



**FIREFLY**

**Draft Uncontrolled Release**

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***FireFly***<sup>®</sup>  
Field Operations  
Quick Reference Guide

Release 2.0  
1018-010030C  
Rev. PC8  
July 2008

**Full-wave imaging. Put it to work for you.**

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Print date: November, 2007

Original publication date: November, 2007

PDF part number: 1018-010030-0001PC7

To order printed copies of this document, please reference the following part number: 1018-010030-0002C

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### FCC ID: MCV-FSU2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### FCC Modification Rule for User Manuals:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **Warning RF Exposure Compliance**

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 60 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

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## Loading the Equipment

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To load the equipment onto the hasps, perform the following tasks:

1. Load the FSUs and SVSMs onto the hasp
2. Load the external batteries onto the hasp

### Equipment and Time

- A crew of one
- Empty field hasp
- 6 FSUs (Field Station Units)
- 6 SVSMs
- 6 charged External Batteries
- Holding tube for antennas

**Time:** 15 minutes (when performed by single crew member)

### TASK: Loading the Hasp

1. Connect the SVSM to the FSU:
  - a. Connect the sensor connector to the FSU cable connector.
  - b. Wrap the dustcap wires around the connector and connect the dustcaps together.
2. Load the antennas into the holding tubes.
3. Connect and load the remaining SVSMs and FSUs for this hasp until all six FSUs, SVSMs, Batteries and the holding tube have been loaded.
4. Load the equipment onto the hasp by stringing the hasp through the molded loops on the FSU, SVSM and the batteries.

## Equipment Layout/Distribution

For incremental equipment layout distribution:

- Set up the equipment at the receiver location
- Navigate from receiver to receiver, dropping the hasp at every sixth receiver
- Navigate from hasp to hasp

### Equipment and Crew

A crew of three people:

- **Line Boss (LB):** carries NavTool on alignment tool and antennas
- **Helper 1 (H1):** Carries drill
- **Helper 2 (H2)** carries two hasps of gear

**Note** Crew size can be changed depending on the operations layout. The minimum crew will be two.

### TASK: Lay Out And Distribute Equipment

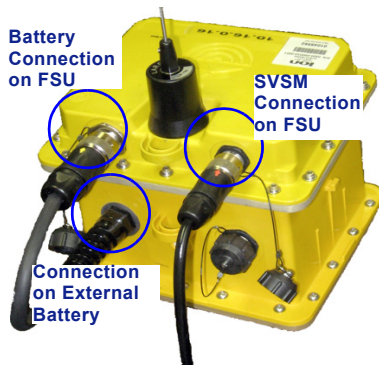
#### 1. Locate hasp (LB).

Use Navtool to locate the hasp dropped by the helicopter or mule, and move hasp to the closest station location.

#### 2. Unload equipment (H1 & H2).

- Secure the helicopter-ground assembly at the first station, and unload the first set of the FSU/SVSM units from hasp.
- Attach the antenna to the antenna mount.
- Plug the SVSM cable into the FSU.
- Plug the external battery into the FSU as shown in Figure 1-1 and wait 30 seconds.

**Figure 1-1. FSU connections**



**3. Place FSU and SVSM (LB, H1&H2).**

- Using NavTool, determine the proper location for SVSM (LB).
- Power on the FSU by swiping with magnet.
- Auger a hole for the VectorSeis sensor (SVSM) and place the SVSM securely in the hole.

**4. Take alignment readings (LB).**

- Keeping the NavTool attached to the Alignment pole, place the Alignment pole over the SVSM to get a reading.

**Figure 1-2. NavTool on Alignment Pole**



- Take a GPS and Compass reading with NavTool and transmit the readings to FSU.

**5. Move to the next station (LB, H1 & H2).**

- Pick up hasp and drill and move to the next station.
- (LB only) Navigate to the next location using NavTool.

**6. Unload equipment (H1 & H2).**

- Unload the next sets of the FSU/SVSM units from hasp and place the units at the station location.
- Plug the antenna, SVSM cable, and the external battery into the FSU. Wait 30 seconds after plugging battery into FSU.

**7. Repeat step 3 and step 4 for all remaining in the hasp (LB, H1 & H2).****8. Move to final station in pack (LB, H1 & H2).**

- Secure the empty hasp at final station that station (H2).
- Use NavTool to take GPS reading for the empty hasp position (LB).

**9. Use NavTool to select next full hasp in the field (LB) and repeat step 1 to step 9.**

## Changing the External Battery

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You can change out an external battery in the field.

### Crew and Equipment

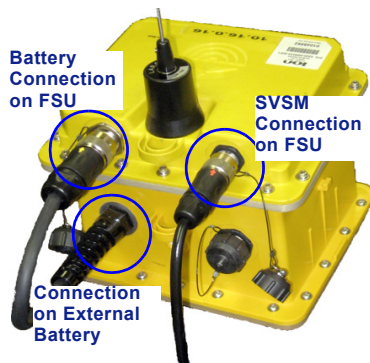
- A crew of two using the buddy system
- Charged external battery and cable
- NavTool
- Magnet
- Hasp (to hold external battery)

**Time:** 15 minutes (when performed by single crew member)

1. Navigate to position for changing battery.
2. Unplug the external battery from the FSU.
3. Plug the new battery into the FSU. The FSU will reboot when the battery is attached.
4. If the FSU does not reboot, power on the FSU by swiping with magnet.
5. Verify that the NavTool connects to the FSU.
6. Place discharged battery on hasp.

The discharged battery should be recharged and checked at the Battery Charging Module.

**Figure 1-3. FSU connections**



## Field Shooting for Dynamite

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### Crew and Equipment

A crew of two:

- **Shooter (S):** Pelton Shot Pro® II firing pack (includes all Pelton equipment), digital compass mounted to firing pack, NavTool, and radio
- **Helper 1 (H1):** Backpack with water, miscellaneous tools, and radio

**Note** The total number of shooting crews will vary depending on the daily production targets, resources and equipment. The communication collision management allows shooting crews to operate independently and in parallel so a higher number of total crews can operate simultaneously, compared to traditional dynamite shooting operations.

### TASK: Shooting

1. **Navigate to the source position using NavTool and take a GPS reading (S & H1).**
2. **Prepare for shooting (S & H1).**
  - (H1 only) Connect the firing line to the cap lead at the drill hole.

- Stretch out the firing line and the geophone line while moving a safe distance (typically a minimum of 100 feet) from this source position in the direction of the next source position, if possible.
- Place the uphole geophone beside the shooting position so that the uphole time of the shot can be measured.
- Remove the Shot Pro backpack and place it upright on the ground. Place NavTool on top of shooting pack (it shows status during shooting and is used for data entry).

### 3. Prepare for shooting (S).

- Press the **READY** button and wait for the ARM notification from the recorder.
- When the ARM notification is received (green LEDs flash on the Shot Pro front panel and the NavTool displays a message), press and hold the two buttons on the Shot Pro to charge the firing voltage and arm the Shot Pro. Continue holding the

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buttons until the FIRE command is received.

**Figure 1-4. Pelton ShotPro**



**Warning** At this point, the shooter has control over the shot detonating. If the area around the shot hole is not clear, the shooter can release the buttons to abort the shot.

### **4. Take the Shot (S).**

- When the FIRE command is received and the shot is detonated, release the charge buttons.
- Select the shot status (good, misfire, or blow out) on the NavTool before moving to the next shot point.
- If the shot was a misfire, retry the shot. You do not need to radio the mis-fire into the recorder over voice radio. The system automatically puts the shooter back into the shooting queue to try the shot again.

### **5. Clean up and navigate to next position (S&H1)**

- (H1) Clean up the detonated shot hole.
- (S) Put the Shot Pro backpack on and use NavTool to go to the next position.

### **6. Repeat step 2 through step 5 for all assigned source positions for the day.**

**Note** If the Helper (H1) is lagging due to cleanup duties, the Shooter (S) should navigate to the next source position alone and connect the firing line to the cap lead himself.

## FSU/SVSM Pickup

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### Equipment and Crew

The pickup crew will be the same size as the deployment crew.

- **Line Boss (LB):** carries NavTool on alignment tool and hasp.
- **Helper 1 (H1):** Carries extraction tool and miscellaneous equipment.

**Note** Crew size can be changed depending on the operations layout. The minimum crew will be two.:

### TASK: Pick Up Equipment

#### 1. Locate hasp (LB, H1 & H2).

- Use NavTool to navigate to empty hasp (LB).
- Pick up hasp and open it (H1).

#### 2. Navigate to first station (LB, H1 & H2).

#### 3. Pick up FSU, SVSM, and battery and put into hasp (LB, H1 & H2).

- (LB only) Verify the FSU ID by tapping the appropriate button: Picked up, Other FSU Picked Up, or No FSU Picked Up.

- (H1) Retrieve SVSM, using extraction tool if necessary.
- (H2) Gather the FSU, SVSM, and external battery and place them onto hasp.

#### 4. Navigate to next position and repeat step 3 (LB, H1 & H2).

#### 5. Move to final station on a hasp (LB, H1 & H2).

- Ensure that all ground assembly equipment is on the hasp.
- Secure the hasp, place it into the helibag, and attach the helicopter lanyard to it.
- Use NavTool to take GPS reading for the helibag (LB).

#### 6. Use NavTool to select next full hasp in the field (LB) and repeat step 1 to step 5.





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