF/UHF radio, for its time base the Force 3 both starts the Vibrator and controls its sweep with unparalleled precision and accuracy.

The Force 3 is equipped with the latest ADC chips for better sweep resolution, increased computing power for faster response, GPS for precise source location, 8 Gbytes of internal memory for integrated VSS and PSS data storage, and integrated Wi-Fi for easy data offloading.

Force 3 controllers support most available radios, including legacy Analog radios, modern Digital radios and high speed Ethernet-based units.

Advanced Acquisition Techniques

The Force 3 supports all acquisition modes and can switch seamlessly between them. Crews can change between techniques as the environment and situation requires, increasing their acquisition production.

The Force 3 controller's superior electronics generate better sweeps in worse conditions and tougher terrain. This helps ensure better data wherever the crew is operating.

The Force 3 operates either integrated or autonomously. Use integrated mode for multiple fleets of multiple units, or autonomous mode for vibrators in rough or remote terrain.

The Force 3 supports simultaneous control of multiple source types. Crews can record multiple Vibrator fleets, dynamite shooters, AWD weigh drops, and even air gun equipped boats from a central platform.

Small Vibrators

Legacy Vibrators

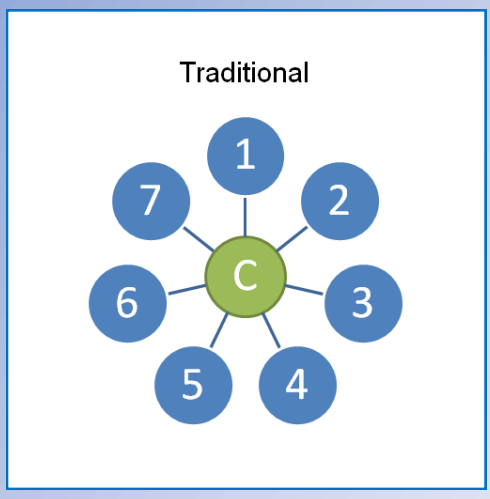
Newest Vibrators

VibLink & NavLink

A New Approach to an Old Problem

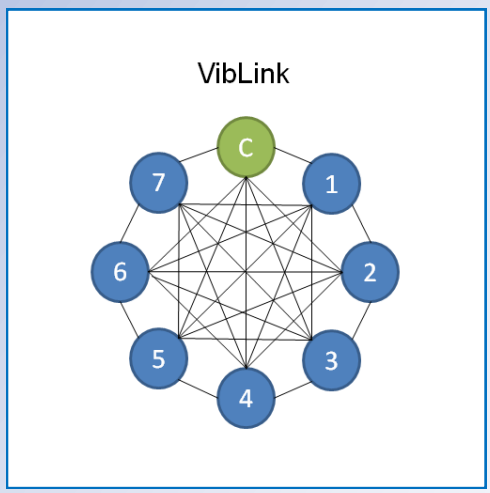
The Problem

- Seismic crews around the world are turning away from traditional acquisition techniques and starting to use high productivity Vibroseis methods
- The goal is to be more efficient, more VPs per day. To achieve this, more vibrators are being used
- More vibrators and high productive techniques require collision management
- Some of the techniques, such as DS4 (time/distance rule) require decision making, which generates extra messages. This inherently causes a slow down



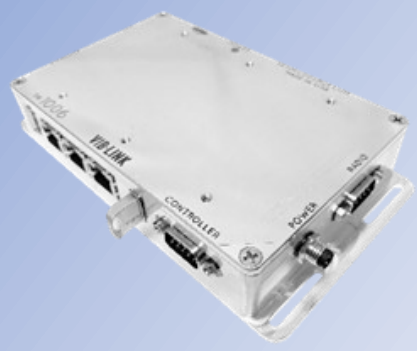
The Solution

- Create a communication system that is capable of delivering messages across many nodes without collision loss over large distances
- Provide a way to allow the individual vibrators to make decisions on the time/distance rules without involving a centralized decision maker

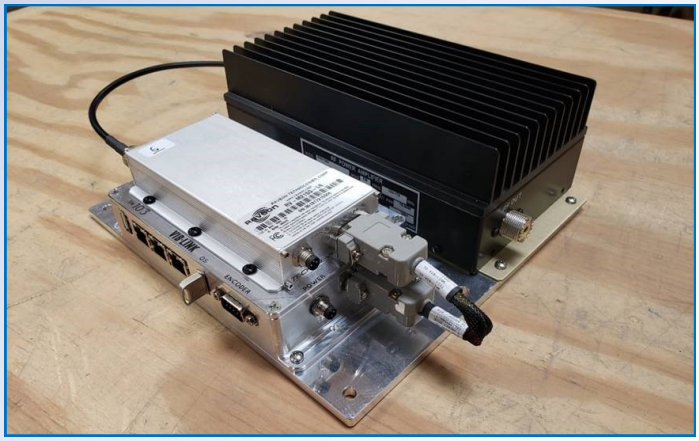


The Hardware

- SSC Radio Control System
- Raveon M8/M21 Digital Radio
- 50W Amplifier



VibLink Module

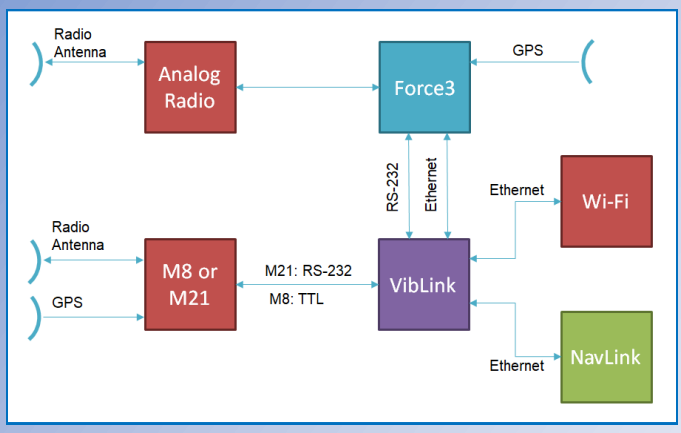


VibLink Unit with Radio and Amplifier

VibLink & NavLink

Hardware/Software for Increased Production

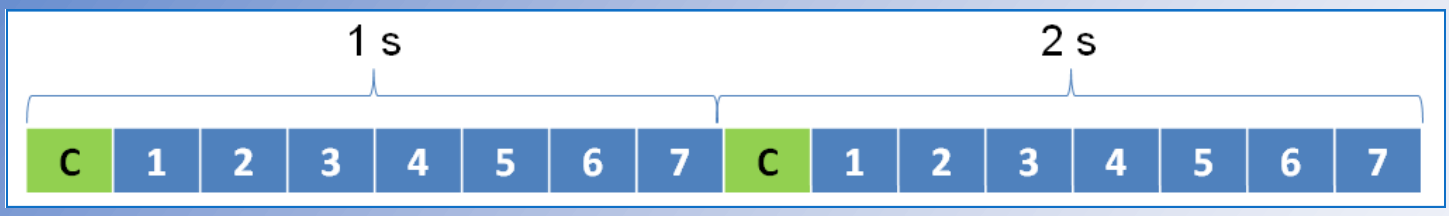
How does VibLink work?



The VibLink module - Each VibLink unit contains a Linux-based co-processor board, a digital radio, and a 50 watt amplifier. The coprocessor implements the TDMA process, the radio handles the communications, and the amplifier ensure the signals are sent out at maximum strength.

The VibLink system - Each vibrator, plus the central recorder, is equipped with a VibLink module. The VibLink module uses advanced TDMA techniques to multiplex seven vibrators and the doghouse on one radio channel. And does this all in one second windows. With additional Vibrators, additional seconds are added.

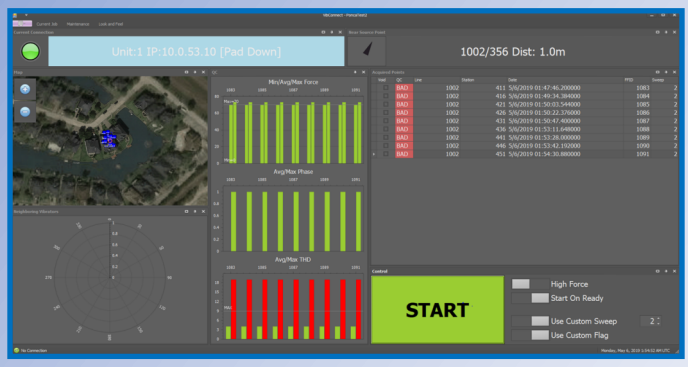
The Universal Encoder 3 uses its time slot to send out status updates and request PSS/PFS data. Each Force 3 controller uses its time slot to send out its location, status, and QC Information.



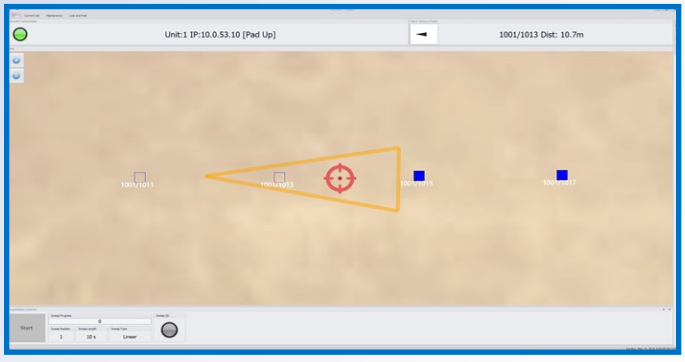
NavLink Software

NavLink is an application that runs on a computer in the vibrator.

- Connects to the VibLink radio and the Force Three unit via network
- Provides full navigation and support for vibrator operation (start, abort sweep, download and save VSS files, etc.)
- Monitors the location and status of all other vibrators
- Displays acquired points from nearby vibrators



NavLink QC Screen



NavLink Operator Screen

Source Control Equipment

Compatible with all SSC source electronics:

The UE3 is compatible with all the acquisition electronics from Seismic Source and iSeis. It is optimized to the Force 3 Vibrator Controller (F3), Boom Box 3 (BB3) and the Remote Trigger Module 3 (RTM3).

The UE3 is also compatible with most recording systems, both conventional and autonomous. Along with SourceLink (SL) software the UE3 brings advance operation to older INOVA, ARAM and Sercel recorders. A UE3/SL system is essential for all nodal recoding systems.

The UE3 is compatible with the Universal Encoder 2 (UE2).

All Decoders Feature:

- External GPS for accurate system timing
- Three 32-bit (24 bits stored) data channels
- All shot information stored internally
- Supports Source Driven operation
- Internal memory for Autonomous operation
- Legacy Mode supports all standard crews

F3 Features:

- Fully compatible with all servo-hydraulic vibrators
- Compatible with most mechanical vibrators
- Generate maximum force with minimum distortion
- Automatic Vibrator Calibration
- Wi-Fi support for source group communications
- Automated Center of Gravity (COG) calculations
- Wireless digital similarities

Boom Box 3 Features:

- Most popular blaster for seismic exploration
- 1 µSec accuracy (GPS mode)
- 400 volt firing voltage
- Wi-Fi supports phone, tablet and computer browser access
- Clip-on battery available for a compact, light-weight system

RTM3 Features:

- Fully compatible with sources large and small
- Triggers from hammer switch or geophone
- ±1 µSec accuracy (GPS mode)
- ±20 µSec accuracy (radio)
- Wi-Fi supports phone, tablet and computer browser access
- Clip-on battery available for a compact, light-weight system