ECHOTRAC E20

Echotrac E20
Singlebeam Echosounder

OPERATOR'S MANUAL

Version: 14

Teledyne Odom Hydrographic

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REVISION HISTORY

Version	Date	Remarks
14		3.4, table 4: List of supported transducers updated (with new “unknown” 50kHz). B.3: Pins 2 and 3 updated.
13	4 Sep 2023	3.3.1: 1st paragraph revised. Added: bullet with NMEA 0183 $SDDBT example; note box. 3.4: NEW “unknown” LF transducers added (10/28/40kHz). 4.4.2: First screen shot updated. 4.4.3.1: Item (a) revised. 5.4: Updated screen shot (no Bar check). NEW 8.1.5: SBES Settings. 8.1.6: Updated screen shot of Settings. C.4: “DESO25 (for depth)” revised. C.5: “NMEA 0183 DBS, Depth Below Surface” revised. NEW C.6: NMEA 0183 DBT, Depth Below Transducer. C.7: Note box added below table 23.
12	3 May 2023	0.3: Glossary updated. 1.2: Updated. 2: Safety Precautions chapter moved before Product Description chapter. 3.1: Transducer interfaces: Impedance updated. 3.3.2: 2nd bullet updated. 3.4: Cross-reference added (to new section 8.1.5). 3.5, table 5 updated (Position > Navigation; NMEA HDT added). 4.4.2: (a) and (b) updated. NEW 6.4: High-Frequency Gating. NEW 8.1.5: Updating Transducer Models. 8.3.2: Caution added to bullet list. D.1: 1st paragraph of Limited Warranty elaborated. (appendix on System Options removed.)
11	3 Jun 2022	Cautions added about not transmitting without a transducer: 3.2: last bullet added. 5.2: Caution boxes added to 5.2.1 and 5.2.2.
10	23 Sep 2021	Screen shots updated in 4.4.1, 4.4.2, 5.2.1.3, 5.2.2.1, 5.2.2.2, 5.2.2.3, 5.4, 6.2, 8.1.3. 2.1: Table 3 updated (SYNC connector). 2.4: Neptune 390 200kHz added to table 4. 4.2.1: Table 6 updated (SYNC with Status LED). 4.4.1: New item (d) on draft and index added. 5.2.1.3: Bullets and Note box updated. 5.2.2.1: Second bullet updated. 5.2.2.2: Note box updated. NEW 6.3 Gates. NEW 6.4 Print. 8.1.3: "E20 System Tool" > "SBES System Tool". C.6: > "the following three strings" (not "two"). App. E: Standard Warranty Information updated. App. F: Support and Service updated.
9	27 May 2021	2.2: Performance table updated.
8	25 Nov 2020	2.3.3, table 4: Some details updated. Two Airmar transducers added (DF). 2.4, table 5: OCTANS > OCTANS TAH. A.1: New no. for DFD document, and footnote added.
7	24 Jul 2020	2.1: Power consumption: 100W > 50W. (also table 6 and hazardous voltage graphic in 4.2.1). App. A.2: Figure 12 updated.

Version	Date	Remarks
6	16 Mar 2020	2.3.1: Expanded with UDP port. 2.4: Table 4 updated with Odom HM15-17 15kHz 17deg; unknow 15kHz; Kongsberg Simrad 38/200; Airmar R509LM 28-60/80-130 NB; Airmar R509LM 28-60/80-130 WB. 4.4.1: Item e) added plus new screen shot. 4.4.2: Expanded with UDP details. 4.4.3: Expanded with NTP server (incl. new subsection) and Info box on multiple time sources active. 4.4.3.1: Revised. NEW 4.4.3.2: NTP server for time synchronization. 4.4.3.3: Revised and expanded with UDP details. 5.2: Expanded to reflect extended UI layout/features with subsections for Mobilize modes for setup and testing, and Survey modes for operation. NEW 5.4: SBES UI BITE. NEW 6.2: Marking. 8.1.3: Revised plus various new screen shots. App. C heading expanded with “UDP”. App. C.1: Time status updated in Table 14 for Echotrac DBX.
5	30 Oct 2019	1.3: Description of BITE updated. 2.1: Table 3 with specifications updated. 2.3.1: Heading corrected (Ethernet removed). 2.3.2: Elaborated with mention of main record types. 2.4: Five “unknown” single-frequency transducers added to list. 2.5: Table 5 with supported auxiliary sensors expanded. 2.6: Signed Declaration of Conformity added. 4.2.1: Sync connector updated in table 6. 4.2.2: Updated/elaborated front panel descriptions. Footnote added with cross-reference to 8.1.3. 4.3: Info box moved to section 4.3.4 on over the side-mount. 4.3.1: Warning added regarding safety of personnel and boat. 4.4.1: Instructions and information box about selection of generic “unknown” transducers added. NEW 4.4.3: Time Synchronization. 5.2: Figure 8 updated. NEW 5.2.1: Config Mode. 5.2.2: Elaborated description of automatic mode. NEW 5.3: Standalone Operation. 8.1.2: Maintenance clarified. 8.1.3: Heading now: System Tool – E20 Software Update (was 8.1.4). 8.1.4: Recovery elaborated (was 8.1.3). 8.2: Footnote added about manufacturer’s instructions. B.3: Pin 3: PPS in
4	5 Jul 2019	2.2.1: Cross-reference to App. C added; CV200 Heave removed. 7.3: Default COM port settings and tab name corrected. NEW: App. C Serial Output String Formats.
3	25 Jun 2019	0.4: PN 1012317-DK and 1012320-DK descriptions elaborated. 2.3: Supported transducers in table 3 updated and expanded.
2	3 Jun 2019	0.4: PN 1014481-DK cable added; quantity changed to 2 for PNs 1012317-DK and 1012775-DK. 2.1: Ping rate updated. A.2: Drawing of cable assy PARTD20639 added. Part numbers added to table and below drawings.
1	25 Mar 2019	Initial release

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0 PREFACE

This Operator's Manual provides detailed procedures for the correct installation, operation, and maintenance of the Echotrac E20 Singlebeam Echosounder system.

Before the system is operated for the first time, it is recommended that users familiarize themselves with the contents of this manual to ensure optimal system performance.

If you require additional information or need clarification of any part of this document, please contact Customer Support for assistance at reson-support@teledyne.com.

0.1 Document Conventions

Hyperlink	Indicates a hyperlinked cross-reference. Click the word to be taken to the specified reference point.
Numbered list	Indicates stepwise instructions to be followed in a particular order.
Bulleted list	Indicates items of a list without any particular order.

0.2 Warnings, Cautions, and Notes

Throughout the manual the following definitions apply and in the format shown.

Warnings alert the user to potential harm to personnel. Ignoring warnings may lead to injury, health hazards, or death.

Cautions alert the user to improper use of the system. Ignoring cautions may lead to accidental damage to the equipment or loss of data.

Notes provide additional system or operating information not related to the safety of personnel or equipment.

If you require additional information or need clarification of any part of this document, please contact the customer support hotline at +45 20 999 088 (Europe) or +1 805 233 3900 (US).

0.3 Glossary

Entry	Definition
1PPS	One pulse per second (the same as PPS)
BITE	Built-In Test Environment
BW	bandwidth
CE	Conformité Européenne
COM	serial port interface (communication port)
CW	continuous wave
DGPS	Differential Global Positioning Systems
E20	Echotrac E20 echosounder
ER	extended range
FM	frequency modulation

Entry	Definition
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HF	high frequency
HFG	high frequency gating
IHO	International Hydrographic Organization
IP	IP Code, Ingress Protection Rating is a classification system that rates to what degree an enclosure is protected against the intrusion of solid objects (incl. dust) and water.
LAN	local area network
LED	light-emitting diode
LF	low frequency
LINZ	Land Information New Zealand
N/A	Not available or not applicable
RMA	Return Material Authorization
RX	receiver
SBES	singlebeam echosounder
SL	source level
SVP	Sound Velocity Probe
SYNC	synchronization
TBD	To Be Defined
TVG	Time Varied Gain
TX	transmitter
UI	user interface
VDC	volts direct current

0.4 Inventory

Table 1: Standard scope of delivery

Description	Quantity
Echotrac E20, single channel or Echotrac E20, dual channel or Echotrac E20-ER extended range, dual channel	1

Part number	Description	Quantity
1013730-DK	Shipping case with handles, E20 and accessories, 585x361x238mm, 6kg	1
SB9999/00057	Cable, power, 230 volt, EU standard, 2.5m	1
88100610	Cable, power, 230 volt, UK standard, 2.5m, black, w. ground	1
60000002	Cable, power, 3-Cond NEMA5-15P TO IEC Feller 2.0m	1
1013300-DK	Cable assembly, AC/DC (mains / 24V) power supply with 7/8 connector with 3 pins	1
1012776-DK	Cable assembly, DC power supply, singlebeam, 7/8 male to crimpring, 5m	1
1012734-DK	Cable assembly, Ethernet RJ45 metal plug screw with protection cap, to standard RJ45, 5m	1
1014481-DK	Cable assembly, M12-A, 4-pin male to DSub 9-pin female, 2m Cable Assy, M12A 4 P male to DSub 9 P Female X=2m	2
1012635-DK	Bag, zipper, neoprene, light blue 250x200x8mm, TELEDYNE MARINE logo and www	1
1012317-DK	Connectors for Serial and Sync (M12-A, 4-pin) with protection cap CONN,CIRC,SCREW,M12,4p,250V,4A,STRAIGHT M, for cable mount, CL3 (reference M12-A connector 4 pole male, e.g. GT271154-31040)	2
1012775-DK	Dust caps for serial connector CONN,CIRC,M12,M,DustCap,Cap Plastic for M12 male end, with lanyard	2
1012320-DK	Connectors for Transducers 7/8” with 5 pins with dust caps CONN,CIRC,SCREW,7/8,5p,600V,8A,STRAIGHT M, for cable mount (7/8“ connector 5 pole male, e.g. GT272254-32050)	2
1012767-DK	Cable Assy,DustCap Plastic for 7/8 male end with cord, 120mm	2
1013728-DK	Memory stick, USB - for manuals and SW, Echotrac E20	1
1013740-DK	Quick Reference Guide, Echotrac E20	1
1013832-DK	Quick Start Guide, SBES User Interface	1

Table 2: Optional components

Part number	Description
1013713-DK	Cable Assy, Converter transducer cable, 7/8 5 pole male to mill spec 5 pole female(PT01J-14-5S), 40cm Enables connection of transducers with military connector (CV100/200/300/MKIII standard) to the Echotrac E20 (7/8" 5 pole).
1013700-DK	Cable Assy, Extender transducer cable, 7/8 5 pole male to 7/8 5 pole female, 25m

Please contact Teledyne Marine for consultancy on our available transducers, DGPS position and motion sensors, sound velocity profilers, or specialized hydrographic software solutions.

1 INTRODUCTION

1.1 System Overview

The Echotrac E20 Singlebeam Echosounder is a dual or single-channel echosounder. The Echotrac E20 is addressing the need for a more compact echosounder for classical day-to-day hydrography on a vessel of opportunity or as a fixed installation on a survey boat. The system is portable, ruggedized, and watertight.

Figure 1: Echotrac E20 Singlebeam Echosounder System

1.2 System Architecture

A typical Echotrac E20 survey system consists of the following main components:

- Echotrac E20 singlebeam echosounder
- Transducer
- DGPS sensor, heave sensor, heading sensor (optional)
- Sound velocity profiler
- Laptop with SBES UI and hydrographic software

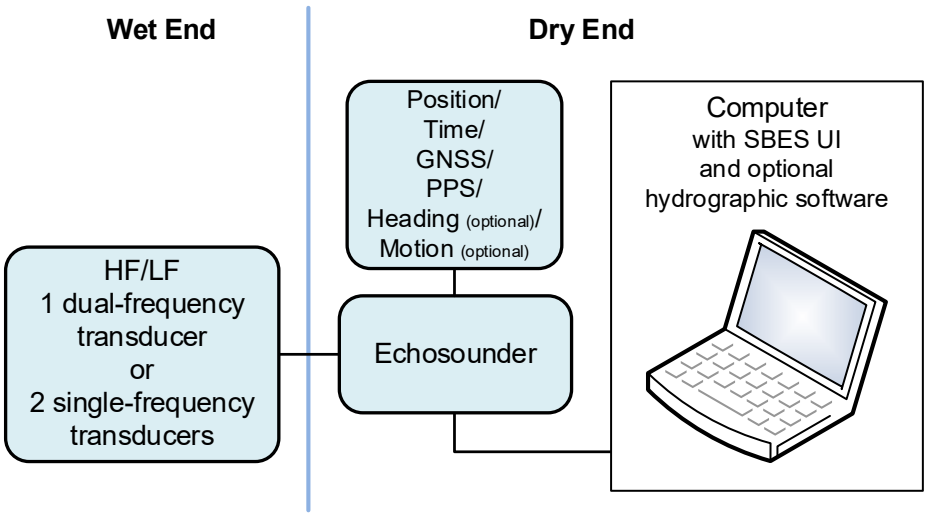


Figure 2: Echotrac E20 Singlebeam Echosounder System Configuration

1.3 Main Features

- **Bottom detection:** The Echotrac E20 provides the most reliable and robust bottom tracking available for precise and repeatable survey results. Its bottom tracking algorithms are based on our multibeam and singlebeam experience and relies on the proven technology from SeaBat, Echotrac, ParaSound, and HydroSweep sonars.
- **Built-In-Test-Environment (BITE):** The BITE is an integral part of the sonar processing unit monitoring the status of the internal electronic sub-systems. The BITE function is designed to inform the operator that the system is performing normally and, therefore, that vessel time is being utilized effectively. In the event of any errors, the operator is informed immediately for prompt troubleshooting.
- **Dual channel:** The Echotrac E20 dual-channel echosounder offers the full flexibility for simultaneous two-channel survey operation in shallow waters.
- **Extended Range (ER):** If deeper water surveys are required, or in environments, where more acoustic power is required, the Echotrac E20-ER provides all the power needed, enabling survey down to 6000m, a max. output of 2-3kW (depending on transducer), and longer chirped pulses.
- **SBES User Interface:** Intuitive user-friendly operator software.
- **Standard data output:** The Echotrac E20 provides bathymetry and echogram data in a standard format for easy interfacing.
- **Automatic operation mode:** Based on the reflectivity of the seabed this mode automatically optimizes all sonar settings. The Automatic mode maximizes the ping rate and optimizes other sonar settings for bathymetry data acquisition by ensuring that returning echoes are not saturated. The Automatic mode is designed to reduce operator workload and skill level requirements, and thus reduce risk of operator error.

1.4 Typical Applications

- As-built surveys
- Coastal mapping
- Environmental research
- Habitat mapping
- Harbor mapping
- Hydrographic surveys to IHO, LINZ, and U.S. Army Corps of Engineers standards
- Pre- and post-dredging and condition surveys
- River surveys
- Site clearance surveys

2 SAFETY PRECAUTIONS

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Teledyne assumes no liability if this product is operated in an unsafe manner.

Use of the equipment in a manner not specified by the manufacturer may affect warranty situation (see *Appendix D – Standard Warranty Information*).

2.1 Operator Safety

The Echotrac E20 system should be handled with attention to operator safety as well as protection of the hardware components. General precautions include:

- **Do not** connect or disconnect cables with the power on.
- **Do not** attempt to open and service the E20 echosounder without specific instructions from Teledyne Marine.
- **Do not** attempt to open and service the transducer.

Exposure to high-energy acoustic transmission, even outside the audible frequency range, may cause severe health injury.

Avoid direct exposure to acoustic transmission:
- **Wear hearing protection while in same room during higher energy tests.**
- **Make sure not to be in direction of sound transmission or directly behind the transmitter during emission.**

Hearing protection must be worn when in the vicinity of low frequency high power transducers to avoid any hearing loss.

This icon on any of the components implies hazardous voltage on output connection.

2.2 Equipment Safety

Use appropriate discretion when handling the system components. The following list includes general precautions:

- Inspect each transit case or shipping box for physical damage prior to opening, and each component for physical damage before installation.
- Use original shipping boxes to provide adequate packaging and shock absorption when shipping or storing the equipment.
- Be careful to lift the equipment correctly, as it may be heavy.
- Do not drop the equipment.
- Do not connect or disconnect cables at the rear of the E20 while the unit is running. This can damage the internal workings.
- Do not scratch the transducer. Place the unit on a clean surface and away from items that may damage it.

- Do not lift the equipment by the cables.
- Do not bend cables beyond the recommended limits.
- Do not exceed operating and storage temperature limits.
- Unused connectors should be sealed with dummy plugs.
- Do not place any objects on top of the E20 and do not expose the unit to direct sunshine, as this may cause the unit to overheat.
- Do not transmit without a transducer attached to the E20 or with the transducer in air.

2.3 Safe Disposal of Waste (WEEE Directive)

The use of the logo to the left indicates that this product is subject to directive 2012/19/EU, known as the Waste Electrical and Electronic Equipment Directive.

The WEEE Directive specifies that used electric/electronic equipment may not be treated as household waste, but must be sorted separately for disposal. By ensuring this product is disposed of correctly, you will help protect the environment.

For more details about the recycling of this product, please contact your local authority, your household waste disposal service provider, or Customer Support at reson-support@teledyne.com.

3 PRODUCT DESCRIPTION

Stated accuracies and depth ranges are frequency and transducer dependent and may be impacted by other auxiliary equipment, environmental conditions, vessel installation, and motion.

3.1 Specifications

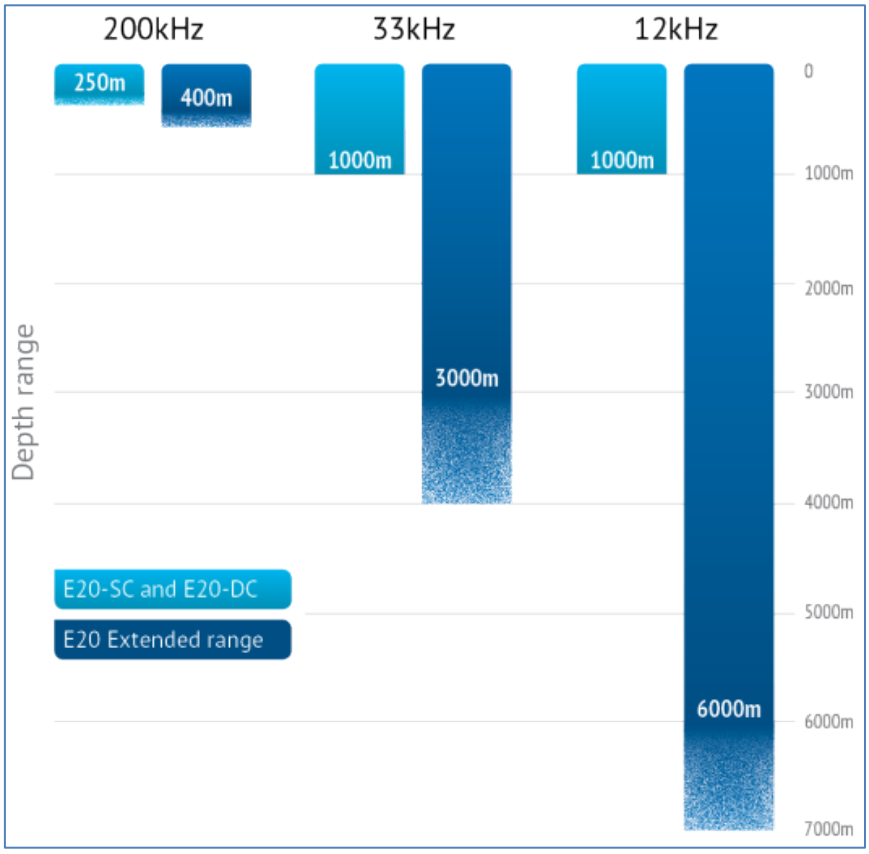
Table 3: Specifications

Parameters	Single channel	Dual channel	Dual channel ER
Operating frequency	10-250kHz per channel		
Channel	Single[1]	Dual: HF channel optimized for 50-250kHz LF channel optimized for 10-50kHz	
Ping rate	Up to 50 pings/s		
Pulse type	CW	CW	CW and FM (chirp)
Pulse length	Fully variable from 1 cycle upwards (e.g. 1ms, 5000W, 20-50kHz, 50 Ohm)		
Bandwidth	Max. 45kHz		
Data output	Via LAN interface: For each channel the measured depth and full amplitude-time echogram, passed through auxiliary sensor data, s7k data protocol. Via serial port: For each channel the measured depth		
DC power supply	10-30VDC		
AC power supply[2]	100-230VAC		
Power consumption	Max. 50W		
Transducer interfaces	Impedance: 50Ohm < nominal load < 200Ohm Max. power: 5kW @ 0.6% duty cycle / 1.5kW @ 2% duty cycle Connection: • Single-connector TX1 for dual transducer • Two separate connectors TX1 and TX2 for separate transducer cables		
Interfaces	3 serial connectors (RS-232): • Input: GPS position and time, heave, motion, heading • Output: depth 1 Ethernet LAN connector 1 sync connector (for PPS input)		
Dimensions	Height: 83.0mm Width: 300.0mm Depth: 221.0mm		
Weight	5.7kg (excl. external cables and transducers)		
Temperature	Operating: -20ºC to +55ºC Storage: -30ºC to +70ºC		
Ingress protection	IP67 (dust tight and watertight under immersion up to 1m in depth for 30 min.)		
Vibration	Complies with standard EN 60945 $ 8.7		
Drop	Complies with standard EN 60945 $ 8.6		

[1] The E20 single channel can utilize both channels, but not at the same time.
[2] External AC power is for dry installation (not IP67 compliant).

3.2 Performance

Parameters	Single channel	Dual channel	Dual channel ER
Accuracy	2cm + 0.1% of depth @200kHz 10cm + 0.1% of depth @33kHz 15cm + 0.1% of depth @12kHz		
Resolution	1cm @200kHz 5cm @33kHz 15cm @12kHz		
Min. depth range	0.35m @200kHz 1.0m @33kHz 3.0m @12kHz		
Max. depth range	250m @200kHz 1000m @33kHz 1000m @12kHz		400m @200kHz 3000m @33kHz 6000m @12kHz



SC = single channel
DC = dual channel

Figure 3: E20 depth performance[3]

[3] The depth values are based on the performance of TC2122 for 200 and 33kHz, and HM210/12-8/20 for 12kHz. Stated depth ranges may be impacted by environmental conditions, vessel installation, and motion

3.3 Standard Data Products

3.3.1 Depth Output via Serial or UDP Port

The Echotrac E20 can generate ASCII depth data messages via serial (COM3) or UDP.

The following depth data messages are supported by the Echotrac E20:

- Depth
  - Echotrac SBT
    Example: "<sp>et<sp><sp>54321<CR>"
  - Echotrac DBT
    Example: "<sp>ETOL<sp>54321<CR>"
  - DESO25
  - NMEA 0183: $SDDBS
    Example: "$SDDBS, 3.3,f,1.9,M,0.6,F*AB<CR><LF>"
  - NMEA 0183: $SDDBT
    Example: "$SDDBT, 18.0,f,5.5,M,3.0,F*AB<CR><LF>"
- Motion
  - DESO DDV Heave
    Example: "DH01.23<sp>m<CR><LF>"
- Draft
  - DESO DDV Draft
- Sound velocity
  - DESO DDV Sound Velocity
- Universal message
  - Echotrac DBX
    Example: "$DBX,2019-09-30T205959.999,2,00123.999,-216.14,00.950,
    00124.321,-218.14,01.100,1,-002.230,1,1435.98<CR><LF>"

For details, see *Appendix C – Serial and UDP Output String Formats*.

The Echotrac SBT and DDV formats do not generate dual-channel data. If both channels are enabled, data is used from the high-frequency channel. Otherwise, data is used from the single frequency channel that is enabled. All other message formats can accommodate dual-channel use. Refer to *Appendix C – Serial and UDP Output String Formats* for details.

3.3.2 Echograms

The Echotrac E20 provides raw data of both channels on Ethernet, in s7k format, including all auxiliary sensor data of sensors connected to the echosounder.

- The raw echogram information is in full resolution of sampling rate.
- The data of all auxiliary sensors connected to the E20, such as Heave, Heading, and GNSS, are provided in the s7k record in full resolution as well.
- Acoustic basic information, such as used transmit pulses, basic echosounder settings, operation modes, and receive gain, is part of the s7k record as well, to allow receiving software to interpret the raw echogram values in a meaningful way.

The main singlebeam record types are 10000 SBES channel settings, 10018 SBES echogram water column data, and 100027 SBES raw detection data. For details, refer to the Data Format Definition document (see *Appendix A – Reference Documentation*).

3.4 Supported Transducers

The Echotrac E20 can generally be adapted to a wide range of transducers. Performance and features of the singlebeam echosounder depends on the selected transducer. The selectable transducers are listed in *Table 4*.

For installation, see *section 4.3 Transducer Installation*.
For configuration, see *section 4.4 Configuration in SBES UI*.
To add new transducer models see *section 8.1.6 Updating Transducer Models*

Table 4: Supported transducers

Name	High freq.	Low freq.	Description
SINGLE FREQUENCY			
Odom FMBB200-9	200kHz, 9°		200kHz, 9°, flange mount, M194 housing
Odom HM12-20-T198		12kHz, 20°	12kHz, 20°, hull mount, T198 housing
Odom HM15-17 15kHz 17deg		15kHz, 17°	15kHz, 17°
Odom SMBB200-9	200kHz, 9°		200kHz, 9°, stainless steel, stem mount, SS510-2 housing
Odom SMBB200-3	200kHz, 3°		200kHz, 3°, stainless steel, stem mount, SS549 housing
Odom SMSW200-4A	200kHz, 5°		200kHz, 5°, stem mount, shallow water, SS538 housing
Odom TM24-20		24kHz, 20°	24kHz, 20°, tank mount, M192-2 housing
Odom TM33-19		33kHz, 19°	33kHz, 19°, tank mount, M192-6 housing
RESON TC2003	200kHz, 3°		200kHz, 3°
RESON TC2024	200kHz, 9.5°		200kHz, 9.5°, shallow water
Airmar SS510 200kHz	200kHz, 8°		200kHz, 8°, shallow water
Airmar SS538 200kHz	200kHz, 5°		200kHz, 5°, shallow water
Airmar SS549 200kHz	200kHz, 3°		200kHz, 3°, shallow water
Airmar M192-2 24kHz		24kHz, 24°	24kHz, 24°
Airmar M192-6 33kHz		33kHz, 19°	33kHz, 19°
Airmar M194 200kHz	200kHz, 8°		200kHz, 8°
Neptune 390 200kHz	200kHz, 8°		200kHz, 8°, hull mount, over the side
Neptune T198		12kHz, 20°	12kHz, 20°, deep water, hull mount
_unknown[4]		10kHz	10kHz, 20°
_unknown		12kHz	12kHz, 20°
_unknown		15kHz	15kHz, 20°
_unknown		24kHz	24kHz, 20°

[4] Generic transducers/frequencies listed as “unknown” have reduced operating parameters to ensure hardware is protected. They can be used where the transducer is not directly supported by the E20 or is unknown.

Name	High freq.	Low freq.	Description
_unknown		28kHz	28kHz, 20°
_unknown		33kHz	33kHz, 20°
_unknown		40kHz	40kHz, 20°
_unknown		50kHz	50kHz, 20°
_unknown	200kHz		200kHz, 7°
_unknown	210kHz		210kHz, 7.5°
DUAL FREQUENCY			
Odom HM200/12-8/20	200kHz, 8°	12kHz, 20°	200/12kHz, 8/20°, hull mount, T197 housing
Odom HM210/12-8/20	210kHz, 7.5°	12kHz, 20°	210/12kHz, 7.5/20°, hull mount, T196 housing
Odom HMBB200/24-4/20	200kHz, 4°	24kHz, 20°	200/24kHz, 4/20°, hull mount, M175-2 housing
Odom OTS200/33-8/23	200kHz, 7°	33kHz, 23°	200/33kHz, 7/23°, over the side, M191 housing
Odom OTSBB200/24-4/20	200kHz, 4°	24kHz, 20°	200/24kHz, 4/20°, over the side, M42 housing
Odom OTSBB200/33-5/23	200kHz, 5°	33kHz, 23°	200/33kHz, 5/23°, over the side, M177-2 housing
Odom THP200/24-4/20	200kHz, 4°	24kHz, 20°	200/24kHz, 4/20°, tank, hull, pole, M108 housing
RESON TC2122	200kHz, 9.5°	33kHz, 22°	200/33kHz, 9.5/22°
RESON TC2178	200kHz, 9.5°	33kHz, 22°	200/33kHz, 9.5/22°, hydrodynamic, over the side applications
Airmar M42-200/24	200kHz, 5°	24kHz, 20°	200/24kHz, 5/20°
Airmar M177-200/33	200kHz, 8°	33kHz, 23°	200/33kHz, 8/23°
Airmar M191 200/33	200kHz, 7°	33kHz, 23°	200/33kHz, 7/23°
Airmar R509LM 28-60/80-130 NB	120kHz, 8°	60kHz, 7°	130/60kHz, 8/7°, narrow band
Airmar R509LM 28-60/80-130 WB	105kHz, 10°	45kHz, 10°	105/45kHz, 10/10°, wide band
Airmar M563 35/100	100kHz, 10°	35kHz, 12°	100/35kHz, 10/12°
Airmar M563 200/40	200kHz, 4°	40kHz, 16°	200/40kHz, 4/16°
Airmar M563 200/28	200kHz, 4°	28kHz, 22°	200/28kHz, 4/22°
Neptune T196	210kHz, 7.5°	12kHz, 20°	210/12kHz, 7.5/20°, deep water, hull mount
Neptune T197	200kHz, 8°	12kHz, 20°	200/12kHz, 8/20°
Kongsberg Simrad 38/200 D	200kHz, 7°	38kHz, 17°	200/38kHz, 7/17°

3.5 Supported Auxiliary Sensors

Table 5: Supported auxiliary sensors

Position/Time	Motion[5]
NMEA GGA	TSS1
NMEA GLL	EM1000
NMEA ZDA	EM3000
NMEA HDT	OCTANS TAH
Up to 10Hz sample rate	Up to 50Hz sample rate

[5] Only the heave component is used by the E20.

3.6 CE Marking

EC DECLARATION OF CONFORMITY

We

Teledyne RESON A/S
Fabriksvangen 13
3550 Slangerup
Denmark

TELEDYNE RESON
Everywhereyoulook™

in accordance with the following directive(s):

2014/30/EU	Electromagnetic Compatibility (EMC)
2014/35/EU	Low Voltage (LVD)

hereby declare that the following equipment:

Echotrac E20 singlebeam echosounder (single channel, dual channel, extended range dual channel)

is in conformity with the applicable requirements of the following standards:

REF. NO.	TITLE	EDITION/DATE
EN 60945 §9 and §10	Maritime navigation and radio communication equipment and systems - General requirements - Methods of testing and required test results.	2002
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.	2010

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable essential requirements of the directives.

Location: Slangerup, Denmark

Date: 10 October 2019

Name: Ole Søe-Pedersen

Position: VP & Group General Manager

CE 19

Document No. CERT19899

Signature:

4 INSTALLATION

4.1 Echotrac E20 Mounting

The Echotrac E20 is a flexible unit designed for tabletop or rack mounting. The outer cabinet of the Echotrac E20 is covered with EPDM rubber, which protects the unit from small bumps etc. and gives the unit a non-slip surface.

- Mount the Echotrac E20 within easy reach of operator workstation connections, interconnect cables, and power switch.
  - Tabletop mounting: Place on a flat surface at a safe distance from edge.
  - Rack mounting: Use the four holes on the bottom of the unit to secure it to a plate to be placed in the rack (see *Figure 14: Echotrac E20 outline*).
- Allow clearance around the unit to provide adequate air circulation.

The unit has an external passive cooling system in the form of a top surface made up of fins for effective heat transfer.

Figure 4: Echotrac E20 – Cooling

CAUTION

Do not place any objects on top of the E20 and do not expose the unit to direct sunshine, as this may cause the unit to overheat.

4.2 Echotrac E20

4.2.1 Rear Panel Cable Connections

All dry-end cables provided by Teledyne Odom Hydrographic come with factory-installed connectors to be attached at the appropriate port(s) on the rear panel of the Echotrac E20.

Do not disconnect any cables from the rear of the Echotrac E20 while the unit is running. This can damage the internal workings of the unit.

The critical connections are clearly marked on the unit and shown in *Figure 5*.

Table 6: Echotrac E20 rear panel cable connections

Connector	Description
Grounding	Protective earth screw for equipotential connection
LAN	Gigabit Ethernet
COM1, COM2, COM3, each with status LED	Serial port for external sensors and serial sounding data ▪ Yellow, flashing: Data is transmitted ▪ Green, flashing: Data is received
SYNC with status LED	Connector for PPS input ▪ Green, flashing: PPS connected
TX1 ⚠	Transducer connection, one or two channels can be connected
TX2 ⚠	Transducer connection, one or two channels can be connected
Power	DC power supply: 10-30VDC, max. 50W

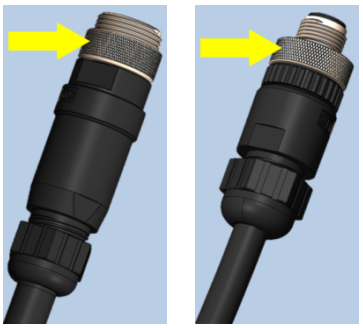
Figure 5: Echotrac E20 rear panel cable connections

For safety purposes, the Echotrac E20 must be connected to protective earth. The protective earth pin in the DC connector is the protective conductor terminal of E20.

The LEDs for the SYNC port and the three COM ports will only be lit, when the E20 is connected to power.

To disconnect the cables from the E20, first unscrew the locking sleeves (at the arrows) before pulling the cables out.

Do not pull directly on the cord, as this will damage both the cables and the E20.



The projector connections must be handled with great care, as the output power voltage is hazardous to human safety.

Do not pull out the cables with the power on.

4.2.2 Front Panel

The power button and BITE LEDs are located on the front of the Echotrac E20.

- **Channel A/B buttons:**
  - Pressing both buttons at power up forces the unit into Recovery mode[6].
  - Pressing during operation starts/stops pinging.
- **Channel A/B LEDs:**
  - No light: Channel off.
  - Green: Channel on.
  - Orange, flashing: Receiving a ping.
  - Red: Error.
- **LAN Link LED:**
  - Yellow: A link has been established.
- **LAN Active LED:**
  - Green, flashing: Data is received/transmitted.
- **Power button:**
  - A short push enters/exits standby.
  - Pushing for more than 5 seconds reboots the system.
- **Power button light indicator:**
  - No light: Not connected to power.
  - Blue: Booting.
  - Red, flashing: In transition to “standby”.
  - Red: On standby.
  - Green, flashing: In transition to “on”.
  - Green: Turned on, normal operation. Status OK.
  - Orange: Warning.
  - Purple: Booted to update/recovery mode.

[6] Recovery mode is a safe mode. For details, see *appendix 8.1.4 Recovery*).

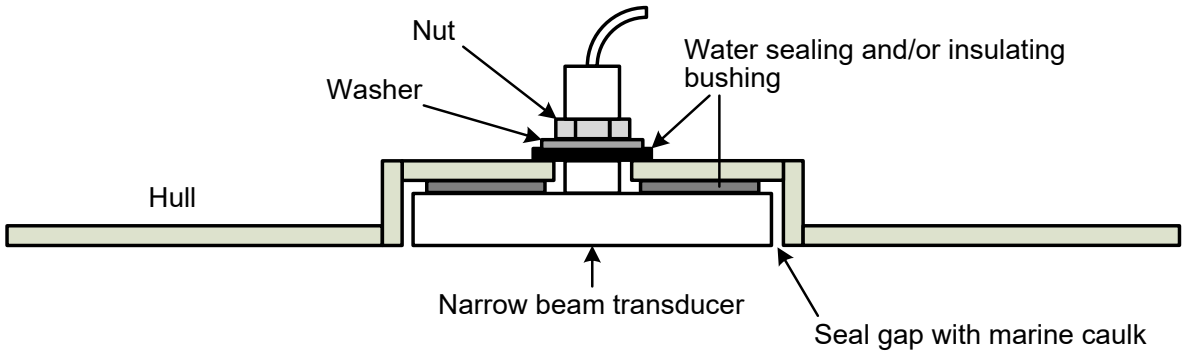
4.3 Transducer Installation

- The transducers are generally supplied with connectors assembled in Single Channel or Dual Channel cable arrangement. When preparing the initial setup of the survey system, the SBES UI will suggest the standard cable connection depending on chosen transducer type (see *section 4.4 Configuration in SBES UI*).
- In all types of installations, the transducer radiating face must remain as parallel to the water surface as possible while the vessel is moving.
- Transducers should be mounted at least 0.3 meter below the waterline.
- A preferred mounting location is near the keel of the vessel in an area where the planing attitude of the hull at speed and the pitch and roll angles of the vessel in seas have the least effect.
- The transducer should be mounted far enough aft of the bow so that bubbles generated by the bow wave will not pass over the face of the unit.
- Transducers should be located away from sources of turbulence and cavitation bubbles such as propellers, bow thrusters and hull protrusions.
- Considerations should also be given to sources of mechanical noise generated within the vessel (engines, props, pumps, generators, etc.). In some severe cases of mechanically coupled noise, vibration-isolating mounts may be required to decouple the transducer from the hull.

For further details on possible sources of interference with the transducer installation, see *section 6.6 Interference Considerations*.

4.3.1 Through Hull

The top side of the transducer is accessible from inside the vessel while the transducer face is exposed to the water.



NOTE: Transducer must be flush with hull

Figure 6: Transducer mounted through the hull

Ensure that installations through the hull are made correctly to ensure the safety of the personnel and boat.

Avoid turbulence around the transducer by installing a fairing with a sloping forward edge ahead of the unit. The fairing will improve the hydrodynamic performance by smoothing the flow of water over the face of the transducer.

Care should be taken to protect the transducer from damage. The installation of a fairing will contribute to reducing the risk of impact damage.

4.3.2 Hull Mount

Streamlined transducers mounted directly to the outside of the hull or transducers fitted into streamlined fairings welded or otherwise attached to the outside of the hull often make for excellent installations. The advantage is that the radiating face of the transducer is generally below the bubble stream in clear water and no acoustic window or transducer tank creates reverberation.

This type of installation requires a stuffing tube to be installed in the hull in order to allow the transducer cable to penetrate the hull.

4.3.3 Sea Chest

In a sea chest mount, a fluid-filled enclosure in the hull of the vessel is large enough to contain the entire transducer. The outer hull is removed in the area of the chest and replaced with an acoustically clear "window" which is mounted flush with the hull.

Depending on construction, material selected for the acoustic window, and draft of the vessel, access to the transducer can often be gained from inside the hull without putting the vessel in dry dock.

In most installations, a water-filled standpipe is incorporated into the sea chest design in order to provide hydrostatic pressure equalization. Transducer cables generally leave these assemblies through stuffing tubes, which maintain the watertight integrity of the chest.

4.3.4 Over the Side

This type of mount is frequently constructed from a length of pipe. This fixture should be sized to position the transducer well below the waterline and the pipe then fixed to a sturdy support on the vessel. Lines are usually attached to the transducer pipe and tied off fore and aft in order to maintain a stable, horizontal transducer attitude.

Ensure that the transducer is mounted sufficiently deep so that it does not break the surface during vessel roll motions. This may mean to a depth greater than 0.3m.

Vibration and oscillation will become evident, if the transducer is not rigidly mounted. To minimize the unsupported length, place a support as close to the waterline as possible

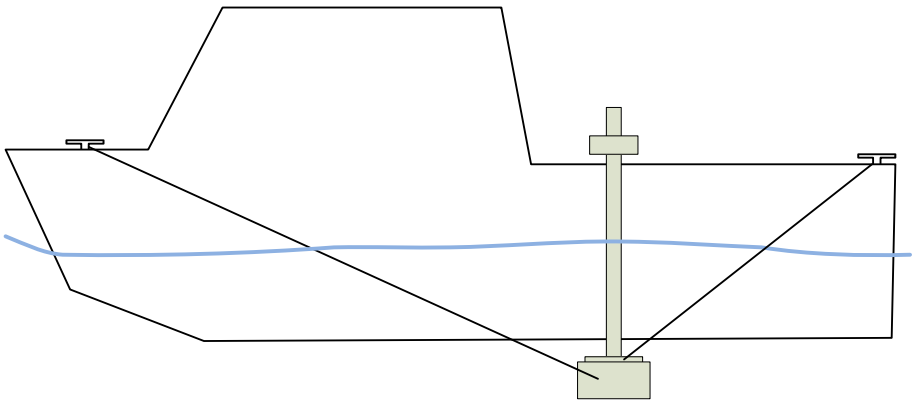


Figure 7: Transducer mounted over the side

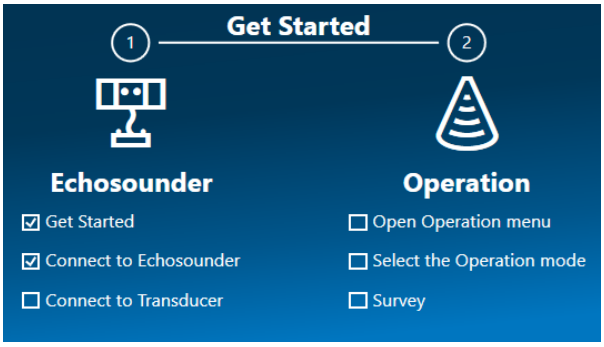
CAUTION

Care should be taken to assure adequate protection for the transducer cable, particularly at the point where the cable leaves the transducer body.

4.4 Configuration in SBES UI

4.4.1 Transducer Configuration

The first time you connect to the E20 unit, the SBES UI will guide you through the necessary steps.



(a) Click the Echosounder tab to start.

(b) Click the Connect echosounder drop-down menu and select the IP address with the serial no. of your E20 system.

Find the serial no. on the front of the E20.

(c) Select the correct transducer type from either the Channel A or Channel B drop-down menu.

If you don't know what model you have installed, select one of the 5 "unknown" transducers listed with the relevant frequency.

(d) Enter the draft and/or index of the transducer, per channel.

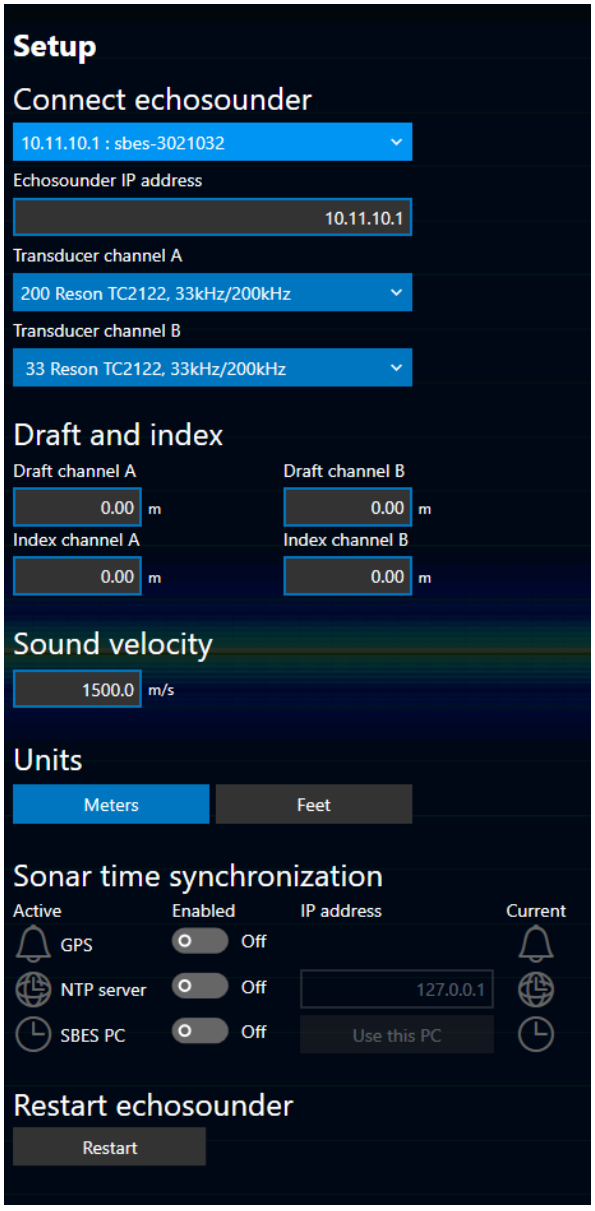
Draft is the distance between the waterline and transducer face. This value can only be positive and adds to the measured range the sonar makes in the depth output.

A positive index value subtracts from the calculated depth. A negative index value adds to the calculated depth.

(e) Make your choice of Meter or Feet.

(f) Choose a method of time synchronization. GPS, NTP and SBES UI PC time are the supported options.

See *4.4.3 below*.



When selecting one of the generic "unknown" transducers, range performance suffers, as max. power has been reduced for precautionary purposes.

4.4.2 Auxiliary Sensors

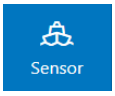
(a) If auxiliary sensors are connected to the serial ports of the echosounder, power up the sensors and ensure that they generate data on the serial or UDP interface.

The inputs to the E20 are defined as follows.

- COM 1 is Navigation, being Position and/or Heading.
- COM 2 is Motion.

(b) Follow these steps in the SBES UI:

(i) Select the Sensor tab.



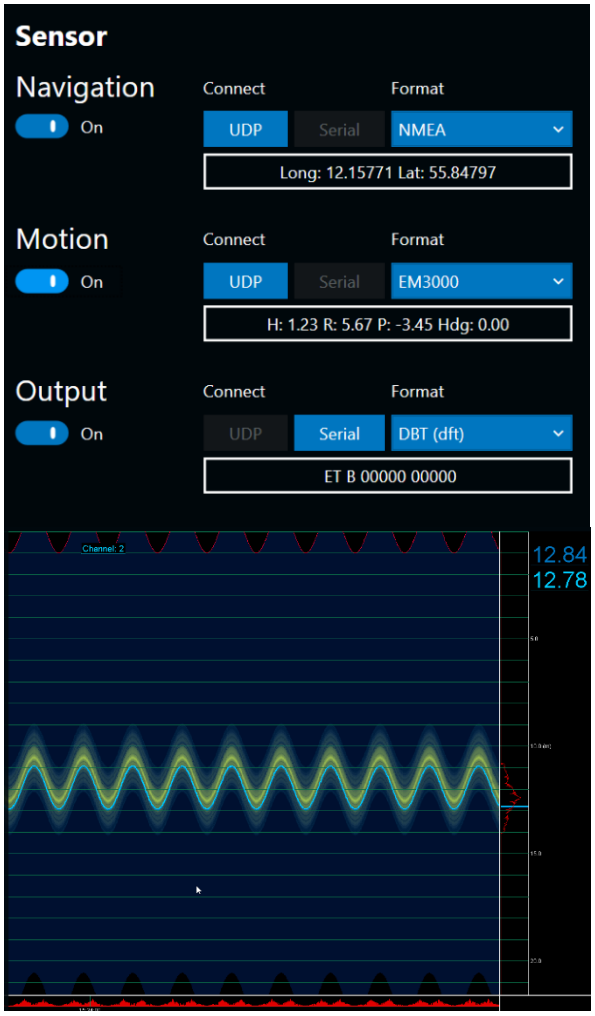
(ii) Select the format of your data via the Format drop-down menu.

(iii) Click on the Serial port button to configure the port on the E20 to match the settings of the sensor output.

The default configuration is 115200, 8, n, 1. This can be reset at any time by clicking the Set Defaults button in the Serial port dialog.

If using UDP, click on the UDP port button to set the receiving port. The IP address can be set to the PC transmitting or to 0.0.0.0 to listen to all subnet addresses.

(iv) Enable/disable the input via the radio button under Position and/or Motion. You will see the data parsing/updating in the preview windows for each sensor.



4.4.3 Time Synchronization

There are three ways to control the time in the E20:

- Synchronize to the SBES PC.
- Use an NTP Server.
- Use a GPS receiver with PPS output.

Valid time sources are indicated with a blue icon next to the source name. The active source is indicated with a green icon.

If multiple time sources are active, the E20 self-prioritizes the order as follows:

1. GPS
2. NTP
3. SBES UI time

If one source drops out, the E20 will try to switch to the next active priority. If there is an identifiable large time gap between these sources (several seconds), the E20 will not use the secondary source, but will flag a time issue. If accepting the large time mismatch and switching to this source, the operator is advised to toggle the source off and on to restart the time synchronization process.

4.4.3.1 Synchronize to the SBES UI PC

To use the SBES PC to control time synchronization, follow this method:

(a) Enable the time source SBES PC and click the Use this PC button.

(b) Wait a few minutes for time to synchronize.

4.4.3.2 Use an NTP Server

To use an NTP server for time synchronization, follow this method:

(a) Enable the time source to enter a local or networked address for the NTP server.

(b) Wait a few minutes for time to synchronize.

4.4.3.3 Use a GPS Receiver

To connect a GPS receiver for time synchronization and position logging, follow this method:

(a) Configure the GPS to generate an NMEA $GPZDA sentence every second.

(b) Connect the serial or UDP output to COM1 on the E20.

(c) Connect the PPS output from the GPS to the SYNC connector on the E20.
The E20 cannot use the raw ZDA string for time without the PPS pulse.

(d) In the SBES UI, select the Sensor tab on the left. Configuration for Position, Motion, and Output is shown. (See also *section 4.4.2 above*,)

(e) For Position:

(i) Click on the Serial or UDP port button and select the appropriate serial or UDP port configuration.

(ii) Click the Format drop-down menu and select NMEA.

(iii) Enable the input via the radio button.

(f) Wait a few minutes for time to synchronize.

Time synchronization of E20 to the UI PC only works, if there is no firewall or routing rules that prevent the underlying UDP connection.

5 OPERATION

5.1 Get Started

Once you have configured the E20 (see *section 4.4.1Transducer Configuration*), the SBES UI will guide you through the next steps to get ready for operation.

When restarting the echosounder, the system applies the settings last used. The Get Started screen is displayed, semi-filled in with only the last two steps remaining. The operator just needs to select the desired mode for operation (see *section 5.2 below*), and then the pinging starts.

5.2 Operation Modes

The Echotrac E20 is an extremely robust and reliable hydrographic echosounder. Its main operation parameters may be maintained autonomously (fully or partially) or manually.

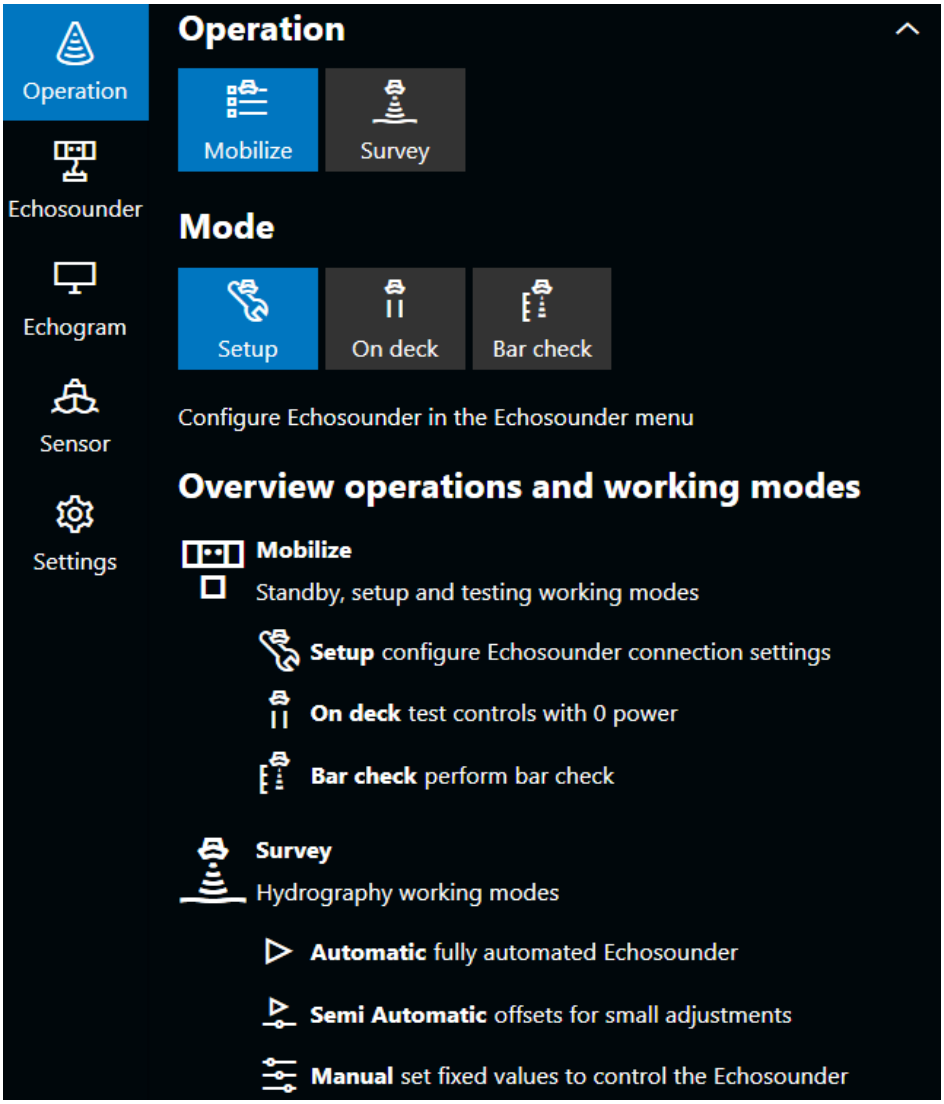


Figure 8: Operation modes

5.2.1 Mobilize Modes

These modes are used for setup and testing of the E20.

CAUTION **Do not transmit without a transducer attached to the E20 or with the transducer in air.**

5.2.1.1 Setup

This mode allows configuration and selection of different transducers on channels A and/or B. See *section 4.4 Configuration in SBES UI*.

5.2.1.2 On Deck

This is a testing mode, where all controls can be changed and adjusted without transmitting power to the transducer.

5.2.1.3 Bar Check

This mode is implemented for operators wishing to perform a bar check.

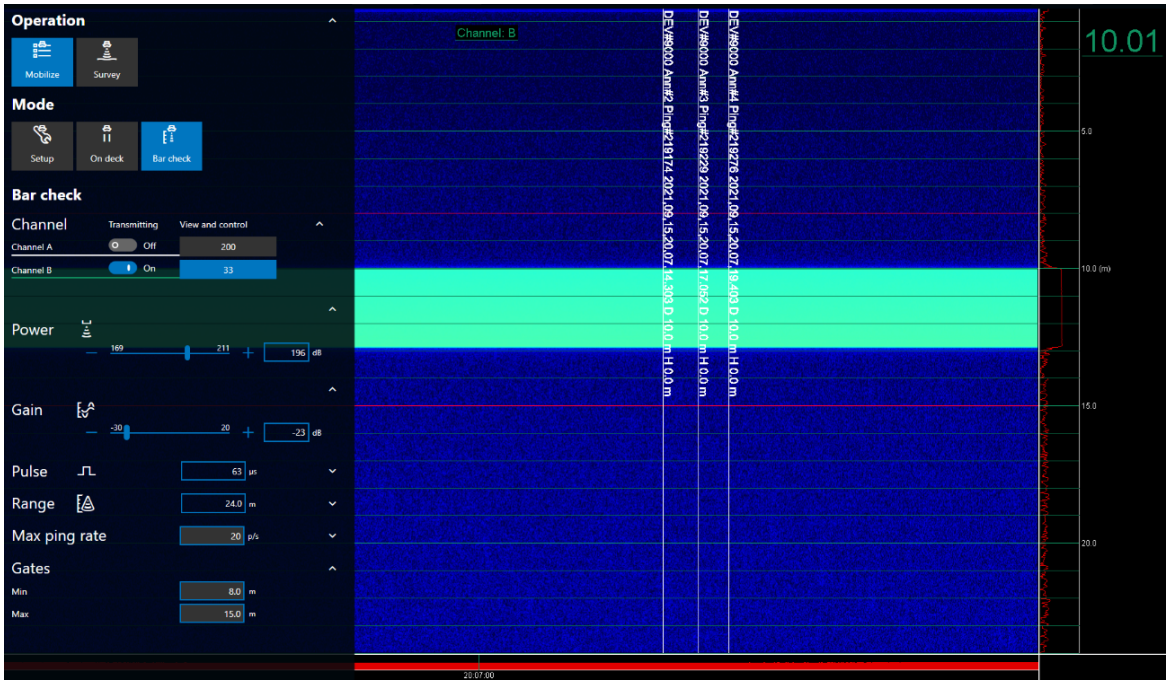


Figure 9: Bar check mode

- All bar check parameters, except ping rate, may be adjusted by the operator.
- For more reliable detections on the bar in the water column, the operator can choose to enable gates by double-clicking the A-scan at the chosen depth. The gate width is set automatically based on depth; the gates are shown in red. Alternatively, they can be manually set in the Operation settings panel. The Gate icon in the SBES UI must be active (blue) for the gates to be used.
- An annotation is triggered in the SBES UI when double-clicking the echogram while the Marker icon is active (blue).

The gates are only visible and interactive when the depth line for the given channel is on.
Settings in bar check mode are copied to manual mode, as long as the system was pinging in manual mode before starting the bar check routine.

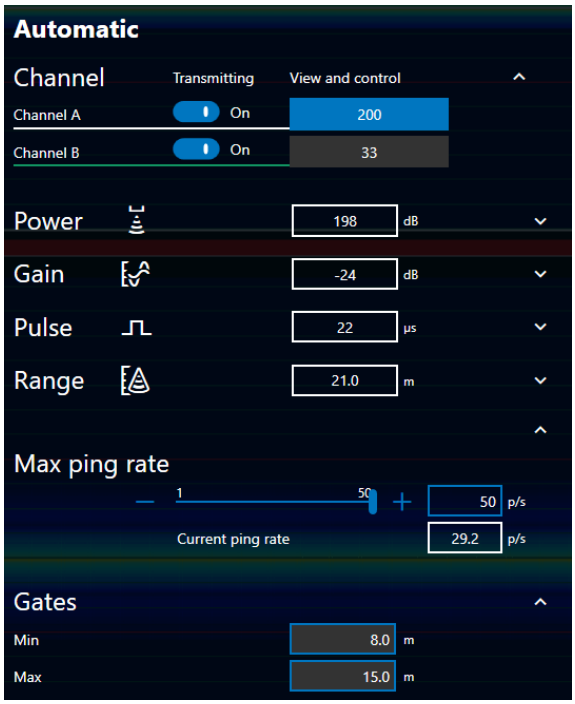
5.2.2 Survey Modes

These are the operational modes for normal hydrographic survey acquisition. Choose between automatic, semi-automatic, and manual control of your E20.

CAUTION **Do not transmit without a transducer attached to the E20 or with the transducer in air.**

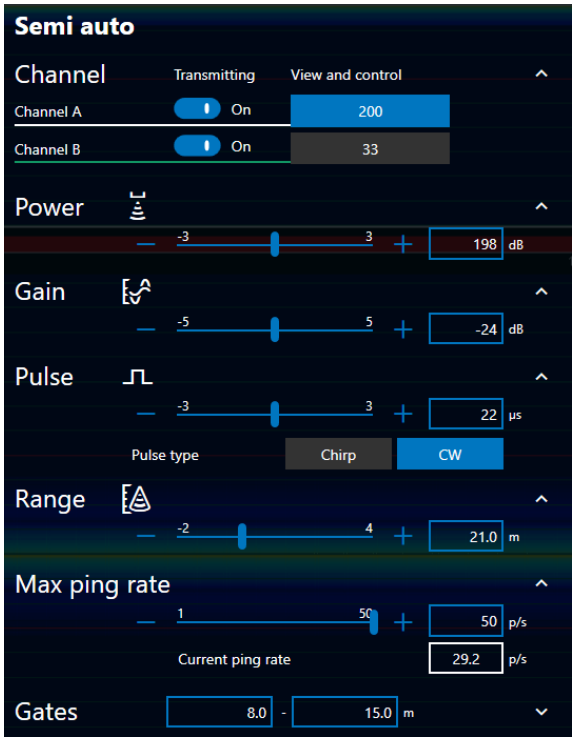
5.2.2.1 *Automatic*

- All operation parameters are maintained autonomously.
- Except for Max ping rate and Gates, the control sliders are not interactive and show applied values only.



5.2.2.2 *Semi Auto*

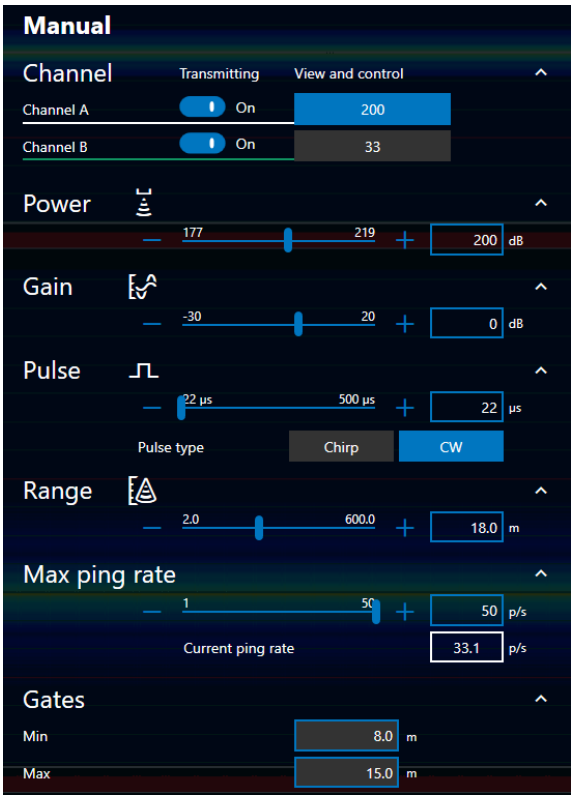
- In Semi auto mode, all operation parameters may be left to the system to maintain.
- When desired, all parameters may be adjusted by the operator.



The scale settings are adjusted in predetermined increments, except Max ping rate and Gates, which are set by the operator in all modes.

5.2.2.3 *Manual*

- In Manual mode, all settings are adjusted by the operator.
- No settings are controlled by the system.



For details on operation, see *section 6.1 Survey Operation* Modes.

	The TVG is always controlled by the system – even in Manual mode.

5.3 Standalone Operation

The E20 can operate without a connected user interface, provided it doesn't need to be time synchronized or if time is synchronized via GPS/ZDA.

To enter standalone mode:

(a) Configure the E20, and select the desired operation mode, Manual, Semi auto, or Automatic.
For Manual and Semi auto mode, adjust any other relevant settings.

(b) Exit the UI. The settings are automatically saved before exiting.

(c) Switch the E20 off.

(d) Switch the E20 on.

(e) Press the channel A/B button on the front panel to start pinging.

(f) The E20 will now resume its operation with the saved settings.

	The E20 will never start pinging by itself when powered up. The channels have to be enabled either via the UI or the front panel buttons.
	**Make sure to switch off the E20, when it is not used. It will continue pinging, if you have not explicitly disabled pinging in the UI before closing it.**

5.4 SBES UI BITE

The top left of the screen provides feedback from the E20 to the operator about its current state.

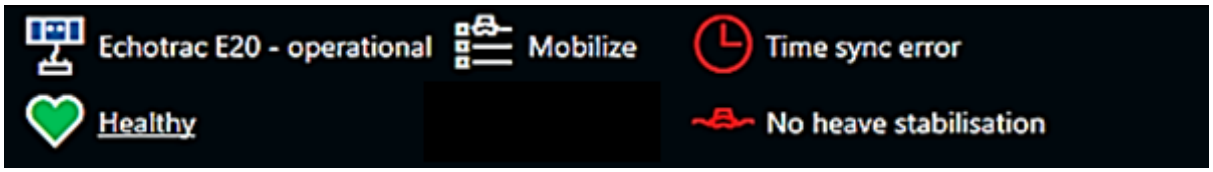


Figure 10: SBES UI BITE

There are a number of built-in alarms/icons to assist the operator troubleshoot the most common problems during operation.

Table 7: BITE icons

BITE icons		Description
	Battery	A drop in the power supply has been detected by the E20, which is an indicator that the external battery supply may need to be replaced/recharged.
	Bottom detect	This alarm shows that the bottom detection is lost. Some settings may have to be adjusted to regain bottom detection. Consider whether the range is too short.
	Heart	The Heart indicates the general health of the E20 unit. The icon is interactive. Click it to generate a more detailed BITE summary file, which can be shared with support when troubleshooting.
	Heave stabilization	This icon shows that a source is active on the Sensors tab, but no data is received.
	Signal clipping	Clipping has occurred in one or more samples of the water column. Reduce power and/or gain, if in manual mode.
	Temperature warning	Environment is too hot. Increase ventilation or reduce the demand on the E20, such as limiting ping rate or reducing source level.
	Time sync status	A time source is active, but no data is received, or the data contains a large time jump. If you are confident there is no error, the time sync can be restarted by toggling the source in the UI.

6 THE ECHOTRAC E20 IN ACTION

6.1 Survey Operation Modes

For most applications, the Automatic mode is the optimal choice for the E20 to deliver the best data, in the widest variety of seafloor conditions, as it constantly adapts to the signal received. Should the operator or hydrographic surveyor desire full control of the sonar, the manual mode provides this facility. The Semi auto mode provides the user with a mode to run with autonomous settings, with the option to tweak the applied sonar parameters to their liking.

- Automatic: This mode is the mode recommended for most operators. This autonomous mode requires no operating input from the user, and adjusts the applied settings based on a continual analysis of the sonar signal.
- Semi auto: This mode is recommended in the cases when you want to slightly adjust or tweak the automatic settings. Adjustments are indexed settings lower and higher than what the automatic mode is picking.

> If the E20 has already chosen the minimum or maximum value of what the transducer supports for a sonar setting, tweaking the setting in Semi auto mode does not reduce (at minimum) or enlarge (at maximum) the applied value further.

- Manual: This mode gives the user full control of the E20 and is recommended for:
  - The experienced operator.
  - Use in an area that the operator knows well.
  - The operator who wants static settings to avoid ever changing settings that adjust to a changing environment.

6.2 Marking

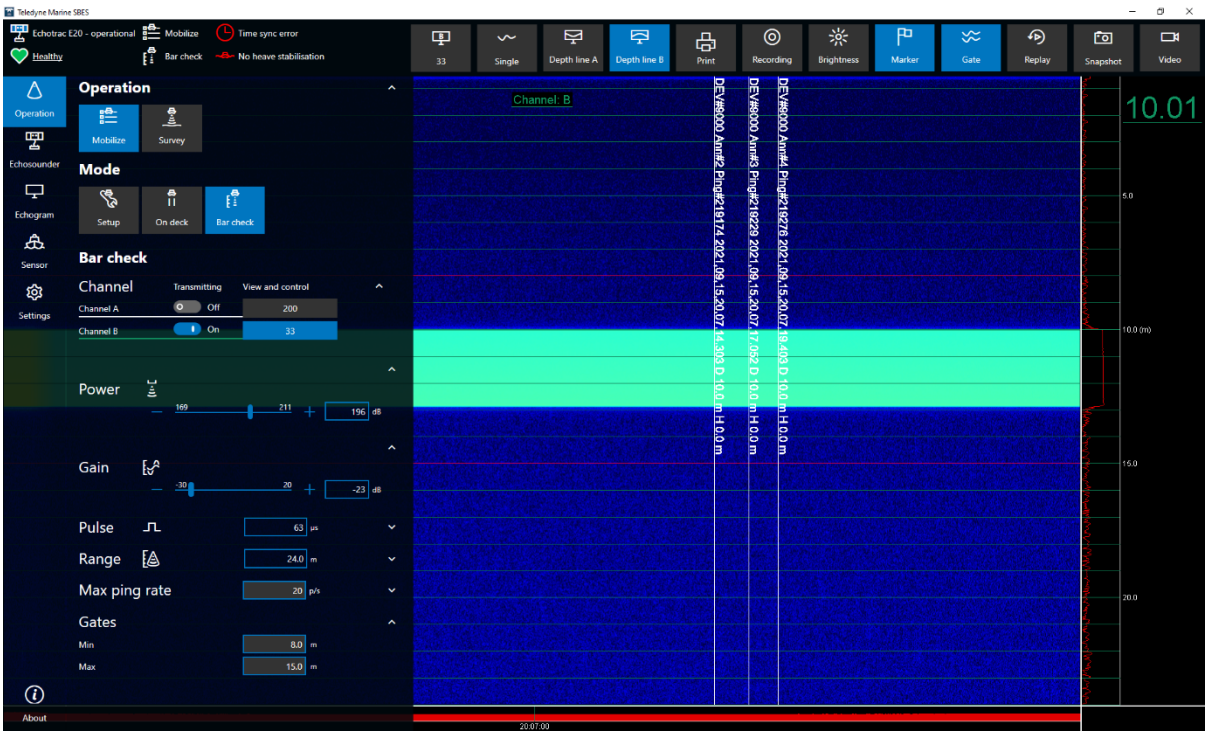


Figure 11: Echogram window with three marker annotations

When the Marker icon is active in the UI, the operator can double-click to add an annotation for the active channel. Click the Marker icon again to hide these markings.
External annotations of the echogram can be triggered via s7k protocol. For details, refer to the Data Format Definition document (see *Appendix A – Reference Documentation*).

6.3 Gates

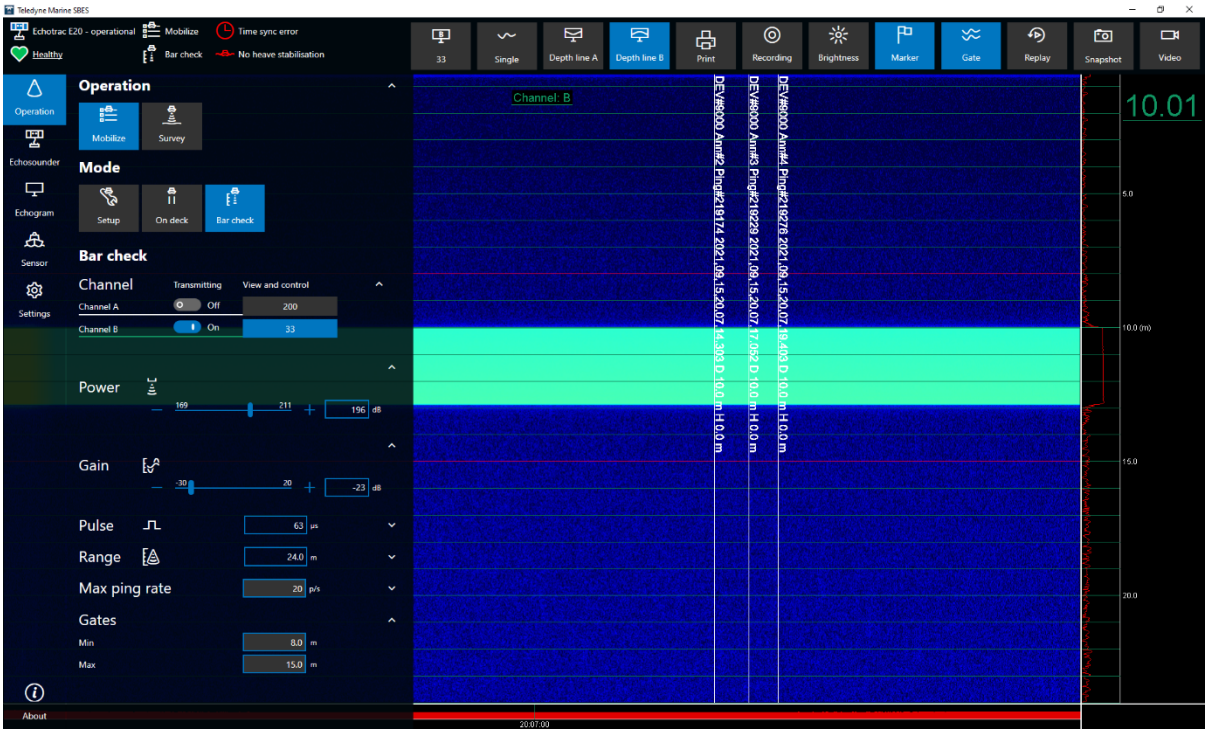


Figure 12: A-scan window with gates

- Manual gates can be used in bar check and all operational modes. They are set per channel using an entry in the Operation tab or quickly set to a percentage of depth when you double-click the A-scan.
- Depths are only valid or accepted inside the gate limit, so it is important to update the gates regularly or set them for a range your survey area won't exceed.
- The gates can only be set, if both a depth line and the Gate icon are active. Disabling the gates is quickly achieved by making the Gate icon inactive.

6.4 High-Frequency Gating

Users echo sounding over soft sediment with a dual-frequency transducer may notice that the LF channel penetrates further in the sediment than the HF channel. For some applications it is desirable to measure both the (soft) upper seabed and the (harder) sub-bottom. The High-Frequency Gating option (HFG) improves the consistency of LF sub-bottom detections.

In this mode, the HF detections act as a gate for the LF channel. In practice, this means that the soft upper layer is detected by the HF channel and ignored by the LF channel, which instead detects the next strongest return. When HFG is used in combination with gates, the upper gate limit is set by the HF detection. The data output remains the same whether HFG is enabled or not. HFG is enabled/disabled from a button in the top ribbon.

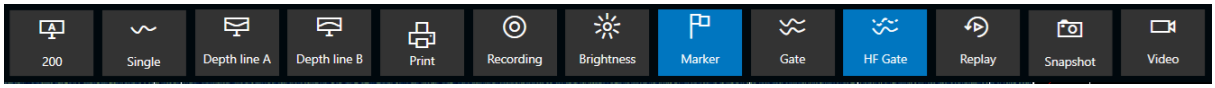
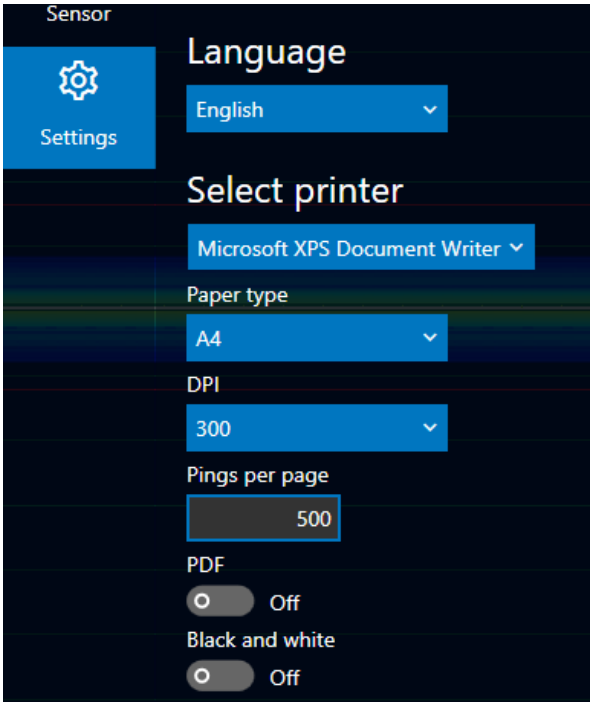


Figure 13: SBES UI with High-Frequency Gating enabled

6.5 Print

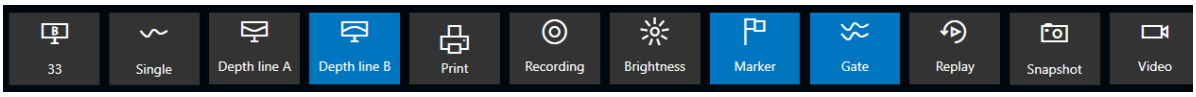
The printing controls are managed from the SBES UI Settings tab.



- Select your printer from the list of devices or drivers you have connected to the computer running the SBES UI.
- If you wish to create a PDF file for later printing, toggle the PDF option.

> Some PCs have a printer driver named 'print to pdf' or similar, but this is not advised; if the system is pinging quickly, you may find the Save dialog popping up too frequently as each page is generated. The embedded PDF option should be used to create a multiple page PDF file instead.

- Your echogram or PDF file will use the same display colors as the SBES UI, but can be forced to use black and white by using the option here.
- Once configured, printing can be started by clicking the Print icon at the top of the screen. When active, the icon will be blue.



6.6 Interference Considerations

Physical limitations in the functionality of the system must be taken into consideration when installing and operating echosounders, including the Echotrac E20. Some of the limitations are absolutes; others can be overcome to some degree. The following subsections provide examples of different kinds of limitations.

6.6.1 Cavitation

Some reduction in the transmitted source level is expected to be caused by cavitation.

Propeller Cavitation

Propeller cavitation can be a significant concern for two reasons. First, the frequency of propeller cavitation noise is in the operating frequency band of most echosounder equipment. Second, the source levels of the propellers installed are expected to be high unless special quieting techniques have been implemented.

Propeller energy typically propagates to the forward area of the echosounder equipment via a direct or hull-grazing path. The other arrival path of propeller energy is by the bottom bounce path. This path

will be more significant in shallow water depths (less than 500 meters). The potential impact can be further quantified for particular bottom depths of proposed operational test sites.

Appendage Cavitation

Appendage cavitation can result from rough or unfaired edges on the hull and can even be present at lower speeds. If the source is located near the acoustic sensor installation area, it can be a significant noise deficiency. It is difficult to predict the occurrence of appendage cavitation without under-hull drawings, pictures, or visual inspection of the ship when in dry-dock.

6.6.2 Machinery Noise

Machinery noise should not be a major factor for acoustic sensors that operate at frequencies above 5kHz. Mechanical machinery noise is usually prevalent at 2kHz and below, though it is occasionally detected at higher frequencies when fluid flow through pipes or cavitating pumps are involved.

Typically, the most important consideration for machinery noise is the proximity of the acoustic sensor to the machinery source. There has been one observed case where diesel engine piston frequency harmonics have been the controlling noise source at 12kHz, but in this situation, the engine room and the acoustic sensor compartment shared a common bulkhead. Normally, acoustic devices are sufficiently distanced from major machinery noise sources that machinery noise does not interfere.

A concern remains that there may be some auxiliary machinery (or other unusual equipment) located near the acoustic sensor that could produce noise interference. An inspection of the installation site and ship drawings to verify the position and proximity of all shipboard equipment should be conducted to determine if there is a potential for machinery interference prior to conducting at-sea testing.

6.6.3 Electrical Noise

Due to measures in the electrical design of the echosounder, it is very robust and insensitive to electrical noise. However, in the event of noise, please consider the following basic advice:

- Avoid low budget DC to AC power converters and power generators.
- If necessary, use stabilized UPS as a power buffer for AC supply, or use a straightforward DC supply via a dedicated battery pack.

6.6.4 Interference from Other Echosounder Systems

Interference from other echosounder systems can be seen as radial lines, typically moving away the minimum to maximum range scale as these pings are not correlated with the ping repetition rate of the Echotrac E20 system. The most typical source of interference of this type is navigational sonars (often 50kHz systems) and Doppler velocity logs.

Synchronization of acoustic systems is one means to mitigate this effect. The most effective approach is to remove the source of interference entirely, by either moving the equipment away from the acoustic sensor of the Echotrac E20 or turning it off.

6.6.5 Speed

Hydrodynamic flow noise can be a concern when operating at higher speeds. Externally mounted acoustic sensors should have fairings that are mounted as flush (or near flush) to the ship hull as is practically possible. This way the hydrodynamic flow-induced vibration noise should be minimal.

A poorly designed sonar fairing can degrade the system performance by a factor of 4 for speeds above 8-10 knots. This noise source is a common problem on all echosounder installations.

6.6.6 Air Bubbles

Bubble sweep-down can be another potential noise problem. The significance of this problem is associated with the noise generated as the bubbles cascade along the hull after being ingested in the bow wave of the ship and, more importantly, with the baffling produced by the entrained air layer between the face of the acoustic sensor and the water environment.

If air bubbles are present between the acoustic sensor and the water, the system will not function properly. This phenomenon is transient in nature occurring only for a few seconds per wave period. It is typically most prevalent on shallow draft ships and increases in intensity at higher sea states and ship speeds.

Modeling of this problem only indicates that air bubble noise may be present by determining the transmission vehicle of potential bubbles. Actual at-sea measurements are usually required to fully determine the presence and severity of bubble sweep-down. At-sea diver viewing has been very successful in the past to capture the bubble sweep-down characteristics of a particular ship hull on film.

Air bubbles mask some or all of the view of the acoustic sensor where the affected area will completely blank out. Common causes for bubble masking include:

- The vessel props when thrusting into reverse and pours a stream of bubbles over the acoustic sensor.
- The acoustic sensor has not been deployed deeply enough and there is bubble wash from the sea surface.
- Bubble ingestion as the vessel pitches into the sea.

6.6.7 Environment

A high-reverberation environment where echoes of the previous ping are contaminating the current ping may prove to be difficult to overcome.

7 TROUBLESHOOTING

7.1 The Echotrac E20 does not seem to be working

If the Echotrac E20 does not seem to be working correctly, perform these steps to find the cause.

(a) Check if the power LED is on.

(b) The Echotrac E20 has a Standby bit that is turned on by default. Try to communicate with the Echotrac E20 via the SBES UI.

(c) Check that all the cables are properly connected and intact. If cables are not properly secured, electrical signals may not be transmitted or received.

(d) A blinking TX LED means that the digitizer is firing, but the data may not be sent out on the COM port of the Echotrac E20. The Echotrac E20 could be in Standby mode.

(e) Make sure the Echotrac E20 is not in Standby mode.

(f) Make sure you are using the correct COM port. Windows will display an error message if the port cannot be used or if it is already open/used by another program.

These programs or devices use COM ports: Modem, Mouse, Scanners, and Printers.

(g) Try toggling the COM port off and on with the Windows application software you are using.

(h) Try powering down the Echotrac E20 and powering it back up again. If the Echotrac E20 is turned on before the computer, it may interfere with initializing and setting up communication channels.

7.2 The Echotrac E20 power LED is off

Try powering the Echotrac E20 down and back up again.

If this does not resolve the problem, contact reson-support@teledyne.com for assistance.

7.3 What are the COM port settings?

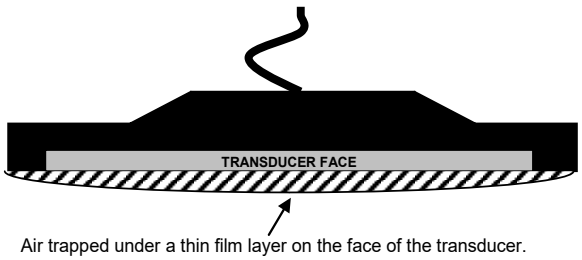
The Echotrac E20 uses the following default settings for the COM ports:

- 115200 baud, 8 data bits, no parity, 1 stop bit.

The COM port used to interface with the Echotrac E20 can be selected on the Sensor tab in the SBES UI.

7.4 Known problems with Transducer

Always make sure that the transducer face has been cleaned with mild soap to improve the interface between the transducer and the water. Sometimes a thin layer of air can be trapped on the face of the transducer. This will result in poor or no signal return from the transducer.



Air trapped under a thin film layer on the face of the transducer.

8 HANDLING AND MAINTENANCE

8.1 Echotrac E20

8.1.1 Handling

- Use original shipping boxes when shipping or storing the unit.
- It is important to ensure that the echosounder is not dropped or suffers any shock damage.

Avoid impact damage to the unit, as this may damage the internal components.

8.1.2 Maintenance

- Inspect the echosounder for any signs of damage at regular intervals.
- Keep the Echotrac E20 echosounder clean and its top surface free from buildup dust, as it may prevent the external passive cooling system from functioning effectively.

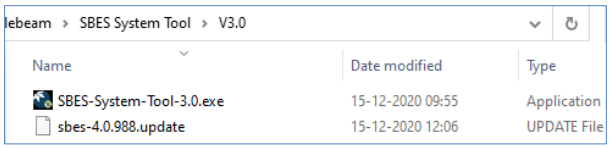
8.1.3 System Tool –Software Update

The SBES System Tool allows you to manage the Echotrac E20 echosounder. The tool is provided on the USB key delivered with your system.

Install System Tool

(a) Plug in the USB and navigate to the Windows folder where the System Tool executable is stored (on the supplied USB or on your laptop/PC).

(b) Double-click the SBES-SystemTool-XXX.exe file.



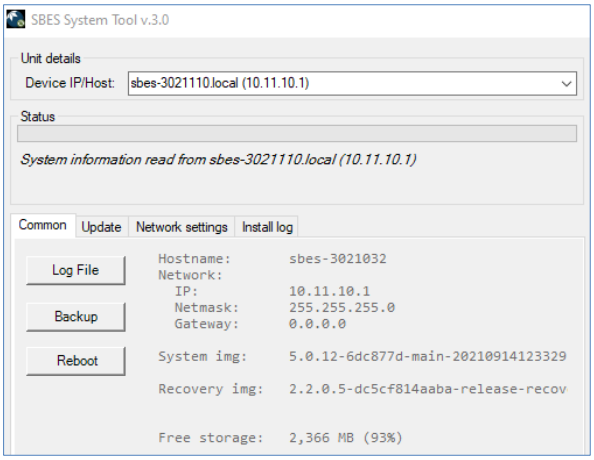
Connect to the E20

(a) Enter the Device IP/Host address or click the drop-down menu to display a list of available E20 systems on the network.

(b) If in doubt: The Host name is the serial number located on the front of the E20. The Host name can be used to distinguish the units from each other on a network with multiple E20s.

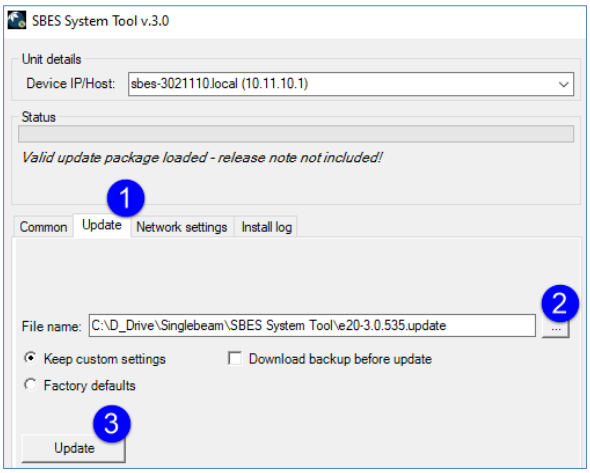
When an IP is entered or selected, the tool automatically tries to establish a link with the E20.

The Status window will provide feedback on whether the tool is successfully connected or not.



The Common tab contains options for downloading log files, making backups of the system image, and a method to trigger a soft reboot of the device.

Update E20 Software



(a) Click the Update tab (1).

(b) Click the ellipsis (…) button (2) and navigate to the appropriate Windows folder to select the UPDATE file.

Or drag and drop the UPDATE file onto the application.

(c) For a standard update, select Keep custom settings (default).

(d) The checkbox Download backup before update is selected by default. If a backup is not required, deselect this option.

(e) Click Update (3).

The system will reboot and start the update with progress details displayed in the status window.

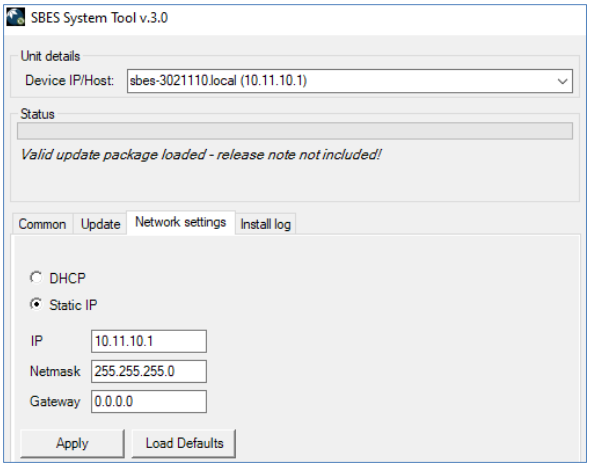
Update mode is indicated by a steady purple light on the E20 power button, and the channel buttons will flash in purple as the update is written to the E20.

(f) Once the update is complete, switch to the Common tab:

(i) To rescan the E20 and verify that the update has been applied.

(ii) To read the Log File.

Modify Network Settings



(a) Click the Network settings tab.

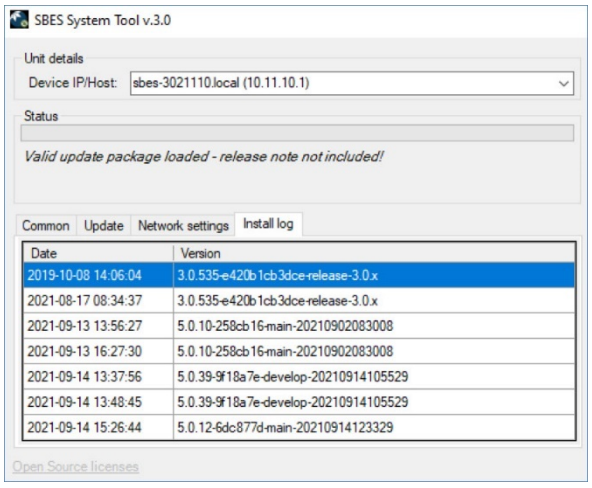
(b) Select the desired options:

- DHCP
- Static IP

(c) Click Apply.

(d) The E20 is automatically rebooted for the settings to take effect.

Install Log



- Click the Install log tab to display the list of applied updates over time.

8.1.4 Recovery

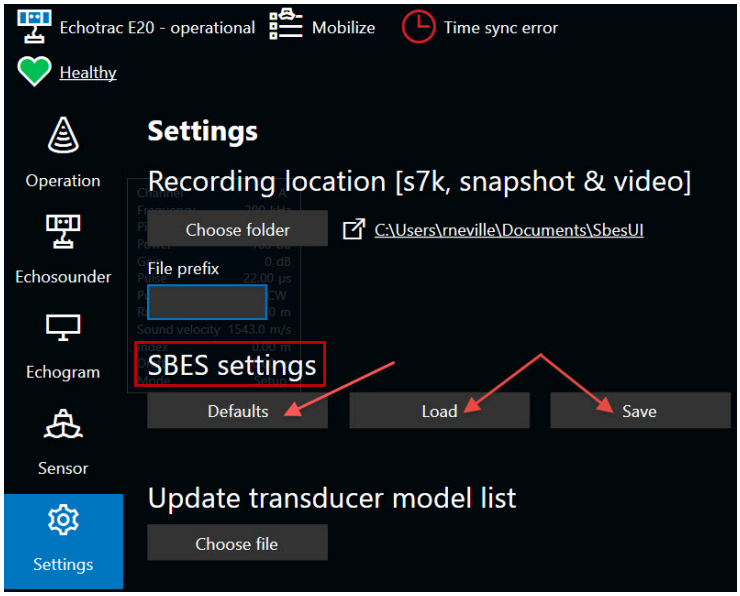
Recovery mode is for trained engineering service personnel. It is a safe mode that allows access to the E20 on a secondary recovery IP address. The main user settings are still active.

- You can force the Echotrac E20 echosounder into Recovery mode by pressing the Channel A and B buttons simultaneously at power up.
- The Recovery mode will not allow any echosounder operations and the SBES UI will not be able to see the unit.
- In this mode it is possible to use the E20 System Tool via the default IP address 10.11.10.1.
- With the Recovery mode you always have access to a safe working state, which is useful in e.g. the following circumstances:
  - There is a loss of power during an E20 software update.
  - If you have accidentally misconfigured the network settings and cannot get in contact with the unit.

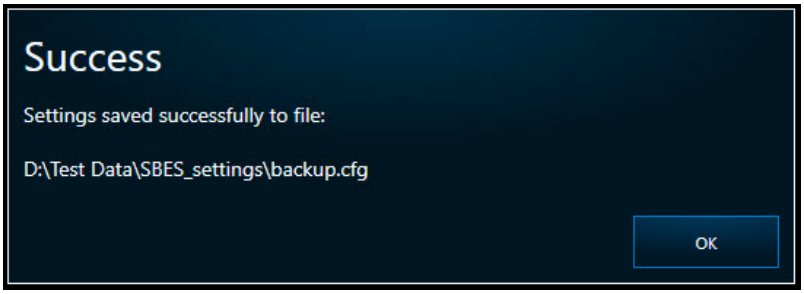
When resuming normal operation by power cycling the unit, the setup of the SBES is the same as before (unless modified during the recovery mode session).

8.1.5 SBES Settings

This feature allows the user to save/load the SBES settings to/from a config file or revert to defaults.



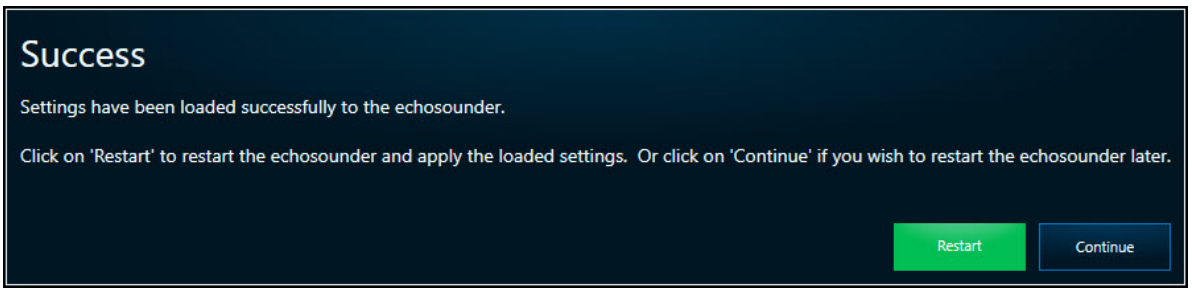
- The SBES settings include all the E20 settings (except the IP address), the units (meter/feet) and the inverted color scheme.
  - When saving the settings to a file, the user may select the file name and file path.



  - The settings file should not be edited manually. The E20 will notify the user if the settings file fails its integrity check and will then continue using its current settings.
- The settings file (.cfg) file may be used to clone the E20 settings on another unit.

> Since the IP address remains unchanged when restoring settings, it is possible to apply the settings on other E20 units with different IP addresses without losing network connectivity.

- The SBES settings file ensures that the same settings are used for the next vessel mobilization.
- The Defaults button will restore the E20 factory defaults. A reboot is initiated (upon approval) to initiate the new settings.

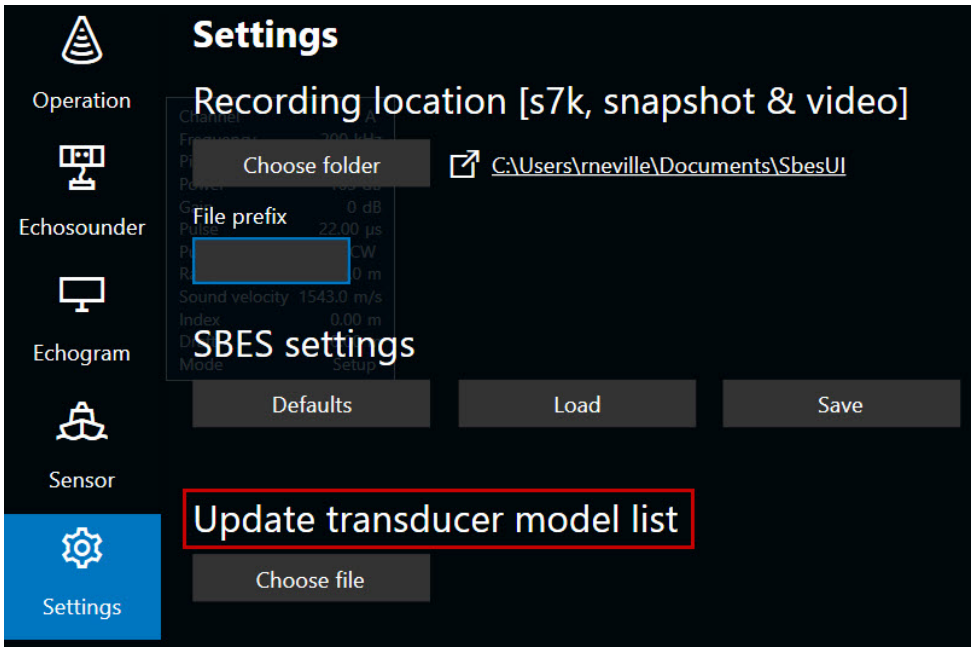


8.1.6 Updating Transducer Models

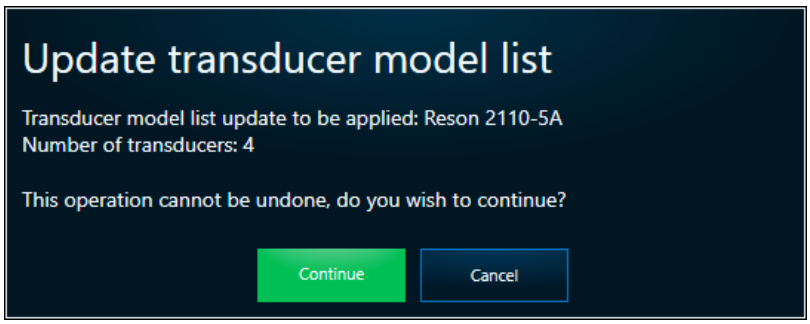
This feature allows the user to add new transducer models to the E20 (when connected to the E20).

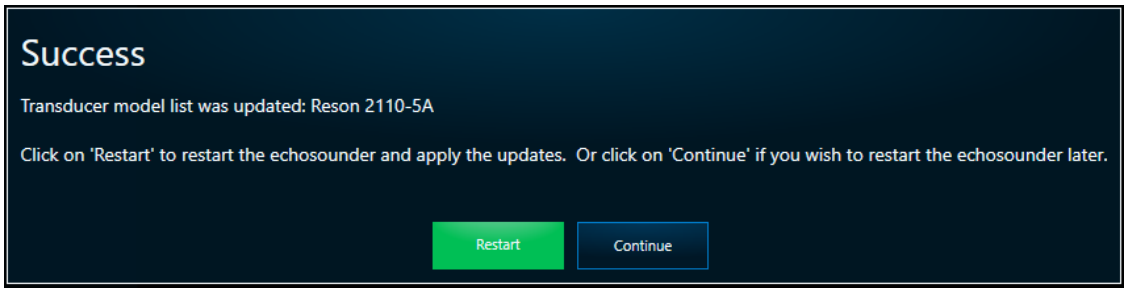
(a) Click the Settings tab.

(b) Under Update transducer model list, click the Choose file button and select the file that was issued by Teledyne Support.



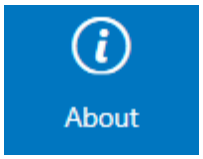
(c) Click Continue, and then Restart to add the new model(s).



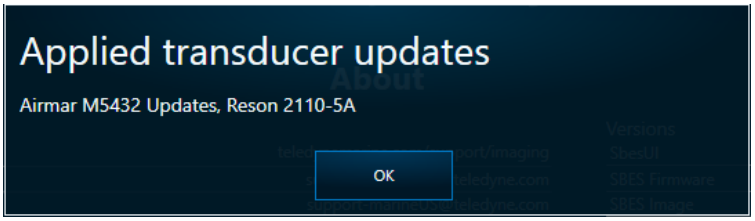


(d) The added transducer model(s) can be found by:

(i) Clicking the About button to the bottom left of the screen.



(ii) Clicking the Applied updates button to the bottom right.



If a model does not exist for the transducer, use the generic "unknown" transducer model. Using an incorrect model not only degrades the performance, but can also cause damage to the E20 or transducer.

8.2 Transducer[7]

8.2.1 Handling

- Use original shipping boxes when shipping or storing the unit.
- It is important to ensure that the transducer is not dropped or suffers any shock damage.

Avoid impact damage to the unit, as this may damage the internal components.

[7] Please, refer to the manufacturer's instructions, as well.

8.2.2 Maintenance

- Keep the transducer clean and free from marine growth where possible.
- Inspect and clean the transducer at regular intervals, especially if it is to be immersed in water for long periods of time.
  - A non-abrasive cleaning product should be used to clean the unit.
  - Ensure that the transducer is not scratched in any way.
- Store the transducer in a dry environment.

Be careful not to scratch the transducer. Ensure it is placed on a clean surface free from items that may damage it.

8.3 Power/Data Cable

8.3.1 Handling

Take care not to bend the cables beyond the recommended minimum bend radius.

- **DC power cable:**
  - Fixed installation: 42mm
  - Occasional flexing: 125mm
- **Data cables (transducers, COM/SYNC):**
  - Fixed installation: 5 x outer diameter
  - Occasional flexing: 15 x outer diameter

Do not lift the equipment by the cables.

8.3.2 Maintenance

Regularly inspect the cables and connectors for wear, and clean regularly with a non-corrosive cleaning agent.

Dry end:

- Inspect the connectors at regular intervals.
- Lubricate the connectors lightly with 3M lubricating spray or equivalent when necessary.

Avoid using WD-40 and similar that could degrade connectors and cables.

- Grip main body of connector during mating or unmating. Do not pull on cable to disconnect.
- Avoid sharp bends at cable entry to connector.

APPENDIX A – REFERENCE DOCUMENTATION

A.1 Echotrac E20 Documentation

In addition to this document, the following documentation is available in Adobe Portable Document Format (.pdf) for printing.

Document Title	Document Number	Description
Echotrac E20 Operator's Manual	OM19133	Version 14 or higher
Echotrac E20 Quick Reference Guide	QG19389	Version 6 or higher
SBES User Interface Quick Start Guide	QG19897	Version 2 or higher
Data Format Definition Document[8]	DFD20723 (NEW no.)	Version 3.17 or higher

A.2 Echotrac E20 Design Documents

The following design documents and drawings are provided for reference purposes.

Document Title	Document Number
Outline ECHOTRAC E20	19214
Cable Assy, M12A 4 P male to DSub 9 P Female	20639 (PN 1014481-DK)
Cable Assy, Converter transducer cable, 7/8 5 pole male to mill spec 5 pole female (PT01J-14-5S) (optional component)	19369 (PN 1013713-DK)
Cable Assy, Extender transducer cable, 7/8 5 pole male to 7/8 5 pole female (optional component)	19359 (PN 1013700-DK)

[8] Also available here: https://github.com/Teledyne-Marine/7k

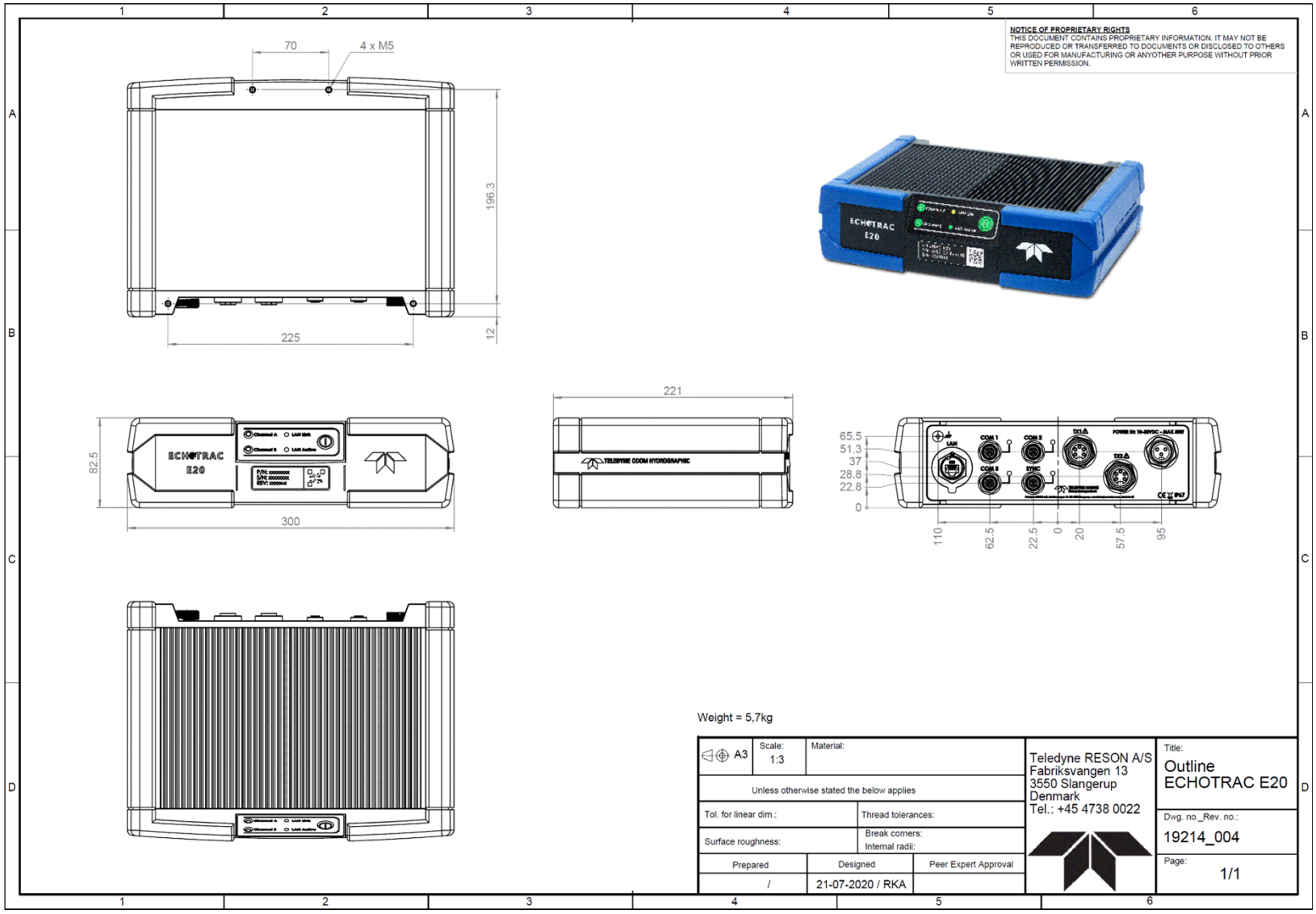


Figure 14: Echotrac E20 outline

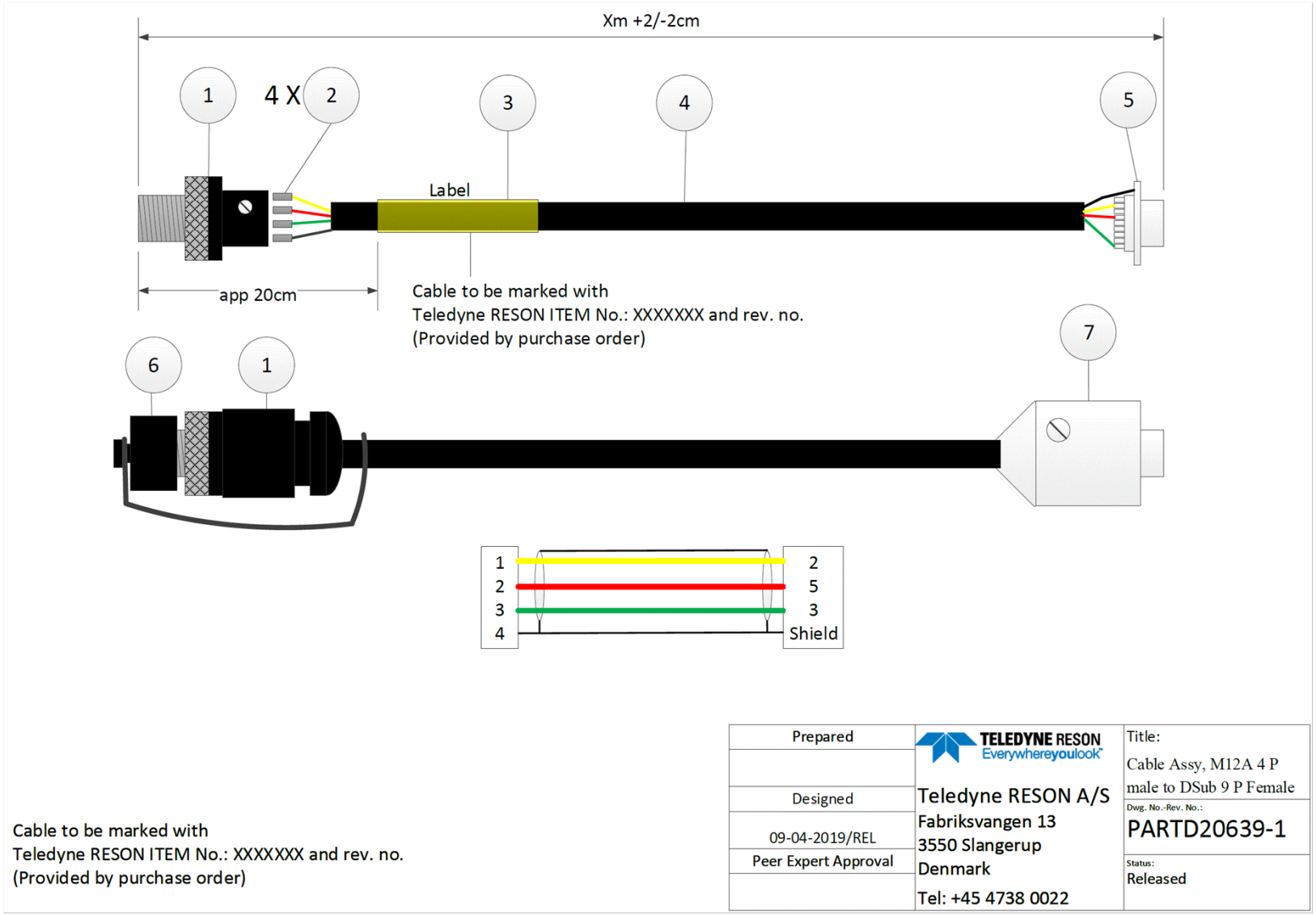


Figure 15: Serial cable (PN 1014481-DK)

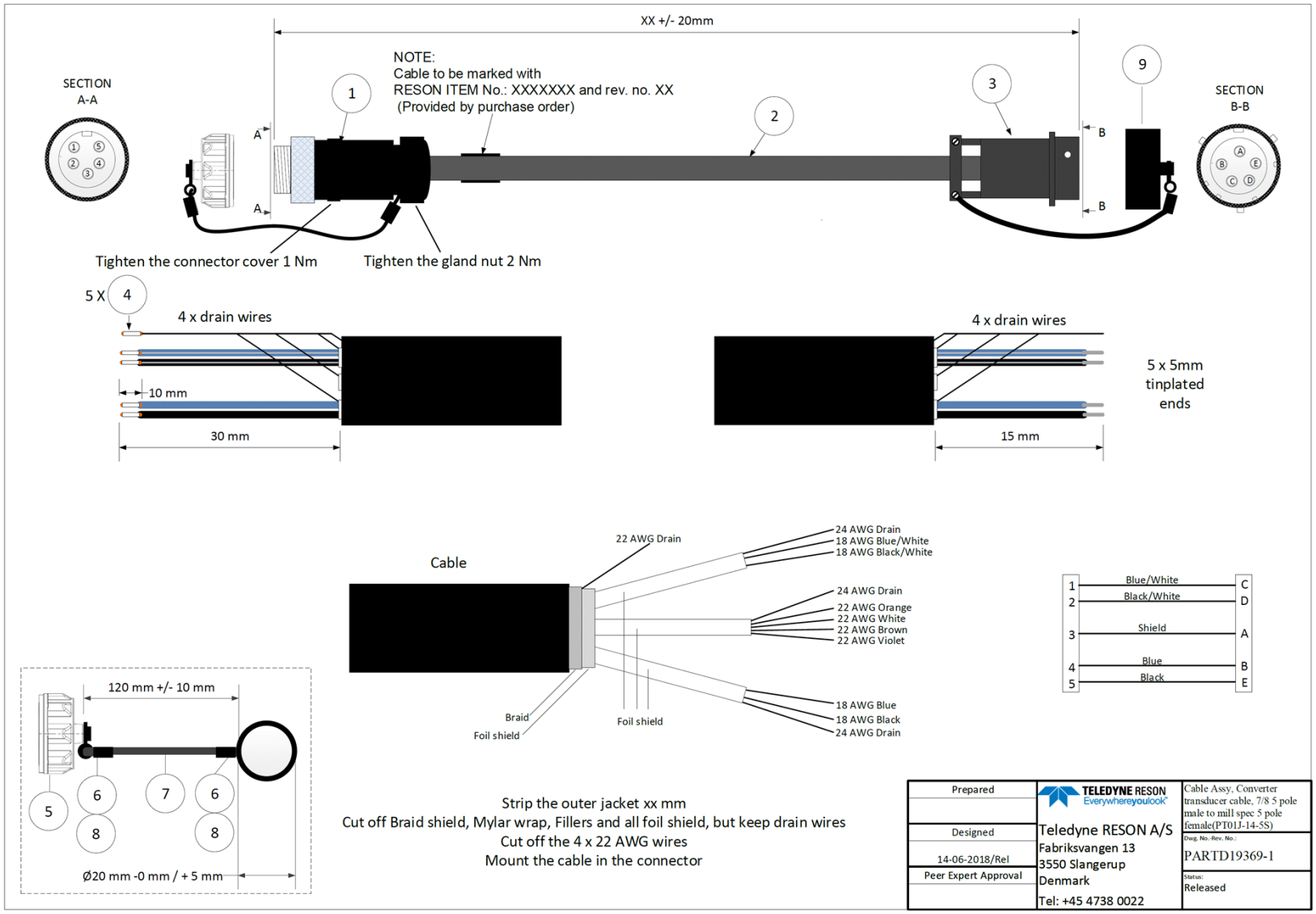


Figure 16: Converter transducer cable (optional component, PN 1013713-DK)

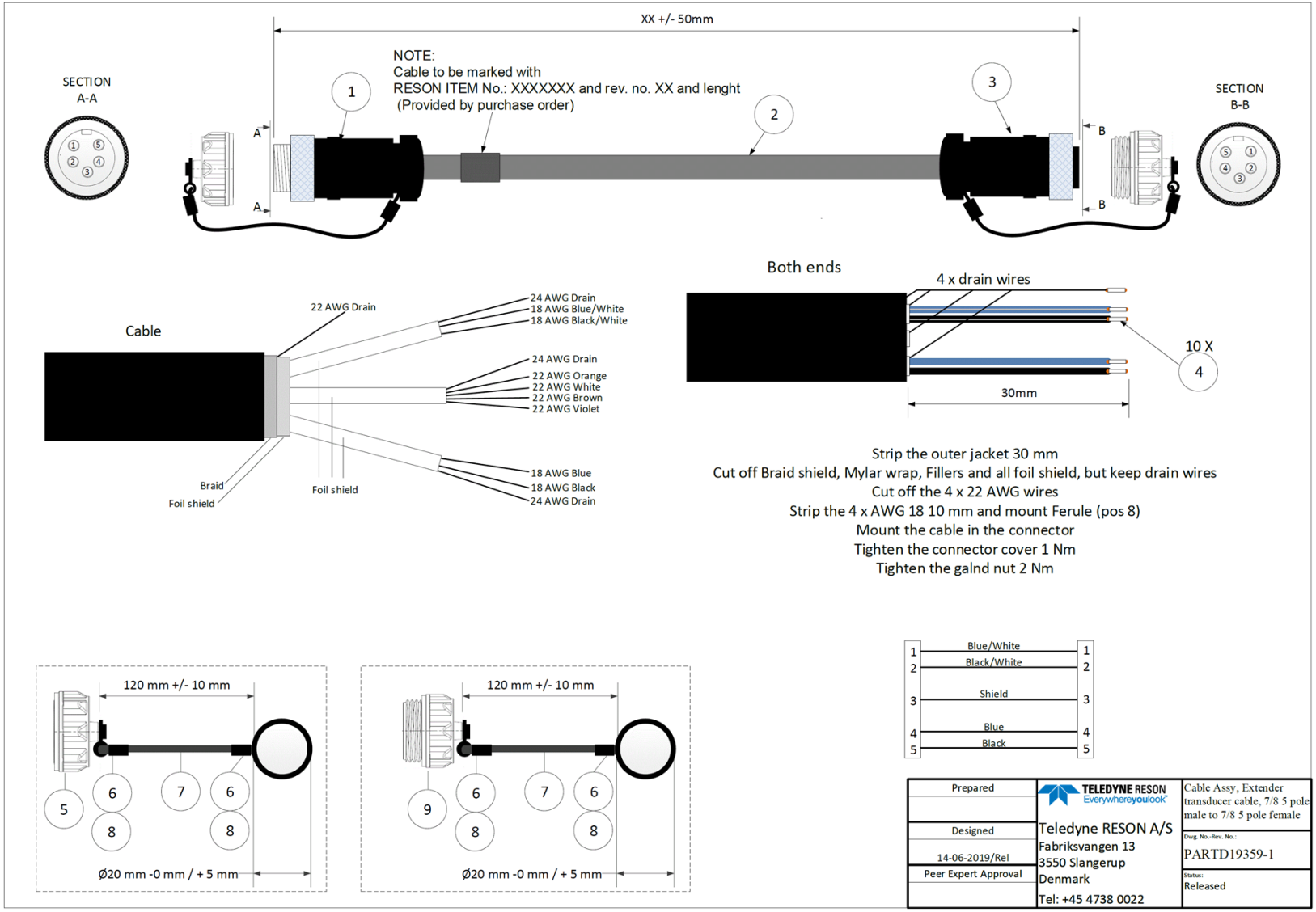


Figure 17: Extender transducer cable (optional component, PN 1013700-DK)

A.3 Licenses – Copyright Information

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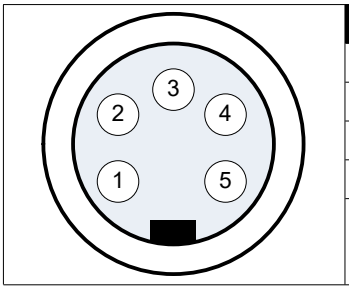
```

APPENDIX B – CABLE CONNECTORS

All connector views are the faces of the cable connectors on the rear panel of the E20.

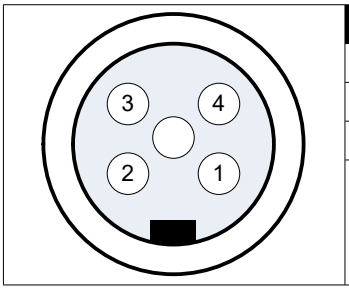
B.1 TX1 and TX2



Pin	Signal
1	Ch B+ (low freq.)
2	Ch B- (low freq.)
3	Shield
4	Ch A+ (high freq.)
5	Ch A- (high freq.)

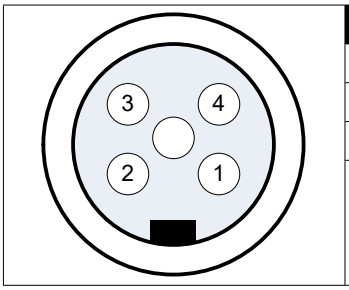
Note: Connectors TX1 and TX2 are connected in parallel.
Connect only 1 transducer for each pair.

B.2 COM Ports



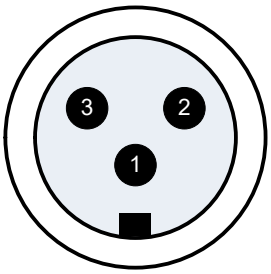
Pin	Signal
1	RS-232 out
2	RS-232 GND
3	RS-232 in
4	Shield

B.3 SYNC



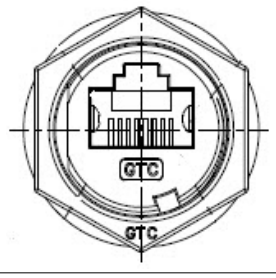
Pin	Signal
1	Trig out
2	GND
3	PPS in/Trig in
4	Shield

B.4 Power



Pin	Signal
1	Protection Earth (chassis)
2	GND
3	10-30VDC

B.5 LAN



Pin	Signal
LAN	

APPENDIX C – SERIAL AND UDP OUTPUT STRING FORMATS

C.1 Echotrac DBX (for Universal message)

- The DBX is an ODOM-defined format that is like NMEA formats but not an NMEA compliant format. Checksum is not included, and "DBX" is not registered by NMEA.
- The representation [+]ddd.ddd (or [+]hh.hh) is a fixed point representation of a number.
- The number of digits (d's, h's, or other letter) before and after the decimal point are fixed. There may be leading zeros but not leading spaces.
- A + designates that a sign is present. In that case it will display as – or +. Fields not prefixed with + will have no sign.
- DBX is sent per ping. If a channel (A or B) does not have detections for that ping or is not enabled/pinging, its corresponding data fields in the message will be populated with zeroes.

Table 14: Echotrac DBX

Field	Name	Format	Description
1	Prefix	string	$DBX
2	Date time UTC	YYYY-MM-DD Thhmmss.sss	UTC time, current time (ISO8601-2:2019) Notes: Even if the UI is showing other time zones on its display, it is the UTC that is synced to the SBES and the UTC that is contained in this message. Although ISO8601 defines a range of formats, the only format available in the DBX string is the one given here.
3	Time status	t	0 = UI PC, 2 = GPS with PPS, 3 = NTP server, 9 = not synchronizing at the moment
4	Depth channel A	ddddd.ddd	Depth below transducer (channel A)
5	Intensity A	+iii.ii	Intensity in dB at measured depth (channel A)
6	Draft A	+rr.rrr	Draft of transducer (channel A), always applied
7	Depth channel B	ddddd.ddd	Depth below transducer (channel B)
8	Intensity B	+iii.ii	Intensity in dB at measured depth (channel B)
9	Draft B	+rr.rrr	Draft of transducer (channel B), always applied
10	Unit	u	Unit for all distance fields in the record: 1 = Meter, 2 = Feet Note: This field defines the unit for the fields 4, 6, 7, 9, 11, 13.
11	Heave value	+hhh.hhh	Measured heave value Note: If a heave sensor is not connected, measured heave is reported as zero.
12	Heave status	c	Heave correction: 0=off; 1=on Note: When heave correction is on, heave is already applied to the depth fields.
13	Sound velocity	ssss.ss	Applied sound velocity
14	End of frame	<CR><LF>	Carriage return and line feed

Full string format:

```
$DBX,YYYY-MM-DDThhmmss.sss,t,ddddd.ddd,+iii.ii,rr.rrr,ddddd.ddd,+iii.ii,rr.rrr,u,
+hhh.hhh,c,ssss.ss<CR><LF>
```

Example:

```
$DBX,2019-09-30T205959.999,2,00123.999,-216.14,00.950,00124.321,-218.14,01.100,1,
-002.230,1,1435.98<CR><LF>
```

Example means:

30 Mar 2019 at 20:59:59.999 PPS synchronized, depth of 123.999m corrected for heave for channel A at -216.14dB and 0.950m draft, depth of 124.321m corrected for heave for channel B at -218.14dB and 1.100m draft, -2.230m heave, sound velocity 1435.98m/s

C.2 Echotrac SBT, Single Bottom Tracking (for depth)

Table 15: Echotrac SBT with One Frequency Active (high or low)

Character #	Character	Description
1	<sp>, F	Normally a space, “F” = Fix mark
2-3	et, ET	Unit indicator: “et” = centimeters, “ET” = tenths of feet
4	<sp>, E	Normally a space, “E” = error
5	<sp>	Always a space
6	D	Depth data (MSD)
7	D	Depth data
8	D	Depth data
9	D	Depth data
10	D	Depth data (LSD)
11	CR	Carriage return

Example: `<sp>et<sp><sp>DDDDD<CR>`
= `<sp>et<sp><sp>02035<CR>`
= 02035cm

For both single- and dual-frequency operation, the SBT string is generated until another string is selected on the Sensor tab (see *section 4.4.2 Auxiliary Sensors*). If the system is operating in dual frequency with SBT selected, the high-frequency depth is generated.

C.3 Echotrac DBT, Dual Bottom Tracking (for depth)

Using a single frequency

Table 16: Echotrac DBT with One Frequency Active (high or low)

Character #	Character	Description
1	<sp>	Always a space
2-3	et, ET	Unit indicator: “et” = centimeters, “ET” = tenths of feet
4	<sp>, E, O	Normally a space, “E” = high frequency error, “O” = low frequency error (missed return)
5	H, L	Frequency indicator: “H” = high, “L” = low
6	<sp>	Always a space
7	D	Depth data (MSD)
8	D	Depth data
9	D	Depth data
10	D	Depth data
11	D	Depth data (LSD)
12	CR	Carriage return

Example: `<sp>ETOL<sp>DDDDD<CR>`
= `<sp>ETOL<sp>54321<CR>`
= Low freq. error, 54321dft

Using dual frequencies

Table 17: Echotrac DBT with Both Frequencies Active (high and low)

Character #	Character	Description
1	<sp>	Always a space
2-3	et, ET	Unit indicator: “et” = centimeters, “ET” = tenths of feet
4	<sp>, E, O, D	Normally a space, “E” = high frequency error, “O” = low frequency error (missed return), “D” = high and low error (missed returns)
5	B	Frequency indicator: Both high and low
6	<sp>	Always a space
7	D	High frequency depth data (MSD)
8	D	High frequency depth data

Character #	Character	Description
9	D	High frequency depth data
10	D	High frequency depth data
11	D	High frequency depth data (LSD)
12	<sp>	Always a space
13	D	Low frequency depth data (MSD)
14	D	Low frequency depth data
15	D	Low frequency depth data
16	D	Low frequency depth data
17	D	Low frequency depth data (LSD)
18	CR	Carriage return

Example: `<sp>etDB<sp>DDDDD<sp>DDDDD<CR>`
= `<sp>etDB<sp>54321<sp>56789<CR>`
= High and low error, dual freq., 54321cm high-freq. depth, 56789cm low-freq. depth

C.4 DESO25 (for depth)

Table 18: DESO25 with Both Frequencies Active (high and low)

Character #	Character	Description
1	D	Always D
2	A, B	Frequency indicator: “A” = high, “B” = low
3-10	DDDDDDDD	Depth data
11	<sp>, f	Space, “f” = feet
12	m, t	Unit indicator: “m” = meters, “t” = feet
13	CR	Carriage return
14	LF	Line feed

Example: `DBDDDDDDDD<sp>m<CR><LF>`
= `DB20.00665<sp>m<CR><LF> or DB684.9470ft<CR><LF>`
= Low freq., 20.00665 meters or DB684.9470 feet

C.5 NMEA 0183 DBS, Depth Below Surface

Table 19: NMEA 0183 DBS with Both Frequencies Active (high and low)

Character #	Description
1-3	$SD for single frequency use $HF for high frequency data during dual channel use $LF for low frequency data during dual channel use
4-7	DBS, message type
	Depth in feet. Single decimal floating point number.
	,f,
	Depth in meters. Single decimal floating point number.
	,M,
	Depth in fathoms. Single decimal floating point number.
	,F*
	8 bit hexadecimal value checksum calculated over the entire string excluding the leading ‘$’
	Carriage return
	Line feed

Example: `$SDDBS,dd.d,f,d.d,M,d.d,F*36<CR><LF>`
= `$SDDBS,67.915,f,20.701,M,11.319,F*32<CR><LF>`
= Single channel data, 67.915 feet, 20.701 meters, 11.319 fathoms below the surface
= `$LFDBS,67.915,f,20.701,M,11.319,F*32<CR><LF>`
= Low freq. channel data in dual channel mode, 67.915 feet, 20.701 meters, 11.319 fathoms below the surface

C.6 NMEA 0183 DBT, Depth Below Transducer

Table 20: NMEA 0183 DBT with Both Frequencies Active (high and low)

Character #	Description
1-3	$SD for single frequency $HF for high frequency data during dual channel use $LF for low frequency data during dual channel use
4-7	DBT, message type
	Depth in feet. Single decimal floating point number.
	,f,
	Depth in meters. Single decimal floating point number.
	,M,
	Depth in fathoms. Single decimal floating point number.
	,F*
	8 bit hexadecimal value checksum calculated over the entire string excluding the leading '$'
	Carriage return
	Line feed

Example: `$SDDBT,dd.d,f,d.d,M,d.d,F*36<CR><LF>`
= `$SDDBT,67.915,f,20.701,M,11.319,F*32<CR><LF>`
= Single channel mode, 67.915 feet, 20.701 meters, 11.319 fathoms below the transducer
= `$LFDBT,67.915,f,20.701,M,11.319,F*32<CR><LF>`
= Low freq. channel data in dual channel mode, 67.915 feet, 20.701 meters, 11.319 fathoms below the transducer

C.7 DESO DDV (for heave, draft, and sound velocity)

Table 21, *Table 22*, *Table 23* apply to the selection of DESO DDV with one frequency (high or low) active. With every ping, the following three strings will be generated immediately after the DESO25 output string.

This feature is only available upon request for Deso echosounders.

Table 21: DESO DDV Heave

Character #	Character	Description
1	D	Always D
2	H	Always H
3-4	DD	Heave data
5	.	Period
6-7	DD	Heave data decimal
8	<sp>	Space
9	m	meters
10	CR	Carriage return
11	LF	Line feed

Example: `DHDD.DD<sp>m<CR><LF>`
= `DH-2.00<sp>m<CR><LF>`
= Heave, -2.00 meters

Table 22: DESO DDV Draft

Character #	Character	Description
1	D	Always D
2	G	Always G
3-4	DD	Draft data
5	.	Period
6-7	DD	Draft data decimal
8	<sp>	Space
9	m	meters
10	<sp>	Space
11	CR	Carriage return
12	LF	Line feed

Example: `DG<sp>DD.DD<sp>m<sp><CR><LF>`
= `DG<sp>00.00<sp>m<sp><CR><LF>`
= Draft 0.00 meters

Table 23: DESO DDV Sound Velocity

Character #	Character	Description
1	C	Always C
2	S	Always S
3-6	DDDD	Sound velocity data
9	<sp>	Space
10-12	m/s	meters per second
13	CR	Carriage return
14	LF	Line feed

Example: `CSDDDD<sp>m/s<CR><LF>`
= `CS1500<sp>m/s<CR><LF>`
= Sound velocity 1500 meters per second

If the system is operating in dual frequency with DESO DDV selected, the high-frequency depth is generated.

APPENDIX D – STANDARD WARRANTY INFORMATION[9]

D.1 Limited Warranty

Teledyne RESON warrants that our SeaBat™ T-Series systems shall be free from defects in materials and workmanship for a period of thirty-six (36) months from the date of Teledyne RESON's original shipment, and that all our other systems and/or auxiliary items shall be free from defects in materials and workmanship for a period of twelve (12) months from the date of Teledyne RESON's original shipment. These warranty periods apply, unless Teledyne RESON has specified a longer standard warranty period for a particular product and/or offered an extended warranty

During the warranty period, Teledyne RESON will, at its sole option, either repair, replace, or issue a credit for the original price of the defective system. Such repair, replacement, or credit shall be the sole remedy for a defective system. For full information about the warranty provisions, please refer to the section "Limited Warranty" in our General Terms and Conditions of Sale.

Teledyne Odom Hydrographic systems must be serviced by Teledyne RESON or one of Teledyne RESON's authorized service providers. Any return of nonconforming or defective systems is subject to Teledyne RESON's current return authorization process and procedures *(*see *appendix E.2 Returning Goods for Service*).

D.2 Warranty Exclusions

The warranty on Teledyne Odom Hydrographic systems does not apply to defects arising from:

- Improper installation, operation, or maintenance.
- Improper handling, storage, or transportation.
- Unauthorized modifications, alterations, or repairs.
- Failure to comply with Teledyne RESON's safety precautions.
- Accidental damage.
- Normal wear and tear.

D.3 Warranty Disclaimer

No warranties of merchantability or fitness for a particular purpose is intended or given.

D.4 Servicing During Warranty Period

If your system should encounter technical issues during the warranty period, please contact the customer support hotline (see *Appendix E – Support and Service*) to protect your warranty rights.

[9] Please refer to Teledyne RESON's General Terms and Conditions of Sale, available at http://www.teledynemarine.com/reson/ > Terms and Conditions.

APPENDIX E – SUPPORT AND SERVICE

E.1 Support

If you experience difficulties with your Teledyne Odom Hydrographic system, please contact Teledyne RESON Support for further instructions:

EUROPE

Tel: +45 20 999 088

e-mail: Marine-supportDK@Teledyne.com (Denmark)
Marine-supportGE@Teledyne.com (Germany)
Marine-supportNL@Teledyne.com (The Netherlands)
Marine-supportUK@Teledyne.com (United Kingdom)

UNITED STATES

Tel: +1 805 233 3900

e-mail: Marine-supportUS@Teledyne.com

E.2 Returning Goods for Service

No goods may be returned without prior authorization, as evidenced by a Return Authorization (RMA) Number.

Before returning any equipment for service, you must follow the Teledyne RESON equipment return authorization procedure stated below:

(a) Contact Teledyne RESON Support to obtain an approved Return Material Authorization (RMA) number.

(b) Follow the instructions in the supplied document and pack the equipment in the original shipping containers.

(c) Ship the equipment, transportation and insurance prepaid, according to the instructions issued by Teledyne RESON.

(d) Ensure that the RMA number is included on all shipping documents and, most importantly, marked on the shipping container's address label.

(e) Include a note which identifies the model or part number, and serial number (if applicable) along with a brief, but thorough, description of the problem.

TELEDYNE
ODOM HYDROGRAPHIC
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ECHOTRAC E20

Echotrac E20 Operator's Manual

Document Number: OM19133-14
Part Number: 1013460-DK