

Active marine sensor box with:
Depth Sounder
Speed / Log
Temperature
NMEA 0183 Interface

User Manual

Issue 1.04

- Connects to depth sounder transducer, and produces NMEA 0183 depth codes DBT, DPT
- Connects to a log hall-effect sensor, and produces NMEA 0183 VHW, VLW Speed/ Log data
- Connects to a 10k @ 25 degrees C temperature sensor to produce NMEA 0183 MTW data
- Full-differential RS485 interface allows connection to any NMEA receiving device with minimum noise
- Reprogrammable using a bi-directional RS485 interface on a PC to allow upgrading of the software at any time

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Important Notices

The **Actisense** NMEA Depth sounder / Speed log / Temperature sensor (DST) is intended for use in a marine environment, primarily for below deck use. If the unit is to be used in a more severe environment, such use may be considered misuse under the seller's warranty.

The **Actisense** NMEA Depth sounder / Speed log / Temperature sensor (DST) has been certified to comply with the European directive for Electro-Magnetic Compatibility (EN60945), and is appropriately CE marked. Operation of the unit should be in conjunction with appropriate CE approved shielded connectors and cabling used in accordance with the CE directive EN60945. Any EMC related issues should be reported to Active Research immediately to allow the company to rectify or resolve EMC related problems in accordance with its obligations under EN60945.

If the unit is connected such that compliance failure occurs beyond the company's control, the company shall not be held responsible for the compliance failure until suitable EMC guidelines for connection are seen to have been taken.

Warning: Depth sounders are not designed to perform as navigational instruments or as devices to avoid grounding a vessel. Any such use of the **Actisense** depth output is at the vessel owner's own risk and no responsibility will be accepted for any resulting boat damage or personal injury.

Always use caution when operating in shallow areas and maintain a very slow speed. Be aware that the depth may change more quickly than your ability to react and avoid grounding.

Notices

When using this document, keep the following in mind:

The products described in this manual and the specifications thereof may be changed without prior notice. To obtain up-to-date information and/or specifications, contact Active Research Limited or visit the **Actisense** website (www.actisense.com).

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Active Research Limited will not be held responsible for any damage to the user that may result from accidents or any other reasons during operation of the user's unit according to this document.

Foreword

Actisense recognises that instructions are often skipped, so we have aimed to write this document in an informative, yet direct manner that will aid the user. We have tried to cover all the points a typical user may need to know. Please read all sections before installing and using the **Actisense** NMEA Depth sounder / Speed log / Temperature sensor (DST) product and its related software programs.

Introduction

The **Actisense** NMEA Depth sounder / Speed log / Temperature sensor (DST) product was developed to allow the connection of a standard passive (no electronics) depth sounder transducer to an instrument with a NMEA 0183 digital data input. The **Actisense** DST interfaces between these two otherwise incompatible elements.

The NMEA 0183 standard is a purely digital data transmission scheme, using '1's and '0's in a binary format, to communicate a digital representation of the required information (depth, speed etc.) to a connected instrument.

A depth sounder transducer is a sensor that must be interfaced to a depth sounder circuit, capable of both producing the high voltages to drive the depth transducer, yet have very sensitive circuitry to receive the faint echoes of the sound reflected from the seabed. Such a depth sounder circuit also needs a powerful software algorithm to track the seabed, and reject false signals that occur throughout the ocean. For example, an unsophisticated depth sounder device can lock on to a false seabed due to reflections from nearby targets, other depth sounder devices working on the same frequency, double depths and even algae.

Actisense has created their current depth sounder circuitry and software over a development period spanning ten years. The algorithms have been proven in thousands of products throughout the world that **Actisense** / Active Research Limited has either manufactured itself, or has played an important design consultancy role in.

Actisense then added the speed/log and temperature inputs to the system, as the resulting component cost is small, but it greatly expands the features on offer to the prospective user.

By connecting a so-called "Triducer" from a company like Airmar (www.airmar.com), it is possible to measure the four quantities of depth, speed, log (distance) and temperature in this one device and so save the cost of the extra electronic devices. The NMEA 0183 port requirements of the receiving instrument are also reduced from three to just one.

Technical features

Sounding transducer circuitry – is capable of interfacing to a wide selection of Airmar (www.airmar.com) transducers (refer to the **Compatible transducer list** section).

NMEA 0183 full-differential output driver - with a 25mA (maximum) drive capability this can drive up to 5 typical NMEA 0183 device loads. The full-differential output ensures better quality communications over longer distances and lower noise emissions on unshielded twisted pair cabling.

Powerful microprocessor - running at a clock frequency of 16MHz, it has enough power to perform all the processing required to produce the accurate and very fast tracking depth output of the system, in addition to the speed, distance and temperature calculations.

Flash ROM technology - that supports automatic programming for quick and easy updates, a minimum of 10,000 erase cycles and over 10-year Data Retention provides for carefree user configuration.

Low Power Consumption - typically 30mA rms.

Connections

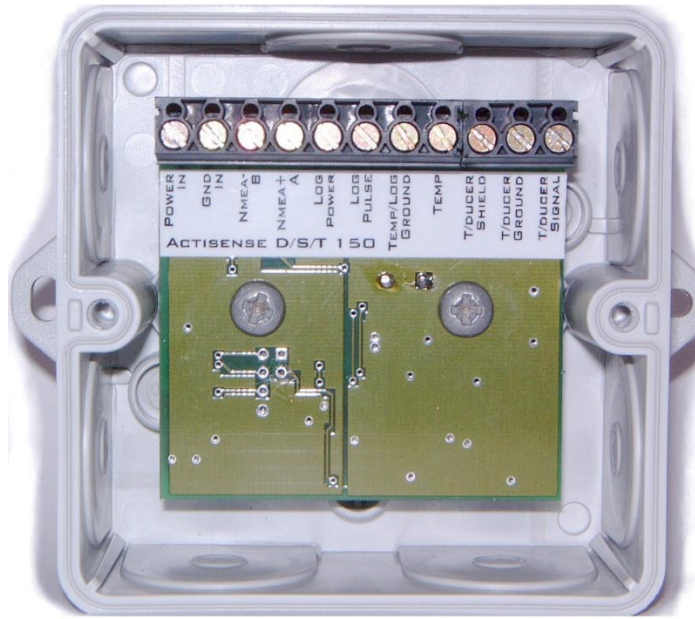


Figure 1 – View of the inside of the unit, showing external connections

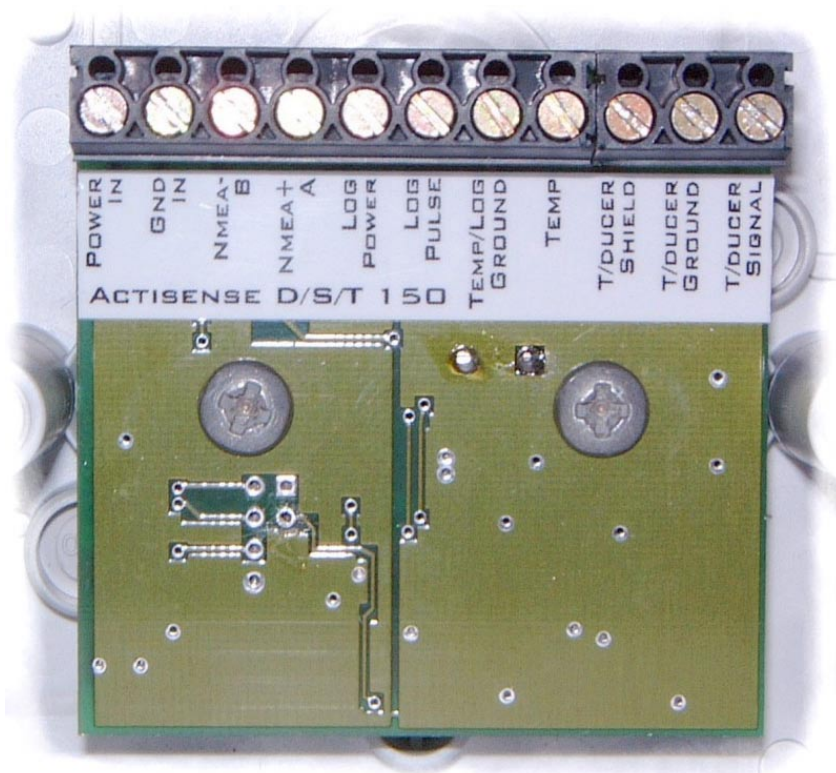


Figure 2 – Close-up of the inside of the unit, showing external connections

Pictures show the 150kHz model. The 200kHz & 235kHz models are identical, but use the label “Actisense D/S/T 200” and “Actisense D/S/T 235” respectively.

NMEA Depth / Speed / Temperature module

Referring to figure 1 & figure 2, from left to right, the **Actisense** DST has connections for: -

1. Battery supply input.
2. NMEA 0183 output. The NMEA 0183 output may be obtained using the three connections: '+', '-' and '**Ground**' and conforms in full to the NMEA 0183 standard. This allows the **Actisense** DST to interface to various different devices that require any combination of two of these outputs.
3. Log (Speed) transducer and its associated +5v power supply and ground.
4. Temperature sensor transducer.
5. Depth sounder transducer.

Note:

1. To comply with the NMEA 0183 standard all device interconnection NMEA cables used should meet the two-conductor, shielded, and twisted pair configuration specification.
2. Refer to the **Specifications** section for the full details on input/output specifications.

Connecting to the battery supply

The **Actisense** DST should be wired to the vessel's battery supply in the most direct manner possible to minimize interference from other electronic devices. The cable used may be of light duty, as the power requirements of the **Actisense** DST are low. Longer cable runs should use heavier gauge wire, as this reduces voltage drop that may adversely affect depth sounder performance.

Cable exits

The D/S/T box is provided with rubber sealing grommets around the edge of the box. It is recommended that the box is positioned with the double grommet at the bottom of the unit, so that two wires may exit downwards from the case. This will prevent any moisture entering the case, as it will drain down wards, and not into the case. Extra wires should use the side grommets. It is not recommended to use the top grommet, as this could cause condensation to creep into the unit over a long time period. The case lid is IP65 minimum specification, and has an integral moulded-in grommet. To pass the cables the grommets, use a small cut slightly smaller than the cable diameter to start the hole off, then push the cable through. The grommet will seal around the cable to provided a seal against dust and water to IP65.

Connecting the NMEA 0183 Output to other NMEA devices

Refer to the datasheet "NMEA information sheet" available on the Actisense website for a more detailed description of NMEA interfacing.

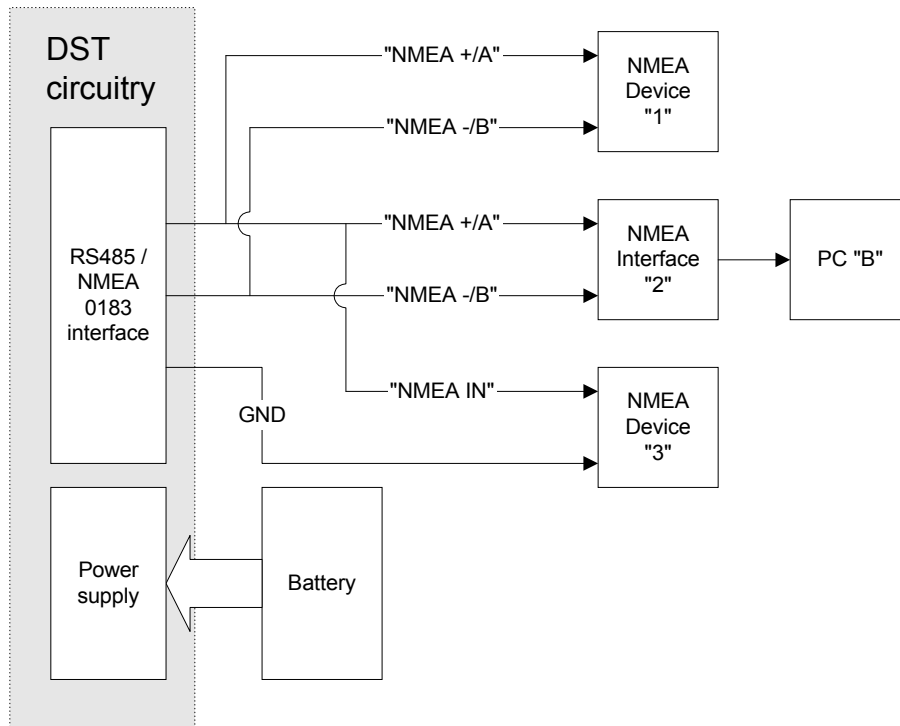


Figure 3 – NMEA 0183 connections

NMEA Device "1": Standard differential NMEA 0183 v2.0 (or higher) device

This device is a differential device conforming in full to the NMEA 0183 v2.0 standard, and connects directly to the pins on the differential device.

NMEA Interface "2": Personal Computer with opto-isolated NMEA input:

Most PC's do not have sufficient protection to connect straight to an NMEA device. An opto-isolated port is recommended for use on boats, to protect the PC from large voltage spikes that can occur when engines switch on and off (outboard motors can be particularly hazardous to the quality of electrical signals on board a boat). The diagram shows an opto-isolated NMEA interface connection to the PC. **Actisense** can supply such an opto-isolated converter at a very reasonable cost.

NMEA Device "3": Single ended NMEA interface device

To connect the device to the differential output connect 'NMEA + / A' to the device's 'NMEA' input and 'Ground' to the 'Ground' on the single ended device. It should be able to receive the NMEA data correctly. Never connect the 'NMEA - / B' to the ground of a single ended receiving instrument. The resulting extra load will at best increase the current consumption of the driver, at worst, it could cause damage to it.

Connecting a speed/log transducer to the DST box

Log transducers generally have three connections:

- ❑ A pulse connection, marked “LOG PULSE” on the DST board, which the DST box measures to give the speed / log output.
- ❑ A ground connection, marked “LOG/TEMP GROUND”, used as a return for the signal, and as the negative supply.
- ❑ A Power connection, marked “LOG POWER”. Here +5v is supplied from the internal supply to the transducer. Please ensure that this supply is only connected to the log transducer. Damage may occur if this supply is connected to any other external power source, as it is connected internally to the sensitive internal circuitry.

You should connect these connections to your transducer according to the instruction of the transducer manufacturer.

Connecting a temperature transducer to the DST box

Temperature transducers suitable for connection to the DST box are of the “Thermistor” sensor type with a 10kΩ impedance at 25 degrees centigrade, as used by Airmar technology in their transducers.

Thermistor type temperature transducers have two connections:

- ❑ A resistance output connection, marked “TEMP” on the DST board, which the DST box measures to give the temperature output.
- ❑ A second resistance connection, often marked ground, connected to the other side of the thermistor. On Airmar “Triducer” type sensors, the log and temperature sensors share a ground pin as a return for the signal, and as the negative supply. The **Actisense** DST also designed to share this same ground return. If the required transducer has two separate wires, simply twist together the ground wire from the log and the ground wire from the temperature sensor, and connect to the same terminal, marked “LOG/TEMP GROUND” on the board.

Please refer to the instructions of the transducer manufacturer for further information.

Connecting a depth sounder transducer to the DST box

Depth sounder transducers may have either two or three connections:

- ❑ A “live” connection (marked “DEPTH TDUCER” on the board), which is usually a coloured connection on twisted pair cable as used on Airmar sensors, or the centre conductor on a coaxial type cable.
- ❑ A “Ground” connection, which is often the black core of a twisted pair cable (Airmar) or the shield of a coaxial type cable.
- ❑ A “Shield” connection, which is the shield of a three-connection cable. Coaxial cable is connected as above through the ground connection.

Two connection transducers only provide the “live” and ground connections.

Please refer to the instructions of the transducer manufacturer for further information.

Block Diagram

The block diagram shows the system from a functional point of view.

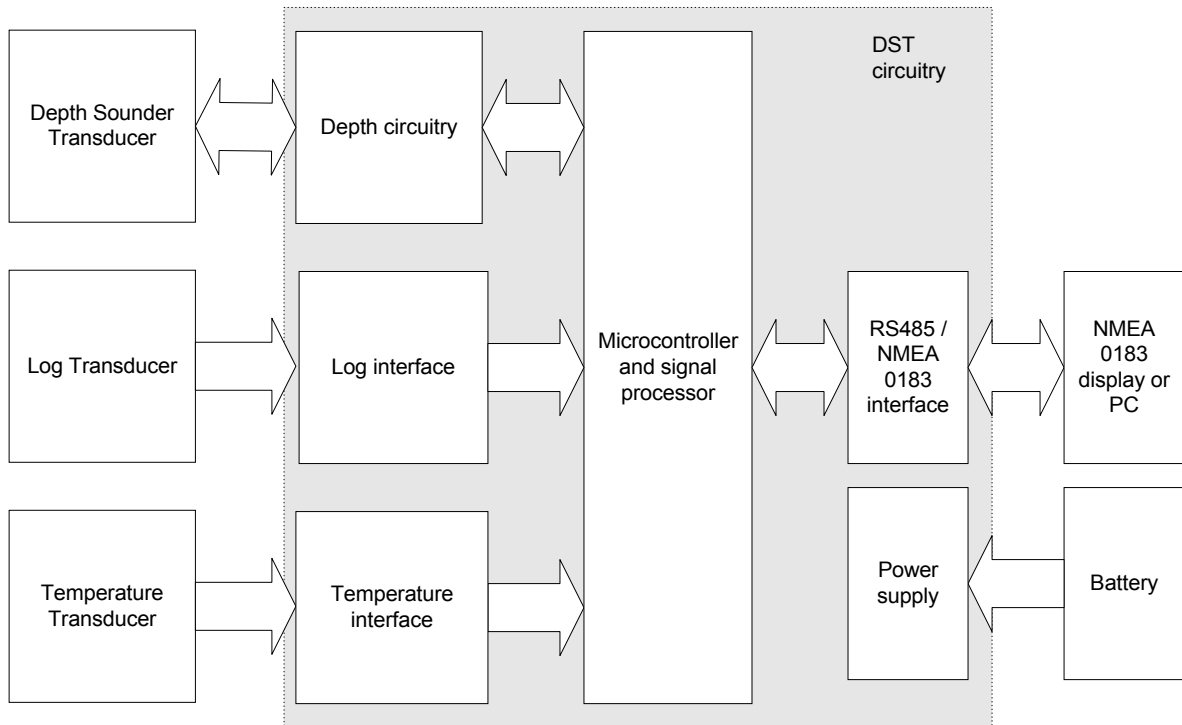


Figure 4 – Actisense DST Block Diagram

Using the “Flash” upgrade facility

Availability

The current **Actisense** DST software program is a mature product that has evolved over the past 5 years, and as such, we believe it has been tested more rigorously than any other depth sounder device currently available.

No upgrade facility is yet required. Please monitor our website for updates, which will be posted when required. This part of the document will contain full details of the PC based system for reprogramming when it becomes available.

Connecting the DST for programming

The DST hardware should be connected to the PC communications port via a bi-directional RS485 interface and a battery supply as shown below. You cannot use the single direction opto-isolated NMEA interface unit, as the data must flow between the PC and the DST, as well as from the DST to the PC. A low cost bi-directional RS485 interface is available from **Actisense**. If you are using an NMEA combiner between the PC and the DST, you will have to remove this device, as bi-directional communication must be made between the PC and the DST box.

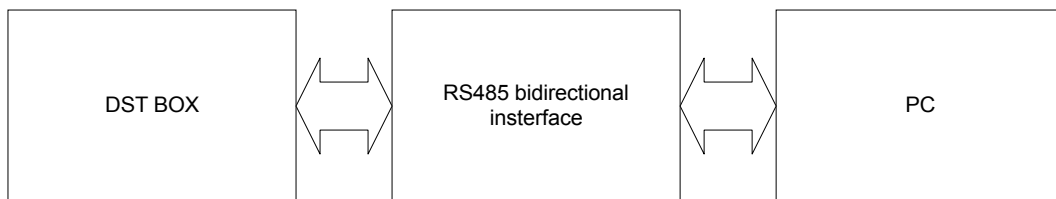


Figure 5 – Connecting to the programming computer

Troubleshooting guide

This guide will concentrate on all relevant troubleshooting issues.

Problem / Error condition	Possible cause / suggested correction
No data seen on NMEA instrument	<p>Ensure that power is applied to the DST box.</p> <p>Ensure all cable connections are correct and of the correct polarity - NMEA connections are polarity sensitive, so check that you have them the right way round. No damage should occur because of this, but the data won't be seen on the receiving instrument!</p>
No data seen on PC	<p>Check cables as above.</p> <p>Ensure that the software you are using is configured correctly.</p> <p>As a diagnostic, you can use the Windows "HyperTerminal" utility to receive NMEA data, by setting the input port to the one that the NMEA port is connected to, and setting the baud rate to 4800, no parity, 1 stop bit, 8 data bits, no flow control. You should then see text data from the DST device on the screen.</p>

Table 1 – Diagnostics

NMEA Depth / Speed / Temperature module

Table 2 – DST Specifications

Symbol	Parameter	Conditions	Min.	Max.	Unit
Supply					
V_B	Supply voltage		7	28	V
I_B	Supply current, RMS	Supply voltage = 12V	30	40	mA
Reverse	Reverse Supply current (protection level)	Reverse voltage \leq 400V		100	μ A
NMEA					
$V_{NMEA I}$	Input voltage between +/-	Logical '1'/stop bit	-15.0	0.5	V
		Logical '0'/start bit	4.0	15.0	V
$V_{NMEA O}$	Output voltage between +/- and ground (see note 1)	Logical '1'/stop bit	0.0	0.5	V
		Logical '0'/start bit	4.8	5.2	V
$I_{NMEA O}$	Output current (see note 1)		15.0	40	mA
$I_{NMEA SC}$	Output short circuit current.		35	100	mA
B_{NMEA}	Baud rate (see note 2)		4.8	-	kbit/sec
Tdata	Data output rate			1	s
Depth Sounder					
Depth range	Using Airmar P52 or other narrow beam sensor	< 10 knots ideal conditions	0.3	200	metres
	Using through hull / wide angle element transducer	< 10 knots ideal conditions	0.3	150	
Depth range	Using Airmar P52 or other narrow beam sensor	10-40 knots ideal conditions	0.3	100	metres
	Using through hull / wide angle element transducer	10-40 knots ideal conditions	0.3	60	
D_{Freq}	Depth Sounder frequency Availability / tolerance	150kHz	147	150	kHz
		200kHz	198	202	
		235kHz	233	235	
Speed/Log					
Speed	Speed in knots	Sensor dependant	0.5 typical	60	Kn
Temperature					
Temp	Temperature / degrees C	Calibrated for 10k @ 25 C thermistor (all Airmar models)	-10	+50	$^{\circ}$ C
General					
T_A	Ambient temperature		-20	+80	$^{\circ}$ C
Case	Casing provided with sealing grommets to IP65				

All specifications are taken with reference to an ambient temperature (T_A) of +25°C.

Note:

1. NMEA output is RS-485 compatible.
2. Future models may support other baud rates through software provided through our website. The transceiver on the unit can support baud rates to 38400 baud. If you have a specialist application which requires a higher baud rate, please contact our Active Research support email address.

NMEA Depth / Speed / Temperature module

Compatible transducer list

This list is by no means exhaustive. Airmar have brought out many new transducers to the market, and any of the 200kHz and 235kHz models will work with the **Actisense** DST (Depth / Speed / Temp) module. The 150kHz model has been tested with the following manufacturers transducers. Seafarer transducers are essentially the same as the NASA model, so should be identical in performance, although we have not tested one as yet.

ACT-SDST-150

Manufacturer	Model	Ceramic type
Echopilot	Standard through hull / oil bath mounting transducer with stem	150kHz/30mm
NASA	Standard through hull / oil bath mounting transducer with stem	150kHz/30mm

ACT-SDST-200

Manufacturer	Model	Ceramic type
Airmar	P52/P66/P79	200kHz-G
Airmar	P37/P553	200kHz-U
Airmar	P32/P23	200kHz-A
Airmar	B45/46/39	All 200kHz models
Airmar	SS505	All 200kHz models
Airmar	P6/206	200kHz-A
Airmar	P7/207	All 200kHz models
Airmar	P8/208	All 200kHz models
Airmar	P17, B17, SS557	All 200kHz models
Airmar	P217, P314, B21	All 200kHz models
Airmar	P19, B22, B124	All 200kHz models
Airmar	P219, B119	All 200kHz models
Airmar	P269, B21	All 200kHz models
Airmar	B744V, B744VL Triducer	All 200kHz models
Airmar	SS44V, B66V, B66VL Triducer	All 200kHz models

ACT-SDST-235

Manufacturer	Model	Ceramic type
Airmar	P52/P66/P79	235kHz-D
Airmar	P37/P553	235kHz-B
Airmar	P32/P23	235kHz-C
Airmar	P6/206	All 235kHz models
Airmar	P7/207	All 235kHz models
Airmar	P8/208	235kHz-C
Airmar	P17, B17, SS557	All 235kHz models
Airmar	P217, P314, B21	All 235kHz models
Airmar	P19, B22, B124	All 235kHz models
Airmar	P219, B119	All 235kHz models
Airmar	P269, B21	All 235kHz models
Airmar	B744V, B744VL Triducer	All 235kHz models
Airmar	SS44V, B66V, B66VL Triducer	All 235kHz models

Ordering information

SDST-0105-150	150kHz model of DST box
SDST-0105-200	200kHz model of DST box
SDST-0105-235	235kHz model of DST box

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