



## EK80 SAT procedure

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## Document history

Revision	Description of Change
A	First Issue
B	Generic update, new standard structure
C	Generic update, EC150-3C added
D	Rewrite and simplify the procedure

## References

No	Doc No	Description
1	395234	EK80 Reference manual
2	394149	EK80 Installation manual
3	438371	EC150-3C Installation manual
4	401925	EK80 HAT procedure
5	N/A	Delivery system interconnection and setup documentation (supplied by ship owner)

All the Kongsberg referenced documents can be found and downloaded from:

<https://www.kongsberg.com/ek80docs>

## Disclaimer

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## 1 INTRODUCTION

The purpose of this Sea Acceptance test (SAT) is to make sure that the echo sounder and the Acoustic Doppler Current Profiler (ADCP) installed on the vessel are correctly installed, and fully functional. The test assumes that the Harbour Acceptance Test (HAT) has been performed previously on the same system, and that it has been approved.

After the SAT, the Customer Acceptance Form must be signed by the relevant parties. The completed document then becomes the official report. Data logged during the SAT must be downloaded and stored on Kongsberg Maritime internal servers for future reference.

### 1.1 Personnel and location

This SAT is done at sea with all systems operational. The test is done by personnel from Kongsberg Maritime, or by a representative from an authorized dealer or distributor. The personnel performing the SAT must be qualified operators of the system and have received proper training.

## 2 SAT PROCEDURE EK80

### 2.1 Verification of previously tested items

Sign the table below to witness that no changes have been made to the installation since the HAT.

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**Note!** *It is not necessary to fill in registration tables for software and hardware items that have already been registered in the HAT.*

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If the software has been updated, record the new software version in **Table 3 List of Items**. If hardware changes have been made (units are replaced), all serial numbers must be recorded in the table again.

Verification	
By checking the boxes and signing I verify the following:	
	Yes    No
Has software been changed since HAT?	<input type="checkbox"/> <input type="checkbox"/>
Have hardware items been changed since HAT?	<input type="checkbox"/> <input type="checkbox"/>
Have installation parameters been changed since HAT?	<input type="checkbox"/> <input type="checkbox"/>
Comments	
Date and signature	

## 2.2 Verification of sensor input

1. Make sure all units are powered on.
2. Check that all sensor inputs are OK.  
All values in the EK80 Top bar will be in the colour blue when the inputs are received and updated correctly.
3. If the ADCP is included in the installation, make sure that the EK80 and the ADCP is synchronised to an available NTP server.

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**Note!** *If the ADCP is included in the system, it is essential that the ADCP and the motion sensor are synchronised to an available NTP server for accurate timing.*

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### 2.3 Functional test of echo sounder

Test each channel separately and go through this procedure for each channel. Operate and test the channels both in CW (Continuous Wave) and LFM (Linear Frequency Modulation) mode, where applicable.

If the EC150-3C is part of this installation, use **Echo Sounder** mode for this test.

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**Note!** *If the vessel has a drop keel, make sure the transducers are in the water when pinging is activated. Pinging in the air may damage the transducers.*

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1. Set one channel in EK80 to **active** and the others to **passive**.
2. Start pinging.
3. Make sure that the echograms look normal.
4. Make sure that echoes in the water column are detected and shown as expected.
5. If possible, make sure that the sea bottom is detected.
6. Repeat for all channels.

### 2.4 Functional test of ADCP

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**Note!** *Make sure the ADCP is in water when pinging is activated. Pinging in the air may damage the transducer.*

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1. Configure the EC150-3C to **ADCP** mode.
2. Start operation of the EC150-3C.
3. Operate the EC150-3C in both CW and LFM mode.
4. Make sure that the velocities indicated in the user interface look normal and as expected.
5. If possible, make sure that the sea bottom is detected.

## 2.5 Noise measurements

To fully utilize the system's capabilities, it is important to achieve the best possible Signal to Noise ratio (SNR) for the installation. The first step is to follow the guidelines given in the installation manual.

For a ship installation, there are other systems and noise sources that inevitably will influence the SNR. It is still important to optimize the installation and keep the influence at a minimum. Kongsberg Maritime can provide a report showing the achievable noise levels during ideal conditions.

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**Note!** *Be aware that lower frequencies can be affected by noise caused by ambient noise like waves and wind. It is therefore important to note the conditions in which the data was recorded.*

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### 2.5.1 Setup of system for noise checks

Set up all the channels in **Normal Operation** dialog box, including the EC150-3C.

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**Note!** *The EC150-3C must be configured in ES mode during the noise measurements.*

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Use the following pulse configurations and settings:

- **Pulse Type:** LFM  
**Mode:** Passive  
**Pulse Duration:** 2.048ms  
**Power:** maximum  
**Ramping:** Fast.
- For frequencies where LFM is not available:  
**Pulse Type:** CW,  
**Mode:** Passive  
**Pulse Duration:** 1.024ms  
**Power:** Maximum  
**Ramping:** Fast
- For EC150-3C in ES mode:  
**Pulse Type:** LFM,  
**Mode:** Passive  
**Depth Cell Size:** 2  
**Max Velocity:** 10 m/S  
**Power:** Maximum

Other settings:

- **Range:** 2000 m (range for echograms)
- **Ping Mode:** maximum
- Turn off bottom detection.
- **TVG:** Sv (20 log)
- **Echogram threshold:** -70 dB



### 2.5.2 Record Noise data

It is important to log noise data with different ship speeds, including different propeller rpm and pitch. The data must be logged with ship speeds from 0 kts with the propeller off, and up to 12 kts. Log at various speeds and propeller pitch/rpm combinations up to 12 kts. To reduce the number of combinations, focus on the ship's standard survey speeds. If possible, turn off all acoustic transmitters during the noise data collection.

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**Note!** *Parameters like ship speed, propeller rpm and pitch and water flow over the ship's hull will affect the background noise levels in the lower frequencies.*

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1. Enter the wind speed, sea state and water depth in **table 4 Speed/noise table**.  
Wind speed is measured using the Beaufort wind force scale.  
Sea state is measured using the WMO (World Meteorological Organization) sea state table  
Water depth metrics is meter.
2. Enter the different ship parameters in **table 4 Speed/noise table**.
3. Ensure that that the raw data file names can be correlated to the different parameter settings. This can be done using a prefix to the file name.
4. Record data for 5 minutes for each combination of parameter settings.  
If needed, copy the table to add more combinations. Record data for all echo sounders at the same time.
5. Read the noise estimate value in the **Diagnostics -> NOISE** in the **Setup** menu.  
The values will be different for each ping. Calculate an average over 10 pings and enter the value in the table.

## 2.6 Calibration

Perform a calibration of the system. Please refer to the reference manual for details on how to perform a calibration.

### 2.6.1 Calibration of echo sounder

1. Configure the channel with the following settings:
  - a. **Pulse Type:** CW
  - b. **Pulse Duration:** 1.048 ms
  - c. **Ramping:** Fast
  - d. Transmit power is selected according to Table 1.
2. Start recording data.
3. Start calibration for the selected channel
4. Check the calibration results for all echo sounders and make sure that they are OK.
5. Apply the new calibration values to the system.
6. Repeat the procedures for all the echo sounders installed.

Table 1 Maximum transmit power vs frequency.

Frequency [kHz]	18	38	70	120	200	333
Max input power [W]	1600	2000	300	250	105	40

### 2.6.2 Calibration of ADCP

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**Note!** *You can't calibrate for current velocity measurements with "live" data. All data must be recorded before starting the calibration process.*

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1. Log data for ADCP calibration.  
The survey pattern for calibration of the ADCP is described in the reference manual.
2. Calibrate the logged ADCP data.
3. Make sure that the calibration values look OK.
4. Apply the new calibration values to the system.

## 2.7 Data download

If no restrictions exist, download the data to an external disk and bring it home for storage on the Kongsberg Maritime local server. The data will be used for future reference. Alternatively, the technical report must include screenshots of installation menus and echograms for documentation.

### 3 LIST OF ITEMS

Fill in the units included in the delivery

Item	Item	Item no	Item information
1	Processor unit		Model:
			Serial no.:
2	Ethernet Switch		Model:
			Serial no.:
3	EK80 Software	N/A	Version:
4	WBT #1		FW version:
			Serial no.:
5	WBT #2		FW version:
			Serial no.:
6	WBT #3		FW version:
			Serial no.:
7	WBT #4		FW version.:
			Serial no:
8	WBT #5		FW version:
			Serial no.:
9	WBT #6		FW version:
			Serial no.:
10	Transducer #1		Model:
			Serial no.:
11	Transducer #2		Model:
			Serial no.:
12	Transducer #3		Model:
			Serial no.:
13	Transducer #4		Model:
			Serial no.:
14	Transducer #5		Model:
			Serial no.:
15	Transducer #6		Model:
			Serial no.:

Item	Item	Item no	Item information
16	ADCP Enter both the 6-digit S/N (EK80 transceiver installation) and the 3-digit S/N (EK80 transducer installation and unit label).		Model:
			Version:
			Software Version:
			Serial no.: /
17			
18			

**4 SPEED/NOISE TABLE**

Wind (ref Beaufort scale)		Sea State (re WMO)		Water depth in meters						
Tag	Speed [kts]	Propeller rpm	Propeller pitch	Noise estimate [dB]						
				18 kHz	38 kHz	70 kHz	120 kHz	200 kHz	333kHz	EC150-3C

Tag	Speed [kts]	Propeller rpm	Propeller pitch	Noise estimate [dB]						
				18 kHz	38 kHz	70 kHz	120 kHz	200 kHz	333kHz	EC150-3C

## 5 CHECK LIST

<i>Pos</i>	<i>Test operation</i>	<i>Result</i>		<i>Specifications</i>
		<i>PreSAT</i>	<i>SAT</i>	
2.1	Verification of previously tested items			OK
2.2	Verification of sensor input			OK
2.3	Functional test of echo sounder			OK
2.4	Functional test of ADCP			OK
0	Noise measurements Record noise data and fill out check-list			OK
2.6.1	Calibration of echo sounder Record data and perform calibration			OK
2.6.2	Calibration of ADCP Record data Perform calibration			OK
				OK
2.7	Data download			OK

Comments:

**6 CUSTOMER ACCEPTANCE FORM**

The SEA ACCEPTANCE TEST for the EK80, for ..... has been performed according to the test procedure.

**The test is: Accepted / Not accepted** *(Delete as appropriate)*

Remarks:
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Please use capital letters:

Test performed by:	Position:	Company:
		Kongsberg Maritime AS.
Test witnessed by:	Position:	Company:
Date:	Signature:	