

# Helium Speech Unscrambler Systems



## 350X DSP Communication System

The Imenco Nautronix DSP Helium Speech Unscrambler is fully digital in design and utilises processing systems to provide the highest speech intelligibility.

The physical properties of the high pressure heliox (heliumoxygen) atmosphere produces significant changes in the speech generation mechanism for a resident diver which at deeper depths results in largely unintelligible speech.

Traditional speech unscramblers have implemented time, or hybrid combinations of time and frequency domain processing. Time domain processing is not capable of fully compensating for all the helium-induced distortion.

Imenco Nautronix's full frequency domain algorithm completely models the effects of the high-pressure helium environment on the vocal tract. The algorithm is computationally intensive, sampling speech at 44kHz, utilising DSP (Digital Signal Processing) devices. Evaluation of unscrambled speech from these algorithms has shown intelligibility levels close to 100% at standard helium diving depths and better than 91% at 450m.

Individual modules are available for wet diver, dry diver, tender control, power, entertainment, telephone, record and unscrambler. Full control is provided via the tender module using communication 'groups'. A group can consist of any number of modules and one unscrambler. A unique group cross talk feature is available to allow divers at the different depths to communicate clearly.

Other unique features include a design with no electronics at the diver end, innovative noise and electrical pick-up cancelling circuitry and built in breathing noise reduction with

full integration to Nautronix Emergency Through Water Communication System.

Another key feature of the 352X system is the modular cards can easily be replaced in a matter of minutes, in the case of a fault. This means minimal disruption to operations.

Special pickup cancelling features ensure that the highest audio quality is achieved providing high intelligibility speech in noisy environments.

### Summary of Capabilities

- Modular Construction  
Easy reconfiguration, expansion & Minimum Spares Holding
- Frequency Domain Processing:  
Highest Possible Intelligibility Using Algorithms Processor
- Full Switching Capability:  
Flexibility and Configurability for Various Scenarios
- Group Facilities:  
Easy Communications with Other Locations e.g. ROV, Deck Crane and Bridge
- No Tuning or Electronics at Bottom End:  
Reliability, Minimum Maintenance
- Standard 4 Wire System:  
Easily Understood - no Maintenance
- Interfacing between Units:  
Back Up
- Comms Between Chambers at Different Depths
- Interface to Telephone System:  
Direct Private Calls from Divers at Depth to Shore, Fully Unscrambled
- Interface to Emergency Acoustic Bell Comms:  
Intelligible Unscrambled Speech for Emergency Situations

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MODEL AVAILABLE	Description
3500 DSP Unscrambler Module	The “brains” of the system using a high specification DSP processor. The module allowing entry of the diving depth and selection of the group to be unscrambled.
3501 Tender Module	The tender module effectively removes the need for one off switch panels and allows the tender to select which groups can be talked to and listened to. A press to talk for each group and entertainment are also available, along with a headset connection and volume up and down control. A remote speaker is available via the rear panel connector.
3514 Tender Module Wireless 3515 Wireless Headset Interface Module	These modules allow wireless headsets to be used by the supervisor. In conjunction with the Imenco Nautronix wireless headset and belt pack allowing wireless communications for the user. The Wireless Tender module also supports wired headsets as a back up.
3502 Power Supply Unit	UPS module provides universal mains input, or 12V DC, and includes battery back-up for a minimum of 1 hour's operation from the internal batteries. Indicators are available for power (charge) battery and low battery warning.
3503 Dry Diver Module	The standard diver module, providing full 4 wire comms, group and entertainment select and including unique pick-up cancelling circuitry, which nullifies any electrical pick-up between the diver module. Separate volume up and down with limit indicator are provided as standard. A 2-wire/4-wire switchover allows the module to be used for comms boxes using a press to talk switch.
3504 Wet Diver Module	Designed for the excursion divers, and as well as providing group select separate volume up and down and pick-up cancelling it has built in breathing noise reduction. An emergency 4-wire/2-wire switchover allows communications to be maintained in the event of a microphone failure.
3505 Telephone Module	Allows a standard telephone line to be connected to the system and assigned to a group, thus allowing a private conversation between divers and the outside world
3506 Record Module	Recording of all communications is provided via the 3506-module allowing 2 separate outputs and an additional auxiliary monitoring output.
3507 Entertainment Module	Up to 3 external audio sources can be input on separate channels with individual volume and enable control. Selection of the channels is available on dry diver and tender modules.
3508 Emergency Acoustic Communications Module	Allows a Nautronix 3136B Emergency Acoustic communications system surface unit to be fully interfaced to the DSP Unscrambler such that uplink speech is fully unscrambled, and downlink speech is channelled direct from the Supervisor's headset mic via the press to talk switch.
3511 Interface Module	Allows configuration of priorities between interconnected systems by specifying which groups are solely controlled from that unit and which from other units in the event of a problem.
3512 Surface Communication Module	The 3512 module allows an interface between a surface location such as the deck crane or bridge and any other selected group. Separate volume knobs for uplink and downlink with limit indicator are provided as standard.