

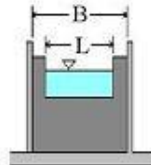
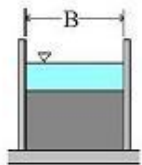
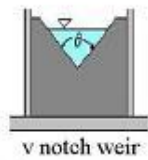
April 2013 Edition



Process Instrumentation

Level & Pump Controller

Instruction Manual



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Common Types of Sharp Crested Weirs

**ECHO Process Instrumentation, Inc.**

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# **SENSOR MANUAL**

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## **TECHNICAL INQUIRIES**

Please contact Sensor Inc. for technical support **850-200-0540**.

# **ECHO Process Instrumentation, Inc.**

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# TECHNICAL SPECIFICATIONS: ULS SERIES

## POWER

Power Supply  
Option (Low Power)

11 to 36 VDC, < 6 W (< 5 W with relays not energized)  
12 VDC with < 100 mA current consumption for incremental wake-up level readings

## GENERAL

Points of Measurement  
Mode of Operation  
Temp. Compensation

Single channel, up to 247 Air Transducers can be multi-dropped via RS-485  
Level, Distance, Flow, Volume or Pump Control  
Internal Precision Temperature Sensor ( $\pm 0.1^\circ\text{C}$  precision)

Measurement Range

### ULS-03 Model

0.15 m to 3 m (0.5 to 10 ft)

### ULS-10 Model

0.3 m to 10 m (1 ft to 33 ft)

Near Blanking

0.15 m (0.5 ft)

0.3 m (1 ft)

Accuracy

$\pm$  the greater of 0.1% of range or 2 mm

$\pm$  the greater of 0.25% of range or 6 mm

Repeatability

1.5 mm

3 mm

Resolution

0.01 mm

$\pm$  the greater of 0.1% of range or 2 mm

Frequency

125 kHz

50 kHz

Update Time

0.5 seconds

0.5 seconds

Effective Beam Angle<sup>1</sup>

3° inclusive

3° inclusive

Mounting<sup>2</sup>

1.5" NPT, BSP, or G

2" NPT, BSP, or G

## CONFIGURATION

Digital Echo Processing  
Analog Output  
Relays  
Communication  
Programming

*SENSOR Logic*, Smart Algorithms with Auto Mapping  
1 4-20 mA or 0-20 mA (Active), 12 bit resolution  
2 SPDT Relays, 5A @ 250 VAC/ 30VDC  
2 RS-485 Modbus RTU Ports  
SENSOR PC Software for laptop programming via USB to RJ-11 adapter  
Handheld programmer with display (available 1Q 2012)

## ENVIRONMENT

Temperature Range  
Pressure Range

-40°F to +185°F (-40°C to +85°C), process and storage areas

7 psi (0.5 bar)

## PHYSICAL

Ingress Protection  
Housing Material  
Cable Entry

NEMA 4X (IP66 to EN 60529)

Wetted: PVDF, Electronics: Glassfiber-reinforced, duroplastic Polyester

2 Cable Glands 1/2" NPT (options: Liquid-tight or Conduit fittings)

1. EBA -"Effective Beam Angle" is the processed beam angle when using SENSOR LOGIC algorithms.

2. Locking nut is included for mounting purposes.

ULS	Wetted/ Electronics	Bottom Thread	Electronics	Total Height	Weight
ULS-03	PVDF/ Fiberglass	1.5" NPT/BSP/G	4.72 x 4.80" (120 x 122 mm)	7.5" (190.5 mm)	3.2 lbs ( 1.45 kg)
ULS-10	PVDF/ Fiberglass	2" NPT/BSP/G	4.72 x 4.80" (120 x 122 mm)	7.5" (190.5 mm)	3.4 lbs ( 1.54 kg)

## Chapter 2 Installation

### Power Supply Requirements

The SENSOR Series operate from 11–36VDC.

*All electronic products are susceptible to electrostatic shock, so follow proper grounding procedures during installation.*

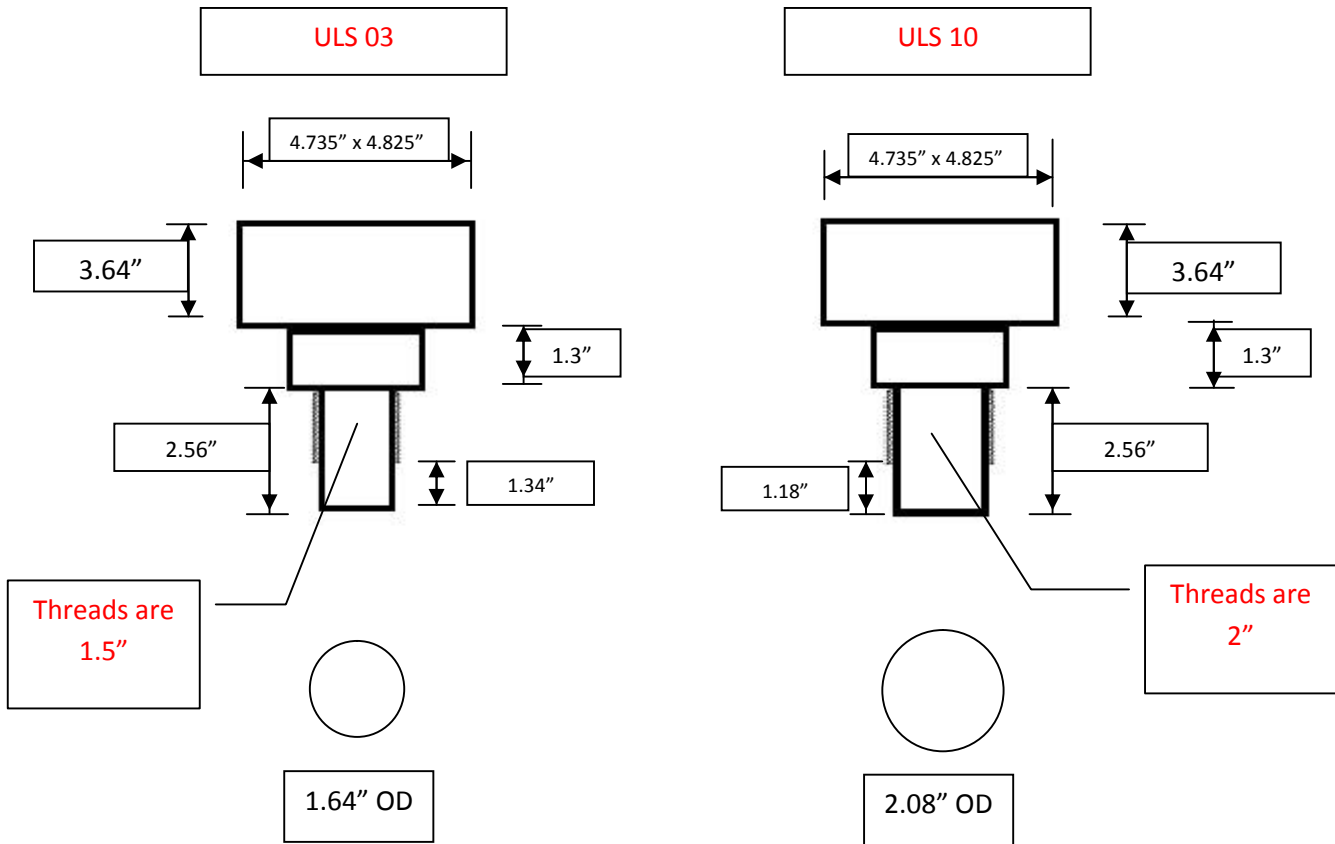
The Sensor can be mounted easily using the 1 ½-2" Threaded Fitting. When choosing a location to mount the

Sensor, bear in mind the following:

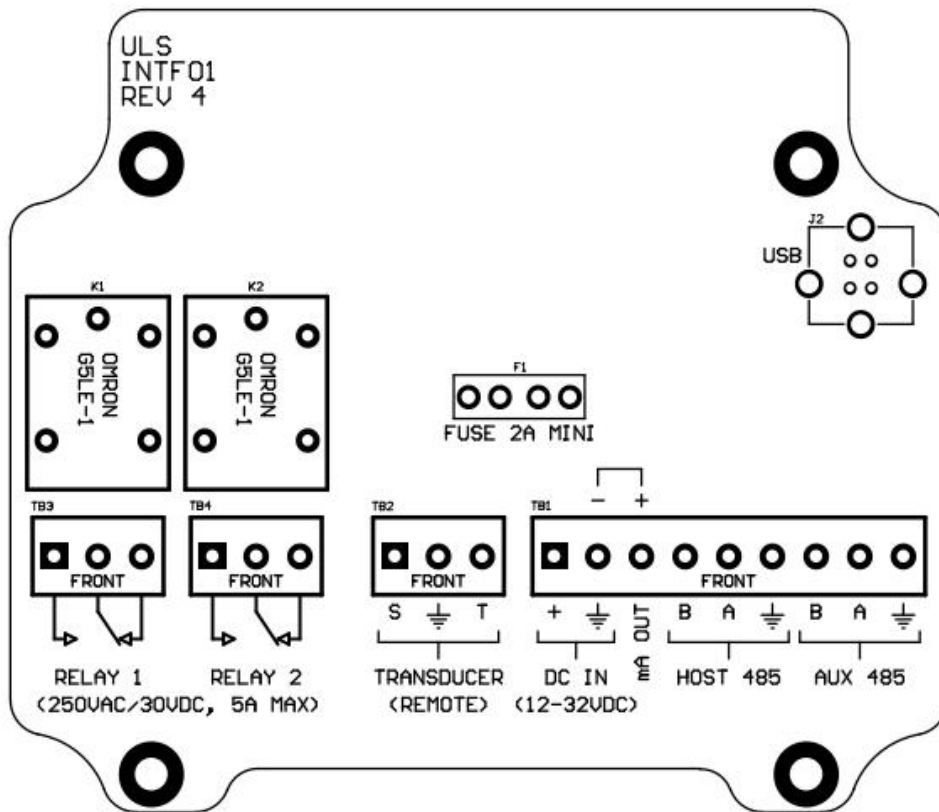
- The ultrasonic signal path should be free of falling material and obstructions such as pipes, beams etc.
- The transducers should be mounted at least .5' (ULS-03), 1' (ULS-10) above the maximum level of the material and be perpendicular to the surface.
- The mounting surface should be vibration-free.
- The ambient temperature of the sensor is between -40°F and 185°F (-40°C to -85°C).
- There should be no high voltage cables or electrical inverters close by.
- Do not use any metal substances when installing

## Dimensions

### SENSOR



Sensor is a non-contacting level sensor which uses the sound energy created by a piezo ceramic. It is designed with a beam focusing form that radiates from the concave surface to minimize the beam angle and protect from condensation.



Terminal		Function	Note
Relay 1, NO	1	Relay 1 Connect Normally Open	NO
Relay 1, COM	2	Relay 1 Connect as common	COM
Relay 1, NC	3	Relay 1 Connect to Normally Closed	NC
Relay 2, NO	4	Relay 2 Connect Normally Open	NO
Relay 2, COM	5	Relay 2 Connect as common	COM
Relay 2, NC	6	Relay 2 Connect to Normally Closed	NC
S	7	Signal from remote transducer	Signal
GND	8	GROUND remote transducer	GND
T	9	Temperature	Temp
+	10	Power + 12-32 VDC	+ PWR
--	11	Power Ground -- (Also used as 4-20 – GND)	-- GND
mA +	12	+ 4-20mA output	+mA
B	13	Host 485 (B)	B 485
A	14	Host 485 (A)	A 485
GND	15	Host 485 (GND)	GND 485
B	16	AUX 485 (B)	B 485
A	17	AUX 485 (A)	A 485
GND	18	AUX 485 (GND)	GND 485

### Quantity of cables gland provided and the cable thickness

Model	Quantity	Thickness( $\phi$ mm)
ULS-03	2	1/2"NPT
ULS-10	2	1/2"NPT

### Outdoor and Open Vessel Installation

The Sensor can be simply can be mounted easily using the 1 1/2-2" Threaded Fitting.

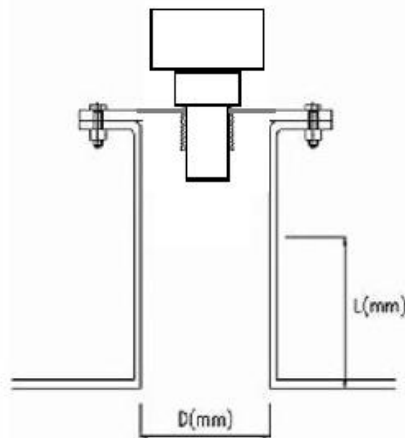
Care should be taken to ensure that the Sensor is shielded from direct sunlight, in order to minimize errors in the measurement of ambient temperature.

Attention should also be taken, when mounting the unit, to ensure that strong windy conditions are avoided, wherever possible, to prevent abnormal operation.

### Closed Vessel Installation

The Sensor can be simply screwed into a flange and secured using the thread located at the bottom of the transducer (1 1/2" -- 2").

Where possible use a flange made of a synthetic material such as PVC, to avoid vibration  
Place a rubber gasket between the flange and the connection to the vessel to avoid vibration.



### Stand Pipe Installation

When mounting the Sensor to a standpipe care should be taken to ensure that the standpipe is of sufficient diameter with reference to its length.

When using a standpipe, fixed to the top of a vessel, ensure that the open end of the standpipe is clear of any obstructions such as weld seams, gaskets etc. in order to avoid unwanted signal returns.

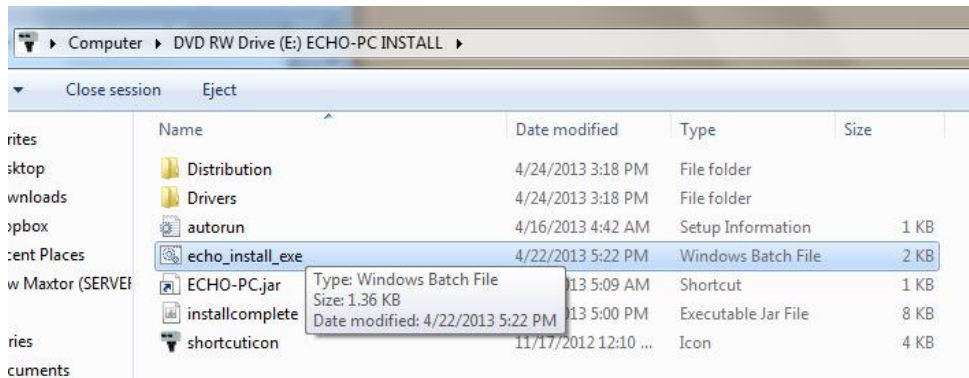
If using standpipes, which extend into the vessel, beyond the blanking distance, but not as far as the empty level, then the open end of the standpipe should be cut to an angle of 45°.



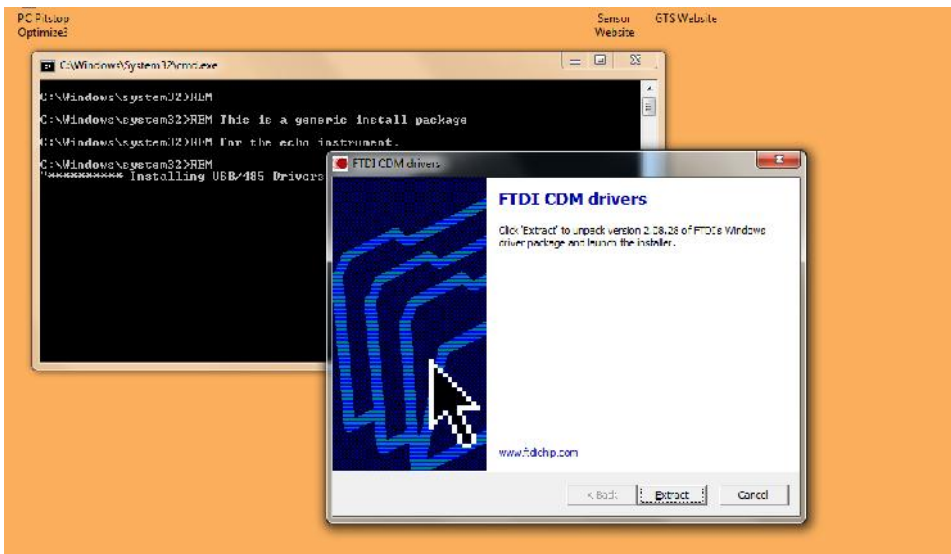
## Chapter 3 Installing PC Software

Insert Disc into your PC and click on the Yes to confirm all setup procedures.

If the disc does not auto run open it and click on the ECHO\_install\_exe.

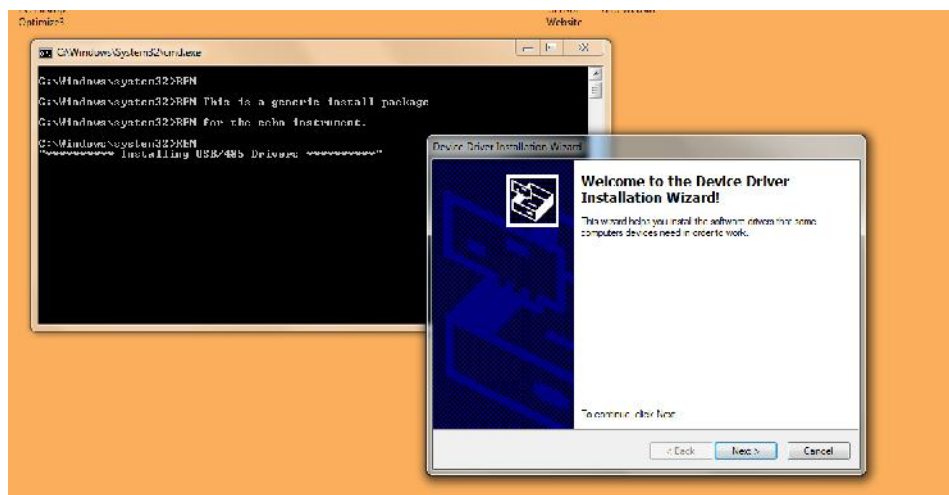


Follow the instructions and click yes and OK to continue the install.

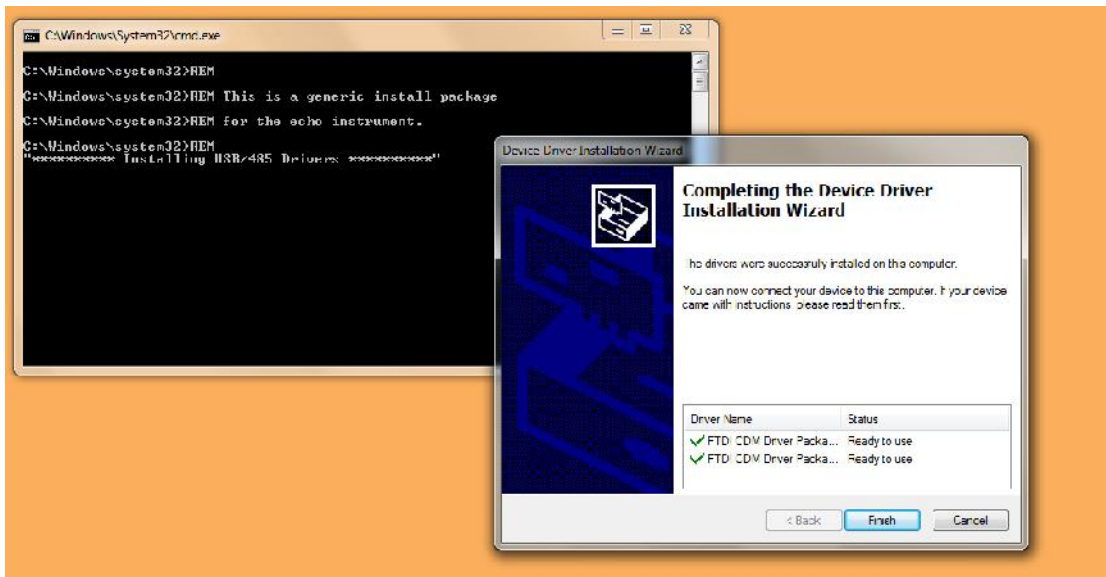


Click on the Extract button.

Then click next as below here.

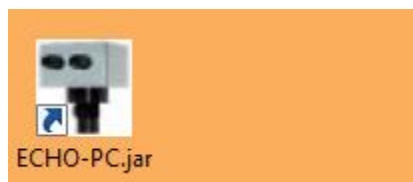


Click finish.



**Now it is installed make sure you connect the Air Transducer through the USB before running the software.**

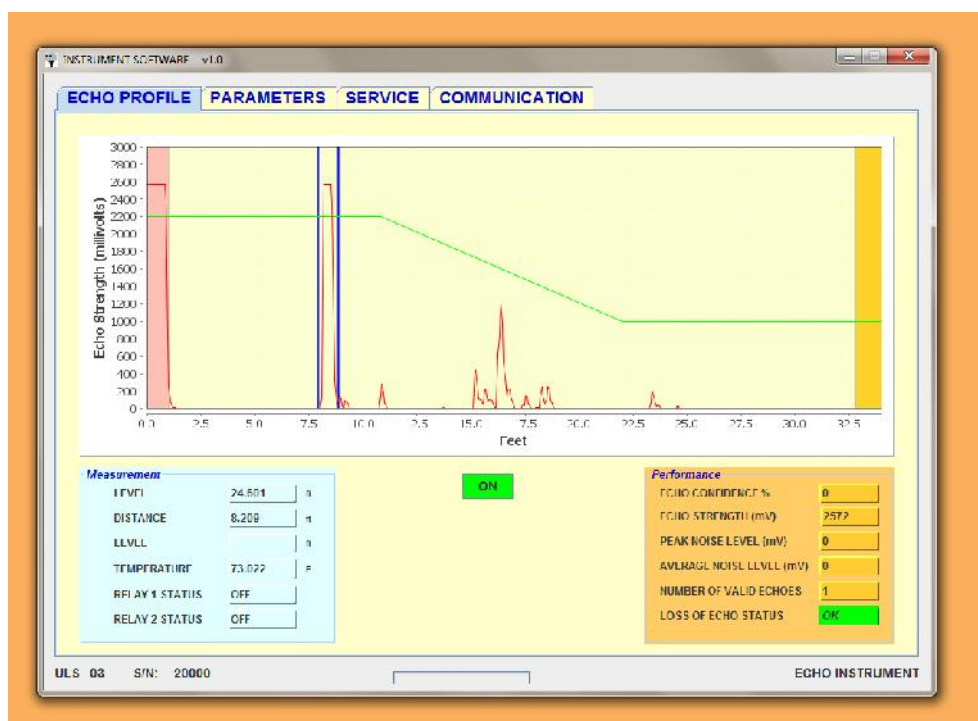
Now your PC Software is installed look for the



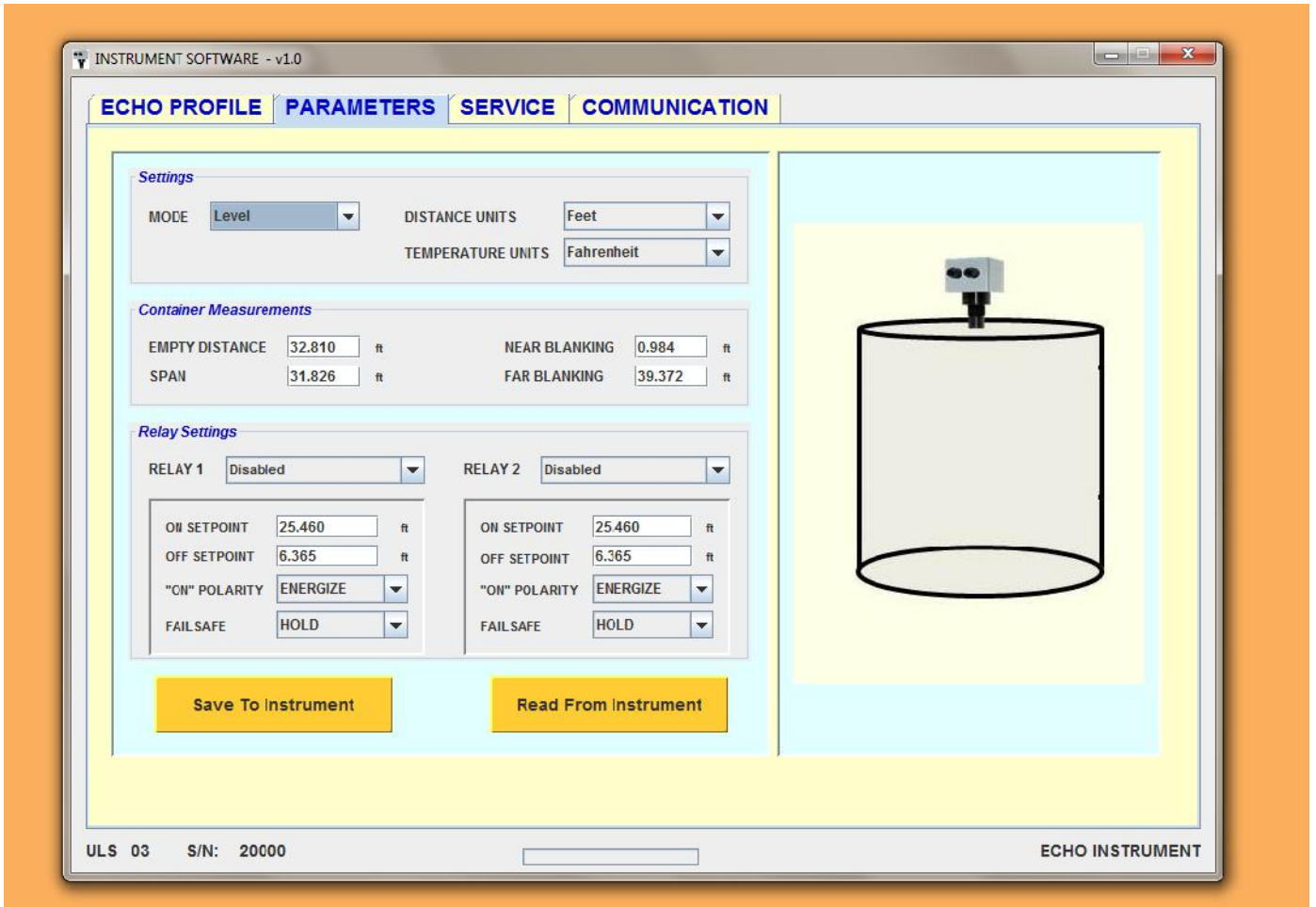
Icon on your desktop.

Double click on this to start the program....

This is your screenshot, with a nice clean signal.



Click on the Parameters Tab.

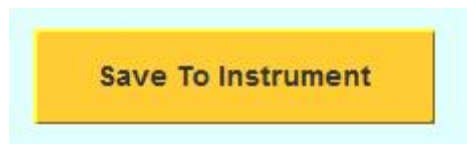


On this screen you can change the;

### Settings

1. Mode
  - A. Level (Default)
  - B. Volume
  - C. Flow
2. Distance Units
  - A. Feet (Default)
  - B. Inches
  - C. Meters
  - D. Centimeters
  - E. Millimeters
3. Temperature Units
  - A. Fahrenheit (Default)
  - B. Centigrade

\*\*\*\* If you change anything make sure you press the



Container Measurements					
EMPTY DISTANCE	<input type="text" value="32.810"/>	ft	NEAR BLANKING	<input type="text" value="0.984"/>	ft
SPAN	<input type="text" value="31.826"/>	ft	FAR BLANKING	<input type="text" value="39.372"/>	ft

**Now change your Container Parameters.**

1. Empty Distance (measurement from the transducer face to Zero/Empty Level).
2. Span (This is your Zero level to your Full level measurement).
3. Near Blanking (min .5' for ULS 03 and 1' for the ULS 10). This may be adjusted to ignore features near the transducer face.
4. Far Blanking (The full allowable measurement range to obtain a valid reading. The default is Empty Distance plus 20% or 10 meters + 2 meters = 12 meters or 39.372 feet).

\*\*\*\* If you change anything make sure you press the

**Save To Instrument**

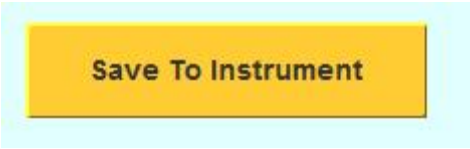
**Relay Settings**

Relay Settings					
RELAY 1	<input type="text" value="Disabled"/>		RELAY 2	<input type="text" value="Disabled"/>	
ON SETPOINT	<input type="text" value="25.460"/>	ft	ON SETPOINT	<input type="text" value="25.460"/>	ft
OFF SETPOINT	<input type="text" value="6.365"/>	ft	OFF SETPOINT	<input type="text" value="6.365"/>	ft
"ON" POLARITY	<input type="text" value="ENERGIZE"/>		"ON" POLARITY	<input type="text" value="ENERGIZE"/>	
FAILSAFE	<input type="text" value="HOLD"/>		FAILSAFE	<input type="text" value="HOLD"/>	
<b>Save To Instrument</b>			<b>Read From Instrument</b>		

1. Relay 1 Options (same as Relay 2).
  - A. Disabled
  - B. High Alarm/Pump Down
  - C. Low Alarm/Pump Up
  - D. Alt Pump down
  - E. Alt Pump Up
  - F. Loss of Echo (LOE)
  - G. Remote

2. Next set your...
  - A. On Point
  - B. Off Point
  - C. "on" Polarity
    1. Energize
    2. De-energize
  - D. Fail Safe
    1. Hold
    2. On
    3. Off

\*\*\*\* If you change anything make sure you press the



## Service Tab

The screenshot shows the 'INSTRUMENT SOFTWARE - v1.0' window with the 'SERVICE' tab selected. The 'UNIT' sub-tab is active, displaying the following 'Unit Information':

MANUFACTURER ID	1.413
DEVICE ID	100.10
SERIAL NUMBER	20000
HARDWARE VERSION	3.3
SOFTWARE VERSION	1.1
ELAPSED TIME (sec)	12
TOTAL TIME (hrs)	0
POWER CYCLES	0

To the right, the 'Performance' section shows:

ECHO CONFIDENCE (%)	0
ECHO STRENGTH (mV)	2572
PEAK NOISE LEVEL (mV)	0
AVERAGE NOISE LEVEL (mV)	0
NUMBER OF VALID ECHOES	1
LOSS OF ECHO	OK

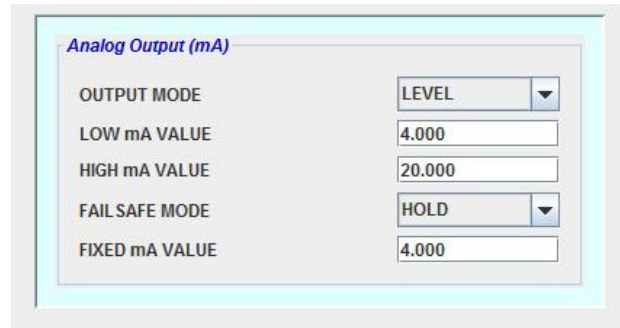
Below the performance section are three buttons: 'MASTER RESET' (red), 'SAVE SERVICE SETTINGS' (yellow), and 'READ SERVICE SETTINGS' (yellow). The status bar at the bottom shows 'ULS 03 S/N: 20000' and 'ECHO INSTRUMENT'.

## Unit Tab

This is where you can check your device info. **You can also do a master reset.**

**MASTER RESET**

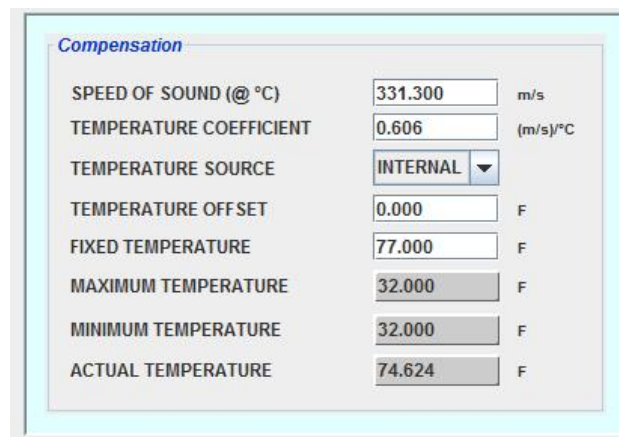
### Click the Analog Tab



Analog Output (mA)	
OUTPUT MODE	LEVEL
LOW mA VALUE	4.000
HIGH mA VALUE	20.000
FAIL SAFE MODE	HOLD
FIXED mA VALUE	4.000

1. Output Mode
  - A. Disable
  - B. Level (Default)
  - C. Volume
  - D. Flow
  - E. Fixed
2. Low mA Value (set usually as 4mA)
3. High mA Value (Usually 20mA)
4. Fail Safe Mode
  - A. Hold (Default)
  - B. Fixed
5. Fixed mA Value

### Click on the Compensation Tab



Compensation	
SPEED OF SOUND (@ °C)	331.300 m/s
TEMPERATURE COEFFICIENT	0.606 (m/s)/°C
TEMPERATURE SOURCE	INTERNAL
TEMPERATURE OFFSET	0.000 F
FIXED TEMPERATURE	77.000 F
MAXIMUM TEMPERATURE	32.000 F
MINIMUM TEMPERATURE	32.000 F
ACTUAL TEMPERATURE	74.624 F

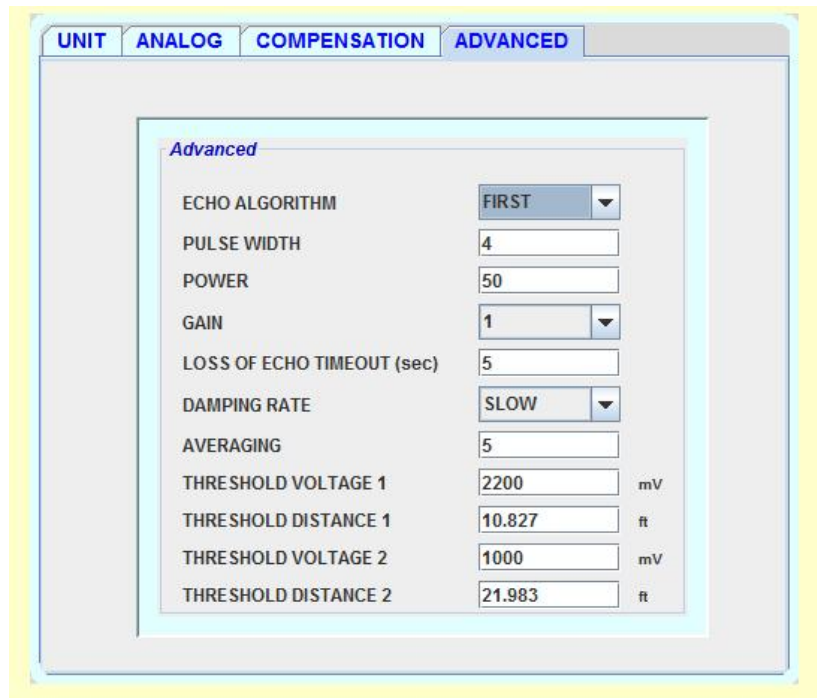
1. Speed Of Sound (Default 331.300 m/s)
2. Temperature Coefficient (Default .606)
3. Temperature Source (Default Internal)
  - A. Internal

- B. Fixed
- 4. Temperature Offset
- 5. Fixed Temperature
- 6. Maximum Temperature
- 7. Minimum Temperature
- 8. Actual Temperature

\*\*\*\* If you change anything make sure you press the



Click on the Advanced Tab



1. Echo Algorithm (Default First)
  - A. First
  - B. Largest
2. Pulse Width (Default 4)
3. Power (Default 50)
4. Gain (Default 1)
  - A. 1
  - B. 2
  - C. 3
  - D. 4
  - E. 5
  - F. 6
  - G. 7



H. 8

5. Loss of Echo Timeout (Default 5 Sec)
6. Dampening Rate (Default Slow)
  - A. Fastest
  - B. Fast
  - C. Medium
  - D. Slow
  - E. Slowest
7. Averaging (Default 5)
8. Threshold Voltage 1 (Default 2200mV)
9. Threshold Distance 1 (Default 10.827ft)
10. Threshold Voltage 2 (Default 1000mV)
11. Threshold Distance 2 (Default 21.983ft)

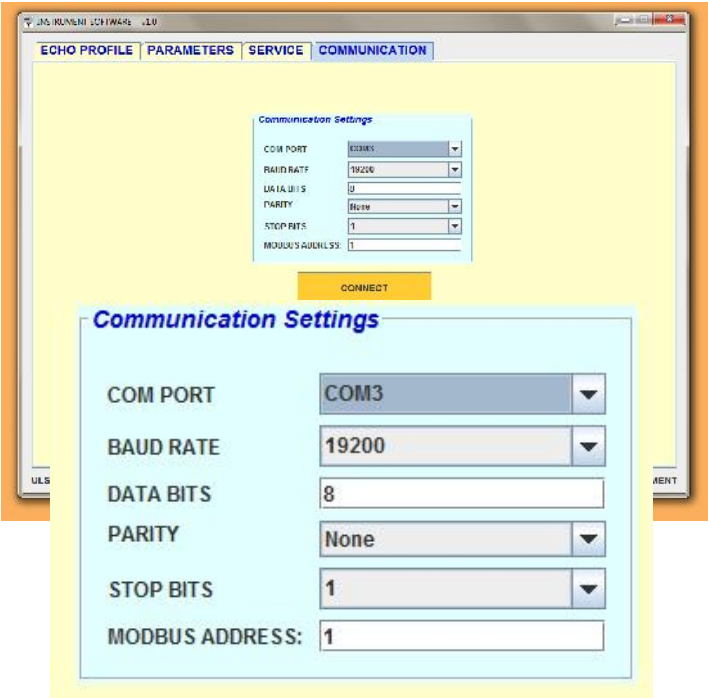
\*\*\*\* If you change anything make sure you press the



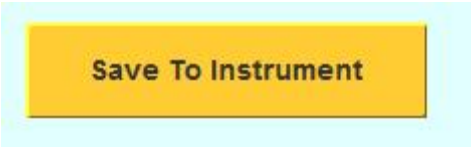
### Click on the Communication Tab

Com Port (Default Com 3)

- A. 1 – 24
1. Baud Rate (Default 19200)
2. Data Bits (Default 8)
3. Parity (Default None)
  - A. None
  - B. Odd
  - C. Even
4. Stop Bits (Default 1)
  - A. 1
  - B. 2
5. MODBUS Address (Default 1)

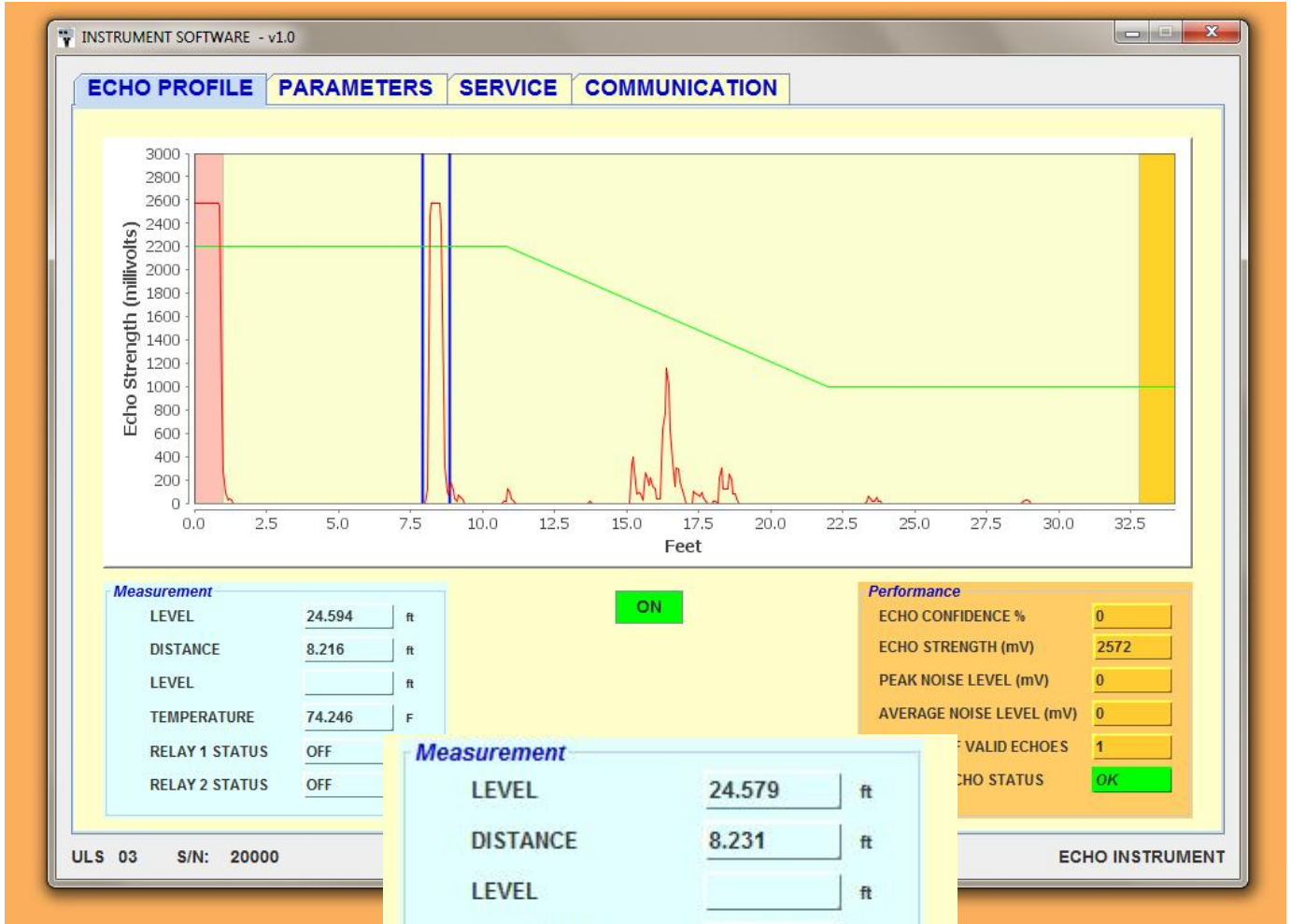


\*\*\*\* If you change anything make sure you press the

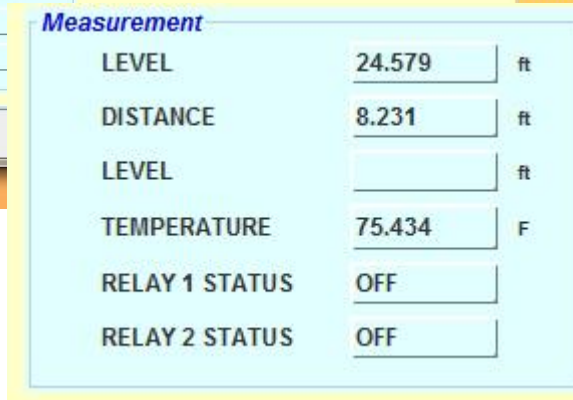




Now click the Echo profile tab again and look at your signal.



Look at this part of the screen.



1. Level (Shows level of material)
2. Distance (From Transducer to material)
3. Level (Mode Of Operation)
4. Temperature (Shows temp at transducer)
5. Relay 1 Status (Default Off)
6. Relay 2 Status (Default Off)



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