IMAGENEX MODEL 864
PROGRAMMABLE DIGITAL ALTIMETER

APPLICATIONS:

- Measure altitude of structures & objects
- Measure range to other structures & objects
- Monitor sedimentation or scouring
- ROV, AUV, & UUV

FEATURES:

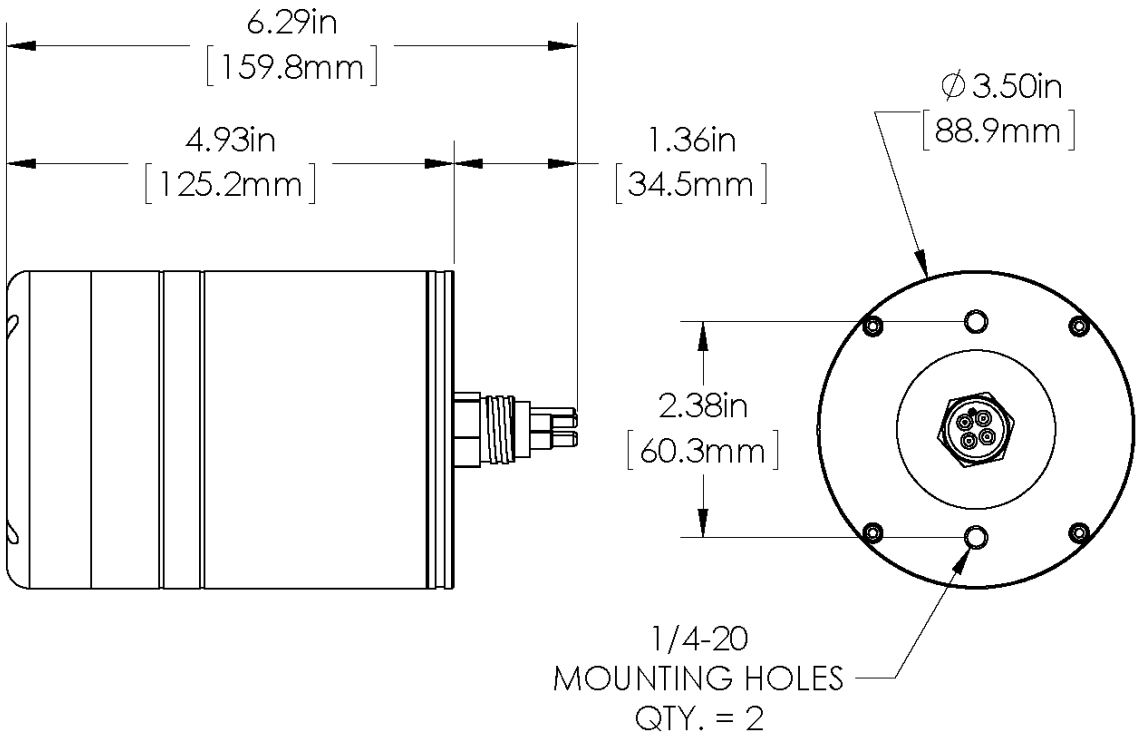
- Programmable
- Self contained
- Serial output
- Compact size

The Imagenex Model 864 is a completely self-contained altimeter with a digital input/output. This unit is compatible with the Model 881A switch data command and return data formats. This unit is mounted in a pressure proof housing with an underwater connector for use at depth. The 864 Altimeter measures the range to the bottom or other large objects. It requires only power and an RS-485 or RS-232 serial interface to an external device.

Model shown is 3000 m depth rated

HARDWARE SPECIFICATIONS:	
FREQUENCY	330 kHz
TRANSDUCER	Conical beam
TRANSDUCER BEAM WIDTH	10°
TRANSMIT PULSE LENGTH	100 microseconds
RANGE RESOLUTION	20 mm
MIN. DETECTABLE RANGE	100 mm
MAX. OPERATING DEPTH	1000 m (3000 m and 6000 m available)
MAX. CABLE LENGTH	1000 m on typical twisted shielded pair (RS-485)
INTERFACE	RS-485 serial interface @ 115.2 kbps (or optional RS-232), 881A style protocol
CONNECTOR	Four conductor, wet mateable (Subconn MCBH4M-AS)
POWER SUPPLY	22 – 32 VDC at 100 mA max.
DIMENSIONS	89 mm (3.5”) diameter x 125 mm (4.9”) length Overall length: 160 mm (6.3”)
WEIGHT: In Air **In Water**	1000 m unit: 1 kg (2.2 lbs) 1000 m unit: 0.4 kg (0.8 lbs)
MATERIALS (all depths)	6061-T6 Aluminum & PVC
FINISH	Anodized

SOFTWARE SPECIFICATIONS:	Win881A.exe v2.39
WINDOWS™ OPERATING SYSTEM	Windows™ XP, Vista, 7, 8, 10
RANGE SCALES	1 m, 2 m, 3 m, 4 m, 5 m, 10 m, 20 m, 30 m, 40 m, 50 m
FILE FORMAT	(filename).81a
RECOMMENDED MINIMUM COMPUTER REQUIREMENTS:	100 MHz Pentium 64 MB RAM 1 GB Hard Disk 800 x 600 x 256 colour graphics



ORDERING INFORMATION:		
1000 m UNIT	Standard	864-000-200
3000 m UNIT	Standard	864-000-201
6000 m UNIT	Standard	864-000-202
RS-232	Option	-006

MODEL 864-000-200
PROGRAMMABLE DIGITAL ALTIMETER
USER'S MANUAL

330 kHz, 1000 m DEPTH RATED
0.1 m TO 50 m OPERATING RANGE
RS-485

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S/N_____

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1. SPECIFICATIONS

1.1 SYSTEM SPECIFICATIONS

1.1 IMAGENEX MODEL 864-000-200 PROGRAMMABLE DIGITAL ALTIMETER

Operating Frequency:	330 kHz
Transducer Beam Angle:	10 degree conical total included angle to 3 db points
Transmit Pulse Length:	100 microseconds
Input/Output:	Serial (RS-485 @ 115200,N,8,1)
Range Resolution:	26.7 microseconds (2 cm) assuming 1500 m/s sound velocity
Overrange Output: No Return Output:	0 cm 0 cm
Power Supply:	22-32 VDC at 100 mA maximum
Connector:	wet mateable Subconn MCBH4M-SS 4 conductors, 2 for power, 2 for RS-485 serial
Materials:	6061-T6 Aluminum & PVC
Finish:	Anodized
Maximum Operating Depth:	1000 m (3281 ft)
Dimensions:	89 mm (3.5 in) dia. x 155 mm (6.1 in) high
Weight:	in air 1.0kg (2.2 lbs)

2. SYSTEM DESCRIPTION

The Imagenex Model 864-000-200 Programmable Digital Altimeter is a self contained module which includes a transducer, a transmitter, a receiver, and a microcontroller. When interrogated, it operates by transmitting a short acoustic pulse, and then detecting the echo from the bottom or other large object. It measures the time from the transmitted pulse until the echo is received. This time is converted to a distance (in centimeters) and output to the serial port.

The module is packaged to operate underwater at depths to 1000 m (3281 ft). Typical applications for this product include a remotely operated vehicle (ROV) altimeter, an autonomous underwater vehicle (AUV) altimeter and any other application where ranges must be measured underwater.

3. INSTALLATION INSTRUCTIONS

3.1 INSTALLATION

The altimeter is normally mounted vertically, with the transducer face pointing vertically down at the bottom. The transducer face must have a clear unobstructed view. The altimeter can be mounted by means of the tapped holes on the connector end cap or it can be clamped around its diameter.

The anodized housing should be protected by plastic or rubber isolation to prevent damage. Due consideration should be given to materials used to clamp the housing, and to electrical isolation from dissimilar metals, to avoid galvanic corrosion of the housing. The altimeter should be protected from physical damage by collision with the bottom or other objects.

The electrical connector should be protected from physical damage and the cable should not be bent sharply near the connector.

Underwater Connector Guidelines:

Lubricate with silicone grease before assembly
Mate with minimum twisting and flexing
Align index pin and socket carefully
Do not damage or bend pins in unmated condition

On a typical ROV installation, the IMAGENEX supplied cable connector is spliced to a customer supplied cable harness on the vehicle. The splice should be suitable for underwater operation. Suitable splices include cast epoxy splices, cast polyurethane splices, moulded rubber splices (so called hot splices) and tape splices. This will pass into the vehicle pressure hull or a junction box. The four conductors will be split into two conductors for power, connected to a suitable power supply in the vehicle's power distribution system and two conductors for the serial communication.

4. MAINTENANCE

The altimeter should be rinsed with fresh water after each immersion in salt water or dirty fresh water. This will prevent accumulation of salt or other contamination, and help prevent corrosion of the aluminum and stainless steel parts. The altimeter should be inspected periodically for signs of galvanic corrosion.

The transducer face should be carefully cleaned with a detergent solution to remove any oil, grease or other deposits which may reduce the acoustic performance of the unit.

Model 864-000-200 DIGITAL ALTIMETER DISASSEMBLY AND ASSEMBLY

The altimeter is a complex precision package. We recommend that only personnel familiar with miniature underwater electronic/mechanical devices attempt to service or repair this device.

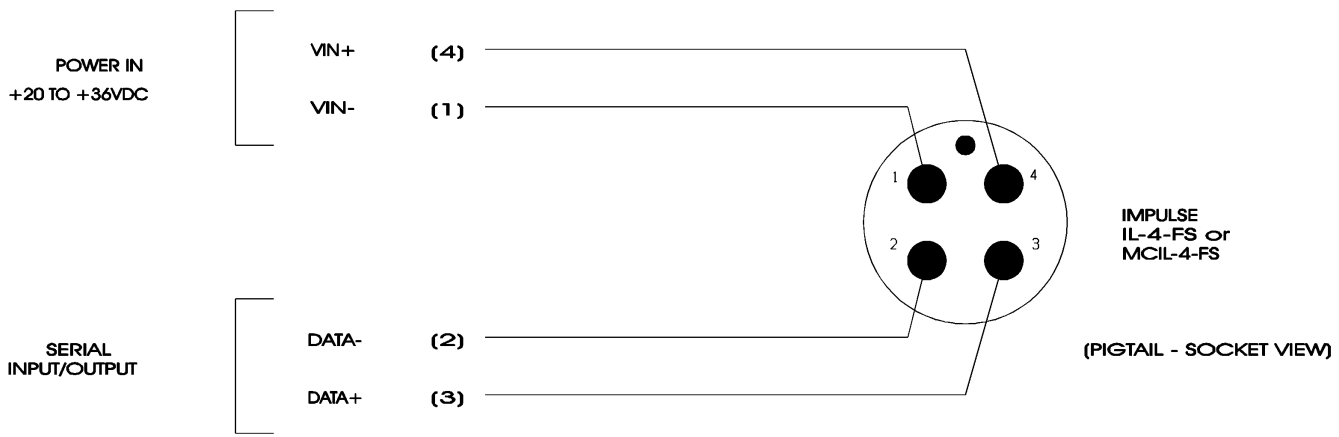
Refer to the assembly drawing to understand the general construction of the Underwater Unit.

The connector end cap can be removed by removing the four hex socket cap screws on the connector end cap and carefully withdrawing the end cap.

Extreme care must be taken when reassembling the Underwater Unit. The O-ring groove and sealing face should be carefully cleaned and inspected. After cleaning, the groove and face should be coated with a thin uniform coat of silicone grease. A new o-ring should be used if possible. The o-ring should be carefully cleaned and inspected for defects, and then lubricated with a thin uniform coat of silicone grease. A small scratch in the o-ring groove or sealing face, a small piece of dirt, or a defect in the o-ring, can cause leakage and consequent flooding of the unit.

5. WIRING DIAGRAM

DWG. NO.	864-200-172	864 ALTIMETER PIGTAIL WIRING (RS-485)



IMAGENEX Technology Corp.		
Title: 864 ALTIMETER PIGTAIL WIRING (RS-485)		
Size: A	Document Number: 864-200-172	REV: 01
Date: November 26, 2004	Sheet 1 of 1	

MODEL 864 DIGITAL ALTIMETER

SERIAL INTERFACE SPECIFICATION (v1.00)

OVERVIEW

The Model 864 Digital Altimeter communicates over a 2-wire differential RS-485 serial data transmission line or optionally a half-duplex RS-232 data line. To interrogate the head and receive echo data, a Switch Data Command string is sent via a serial command program at a baud rate of **115200 bps, No Parity, 8 Data Bits and 1 Stop Bit**. When the Switch Data command is accepted, the head transmits, receives and sends its return data back to the command program.

SWITCH DATA COMMAND

The altimeter accepts up to 27 bytes of switch data from the serial interface and must see the switch data header (2 bytes: **0xFE** and **0x44** HEX) in order to process the switches. The head will stop accepting switch data when it sees the termination byte (**0xFD** HEX). The termination byte must be present for the head to process the switches.

> **Note: the Termination Byte is the only switch value allowed to have a value of 0xFD. All other switches should be set higher or lower than 0xFD (253 Decimal) so they are not interpreted as a termination byte!**

Byte #	Description							
0 – 7	**0xFE**	**0x44**	Head ID	Range	Reserved 0	Reserved 0	Reserved 0	Reserved 0
8 – 15	Start Gain	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Pulse Length	Reserved 0
16 – 23	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Reserved 0	Reserved 0
24 – 26	Switch Delay	Reserved 0	Term. **0xFD**					

Table 1 Model 864 Switch Data Command

SWITCH DATA COMMAND (con't)

BYTE DESCRIPTIONS

Note: All Byte values are shown in decimal unless noted with a '0x' (hexadecimal) prefix.

Byte 0 **Switch Data Header (1st Byte)**
Always **0xFE** (254 decimal)

Byte 1 **Switch Data Header (2nd Byte)**
Always **0x44** (68 decimal)

Byte 2 **Head ID**
Standard: 0x1D (29 decimal)
Optional: 0x11, 0x12, 0x13, 0x14, 0x15

Byte 3 **Range**
1, 2, 3, 4, 5, 10, 20, 30, 40, 50 Meters supported

Byte 4 **Reserved**
Always 0

Byte 5 **Reserved**
Always 0

Byte 6 **Reserved**
Always 0

Byte 7 **Reserved**
Always 0

Byte 8 **Start Gain**
0 to 40dB in 1dB increments

Byte 9 **Reserved**
Always 0

Byte 10 **Reserved**
Always 0

Byte 11 **Reserved**
Always 0

Byte 12 **Reserved**
Always 0

SWITCH DATA COMMAND (con't)

Byte 13 **Reserved**
Always 0

Byte 14 **Pulse Length**
Length of acoustic transmit pulse.
1-255 → 10 to 2550 μsec in 10 μsec increments

Byte 15 **Reserved**
Always 0

Byte 16 **Reserved**
Always 0

Byte 17 **Reserved**
Always 0

Byte 18 **Reserved**
Always 0

Byte 19 **Reserved**
Always 0

Byte 20 **Reserved**
Always 0

Byte 21 **Reserved**
Always 0

Byte 22 **Reserved**
Always 0

Byte 23 **Reserved**
Always 0

Byte 24 **Switch Delay**
The altimeter can be commanded to pause (from 0 to 510 msec) before sending its return data to allow the commanding program enough time to setup for serial reception of the return data.
0 to 255 in 2 msec increments
Byte 24 = delay_in_milliseconds/2
Do not use a value of 253!

SWITCH DATA COMMAND (con't)

Byte 25 **Reserved**
Always 0

Byte 26 **Termination Byte**
The altimeter will stop looking for Switch Data when it sees this byte.
Always **0xFD** (253 decimal)

RETURN DATA

Every ping, the altimeter returns a 12 Byte header, and a terminating byte value of 0xFC.

Byte #	Description					
0 to 5	ASCII 'I'	ASCII 'P'	ASCII 'X'	Head ID	Serial Status	Reserved 0
6 to 11	Reserved 0	Range	Prof Rng (LO)	Prof Rng (HI)	Reserved 0	Reserved 0
12	Term 0xFC					

Table 2 Model 864 Return Data

BYTE DESCRIPTIONS

Note: All Byte values are shown in decimal unless noted with a '0x' prefix.
N = total number of return bytes

Byte 0 - 2 **Imagenex Return Data Header**
ASCII '**IPX**'

Byte 3 **Head ID**
0x11, 0x12, 0x13, 0x14, 0x15 or 0x1D

Byte 4 **Serial Status**
Bit 0 - 0
Bit 1 - 0
Bit 2 - 0
Bit 3 - 0
Bit 4 - 0
Bit 5 - 0
Bit 6 - 1 = Switches Accepted
Bit 7 - 1 = Character Overrun

Byte 5 **Reserved**
Always 0

Byte 6 **Reserved**
Always 0

RETURN DATA (con't)

Byte 7 **Range**
Altimeter Range scale: 1 to 50 Meters

Byte 8 - 9 **Profile Range (Altitude)**
First digitized range value above threshold in centi-meters
Prof Rng (LO), Prof Rng (HI)

Byte 8								**Byte 9**							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	**Prof Rng (LO)**							**0**	**Prof Rng (HI)**						**L**

Prof Rng High Byte = (Byte 9 & 0x7E)>>1
Prof Rng Low Byte = [((Byte 9 & 0x01)<<7) | (Byte 8 & 0x7F)]
Profile Range = (Prof Rng High Byte<<8) | Prof Rng Low Byte

Byte 10 **Reserved**
Always 0

Byte 11 **Reserved**
Always 0

Byte 12 **Termination Byte**
0xFC