

AST

Acoustic Systems Trainer for SONAR

DATA SHEET



***i*nnovative Technology Projects Ltd.**

KEY FEATURES

The Acoustic Systems Trainer is a real-time bench top SONAR training and development console. It has been designed and manufactured for teaching acoustic engineering, demonstrating principals of acoustics, conducting underwater studies and shallow water experiments.

The transparent Acrylic Acoustic Tank is designed to allow the AST to operate in a classroom environment. The console when combined with the tank allows the user to observe the interaction between acoustic signals and a real body of water.

A built-in heater can be used to increase the temperature of the water in the tank to produce varying environmental conditions. Temperature monitoring is conducted with a submersible probe thermometer with an external digital display

A variety of active and passive targets can be mounted on the Target Transport System to create a variable range and / or speed component of the target.

System Features

- Real-time operation
- Integral Sonar Signal Analyzer
- All signals can be monitored
- Windows-based menu driven software
- Variable environmental conditions
- High frequency transducers
- Active and passive targets
- Bench-top, Acrylic Acoustic Tank
- Variable speed Target Transport System
- Low power, low voltage operation
- Multi-Channel Software
- Underwater R&D platform
- Signal recording and playback

Topic Coverage

- Effect of temperature and speed of sound
- Active SONAR
- Passive SONAR
- CTFM SONAR
- Transducer frequency response
- Sub-bottom profiling
- Beam width measurement
- Beam formation / beam steering
- The Doppler Effect
- Target range resolution
- Volume scattering
- Acoustic signal jamming
- Underwater sound analysis

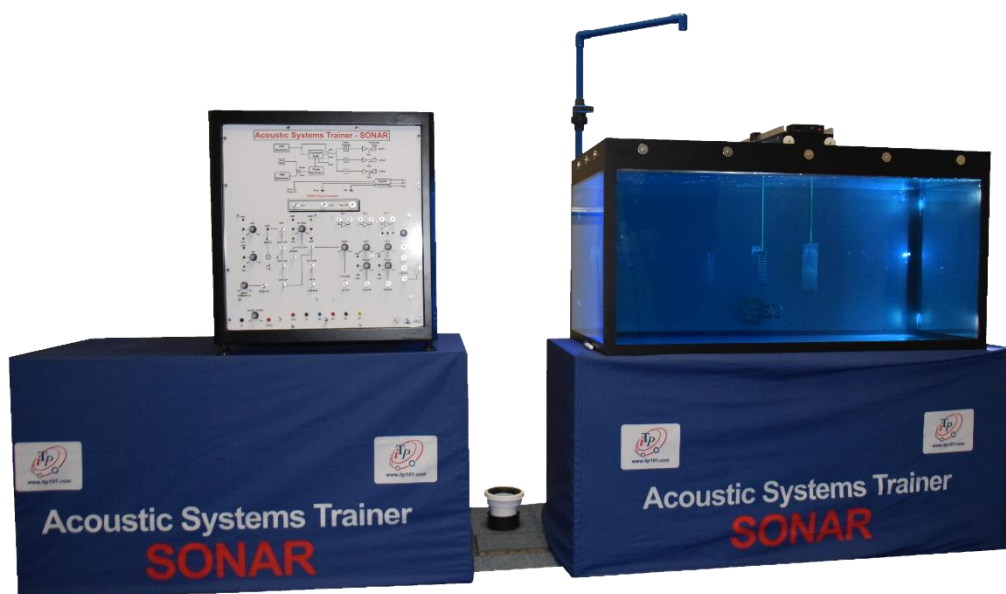


Figure 1 - A typical AST classroom set-up

SYSTEM DESCRIPTION

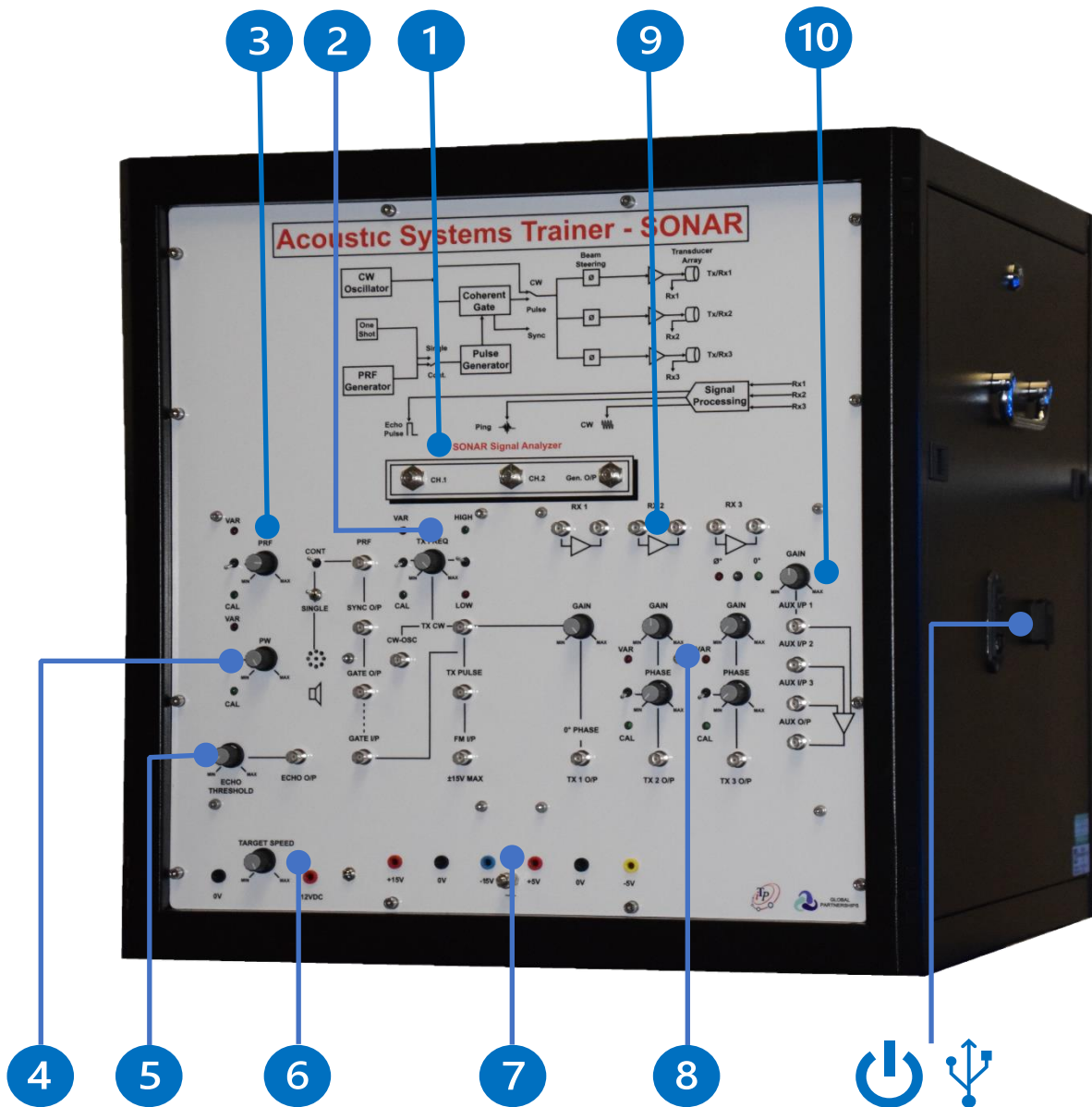




Figure 2 - The AST Console

Image Reference	Component Description
1	Sonar Signal Analyzer – 2 Channel Input and AWG Output
2	Fixed or Variable Transmit Frequency High / Low
3	Fixed or Variable PRF
4	Fixed or Variable Pulse Width
5	Variable Echo Threshold
6	Variable Target Speed / 12v DC Output
7	Fixed $\pm 5v$ & $\pm 15v$ DC Outputs
8	3 Fixed or variable Gain and Phase Transmit Outputs
9	3 Fixed Gain Receiver Amplifiers
10	3 Aux Input – 1 Aux Output Variable Gain Amplifier
 	IEC power cable socket & Type B USB v2.0 port for PC connectivity

SYSTEM DESCRIPTION

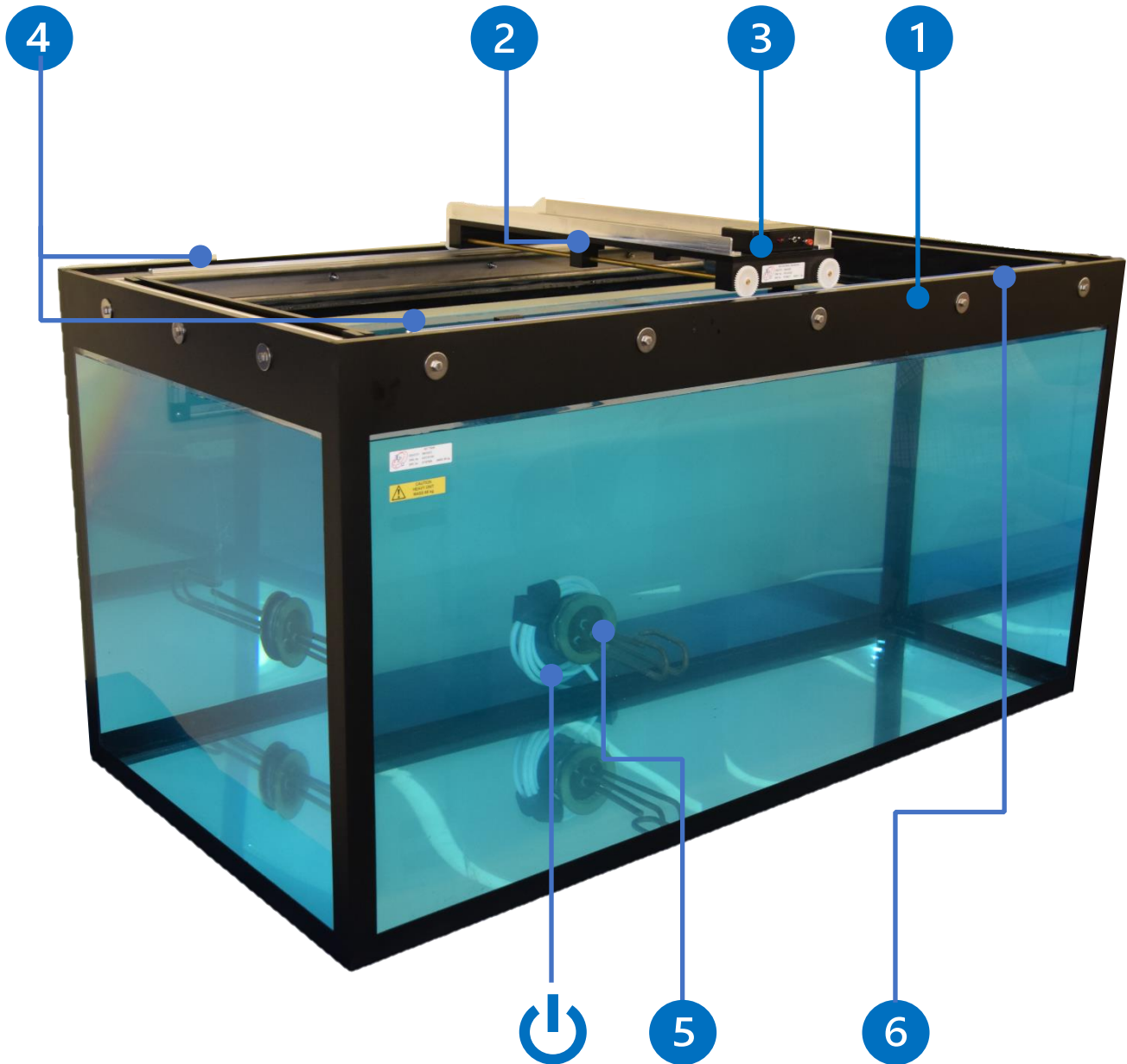



Figure 3 - The Acrylic Acoustic Tank & Target Transport System

Image Reference	Component Description
1	15mm Acrylic Acoustic Tank
2	Variable speed Target Transport System
3	Target Transport System control box
4	Target Transport System guide rails
5	3kW heater
6	Target Transport System magnetic reversing sensor
	UK Type G plug power supply to 3 kW heater

PRODUCT SPECIFICATIONS

AST Console	Lockable rack enclosure with carry handles
	Supply: 110 / 220 / 240 Volts, 50/60 Hz ~ @ 2 amps
	Outputs: 0-12 Volts D.C. variable / ± 5 Volts D.C. fixed / ± 15 Volts D.C. fixed
	Connections: One Type B USB v2.0 connection
	TX CW: 200 kHz – CAL / VAR
	PRF: 714 Hz – CAL / VAR
	PW: 100 μ secs – CAL / VAR
	TX PULSE gated: 100 μ secs ~ 20 CW cycles
	TX2, TX3 fixed and variable phase O/Ps
	SYNC pulse: +5 Volts D.C. Echo threshold control
Acoustic Tank	15mm reinforced acrylic construction
	Tank capacity: ~ 400 Litres (106 gal)
	Supply: 220/240 Volts, 50/60 Hz (Live, Neutral and Ground)
	Internal fitted 3kW heater with 50°C max limit thermostat
	Internal/External digital thermometer
	Stainless steel frame Target Transport System guide rails with magnetic reversing sensors
Sonar Signal Analyzer	Sample Rate: 8, 12, 14, 16 bits Resolution ~ 500 Ms/sec
	2 Channel operation & math functions
	Storage oscilloscope: 100 nsec – 600 sec/div
	Averaging: 1 - 256
	Phase measurement
	Spectrum analyzer: .001Hz – 50MHz
	AM/FM/FSK modulation ~ Sweep & Burst
	Transient recorder: > 30,000 points ~ 750 days
Voltmeters: 6 programmable Arbitrary Waveform Generator: 1 μ Hz – 30MHz	
Transducer	Resonant Frequency: 200 kHz
	Beam Width: ~ 10° to 20° @ -3 dBs
	Conical beam shape
	Epoxy resin encapsulation
	Variable depth
	Coaxial connector type: BNC Connector
	Reversible operation Orientation: vertical or horizontal Mounting: Delrin tank mount
Target Transport System	Speed control Voltage: 0-12 Volts (Using AST Console)
	Auto reversing with manual override
	Magnetic reversing sensors
	Direct traction drive
	Sliding target rails
Targets – Active	Stainless steel flat plate 20cm Sq.
	Stainless steel flat plate 10cm Sq.
	Stainless steel grill plate 10cm Sq.
	Acrylic flat plate 20cm Sq.
	Plastic Sphere
Targets – Passive	Three bladed propellor 45mm M4 RH
	Four bladed propellor 45mm M4 RH
	Five bladed propellor 45mm M4 RH
	Variable speed motor & gearbox

PHYSICAL CHARACTERISTICS

AST Console		
	Console Dimensions	Shipping Dimensions
	LxWxH: 600x600x650mm (24x24x26in)	LxWxH: 760x760x960mm (30x30x38in)
	Weight: 40Kg (88lb)	Weight: 74Kg (163lb)
Acrylic Acoustic Tank (Empty)		
	Tank Dimensions	Shipping Dimensions
	LxWxH: 1200x600x600mm (47x24x24in)	LxWxH: 1360x760x960mm (54x30x38in)
	Weight: 68Kg (150lb)	Weight: 123Kg (271lb)
Acrylic Acoustic Tank (Water filled)		
	Tank Dimensions	
	LxWxH: 1200x600x600mm (47x24x24in)	
	Weight: ~500Kg (~1102lb)	

ENVIRONMENTAL & SAFETY

Temperature	Operating: +5°C to +45°C (41°F to 113°F) Non-operating (empty tank): -5°C to 55°C (23°F to 131°F)
Relative Humidity	Operating: 5% to 90%, non-condensing Non-operating: 5% to 90%, non-condensing
Regulatory	Built to ISO 9001:2015 standard
Console Cooling Clearance	50mm (2in) from any console surface

PC REQUIREMENTS

No supporting IT equipment is supplied with the AST.

Computers that are intended to support and run the Acoustic Systems Trainer (AST) must meet the below requirements.

	Minimum Requirements	Recommended Requirements
Operating System	Windows 10 – 64bit	Windows 11 – 64bit
Processor	Intel Core i3	Intel Core i5
Processor Speed	2GHz	2.4GHz
Memory	4GB	8GB
Hard Disk Size	80GB HDD	128GB or more (Solid State Drive)
Free Disk Space	20GB	40GB or more
Graphics Card	Dual Monitor Capable	Dual Monitor Capable
Monitors	Two Monitors	Two Monitors
Monitor Resolution	1024 x 768	1920 x 1080
Mouse	USB Mouse	USB Mouse
Keyboard	USB Keyboard	USB Keyboard
3x USB Type A Ports	Required for the AST Console, Mouse & Keyboard	Required for the AST Console, Mouse & Keyboard
Headphone Port	Required for Headphone Use	Required for Headphone Use
Microphone Port	Required for Microphone Use	Required for Microphone Use
Sound Card	Required for Demonstrations	Required for Demonstrations
Internet Connection	Recommended	Recommended
Microsoft Office	Microsoft PowerPoint	Microsoft Office 365 or Microsoft Office 2019

