

Single-Beam Sonar Module

User manual | Hardware connection, UnderwaterExplore software and developer interface

A compact underwater echosounder for ROV and AUV altitude sensing, USV depth sounding and obstacle ranging.



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English edition: 29 October 2026. Based on the supplied manual dated 1 March 2022, with current product corrections confirmed during preparation.

1. Overview and specifications

Ping Sonar is a single-beam echosounder with a maximum underwater range of 50 m, a 14-degree beamwidth and a 300 m depth rating. A compatible USB-to-serial interface can connect it to a computer; the native serial logic level is 3.3 V TTL.

A piezoelectric transducer sends ultrasonic pulses into the water and listens for the returning echo. The sonar determines distance to the strongest echo, commonly from the seabed or a large object. It also provides the full echo response: echo intensity versus time.

Applications include ROV and AUV altimetry, USV depth sounding, obstacle ranging and other underwater distance measurements.

Acoustic characteristics

Maximum measurement range	50 m
Minimum range / blind distance	0.2 m (20 cm)
Listed resolution	10 cm at 30 m
Beamwidth	14 degrees
Acoustic frequency	200 kHz

Electrical characteristics

Communication supply	5 V
Power-stage supply	12 V; separate from the 5 V communication supply
Listed supply currents	5 V: 150 mA; 12 V: 1 A maximum
External power-source requirement	12 V DC, rated for at least 1.5 A
TTL logic level	3.3 V
Baud rate	115200

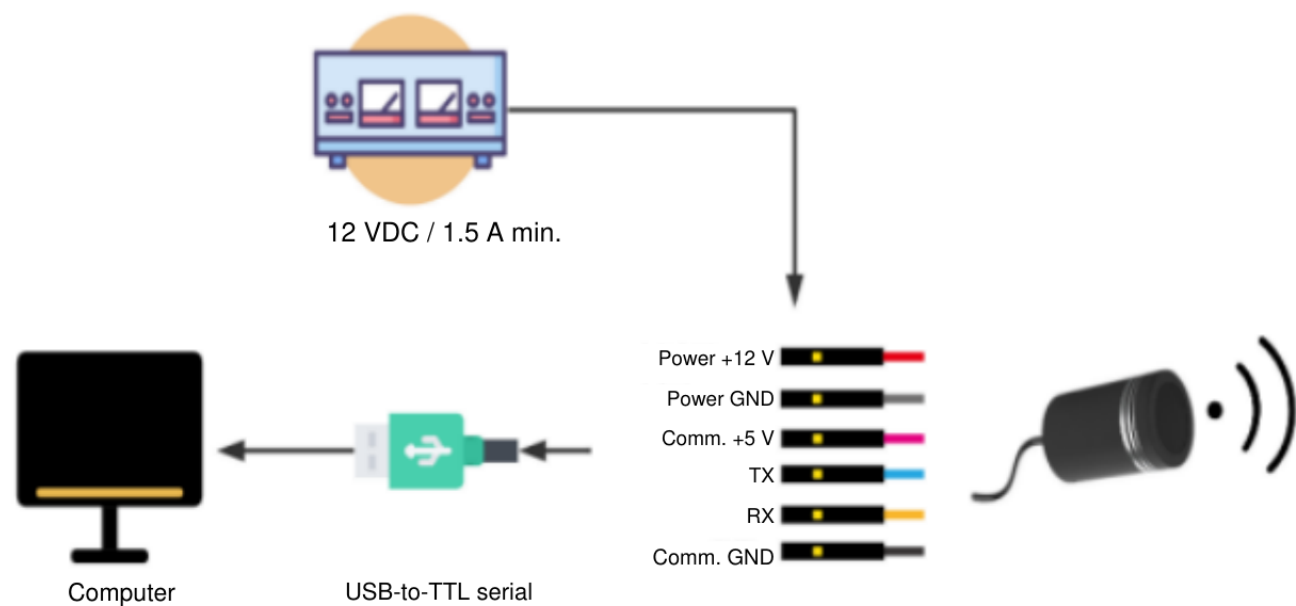
Physical characteristics

Depth rating: 300 m. **Envelope:** 50 mm diameter x 96.5 mm long.

The 0.2 m minimum range follows the confirmed product specification. Increasing pulse width increases the blind distance; see page 6. The listed resolution is not an accuracy guarantee.

2. Hardware connection

Two supplies are required: 5 V for communication and a separate 12 V power stage.



English labels applied to the original connection illustration. The six leads are identified below.

	Power +12 V	Red
	Power GND	Grey
	Communication +5 V	Magenta
	TX	Blue
	RX	Yellow
	Communication GND	Grey

Supply and connection requirements

Power stage: use a 12 V DC supply rated for at least 1.5 A. The source manual recommends a 100-470 uF electrolytic capacitor in parallel across the supply output to meet transient power demand.

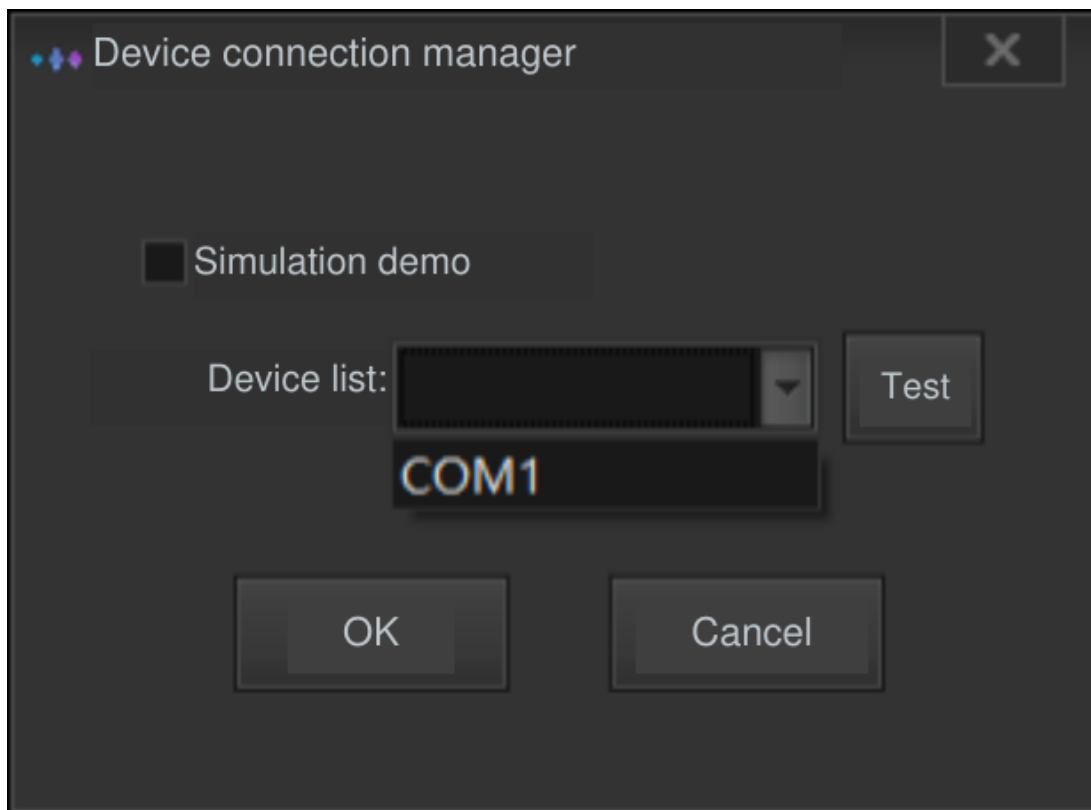
Communication side: requires 5 V and may use the power available from the USB-to-serial module.

Connection order: first connect communication +5 V, TX, RX and communication GND to the USB-to-serial module. Then connect power +12 V and power GND to the external supply.

Grounding: the power and communication grounds share a common reference, but the designated leads must not be interchanged. Use power GND for the power circuit and communication GND for the communication circuit. The source manual warns that mixing these leads can damage the module.

3. UnderwaterExplore quick start

1. Complete the hardware connections in the order described on page 3. The module needs the separate 12 V power supply as well as the 5 V communication supply.
2. Launch **UnderwaterExplore** by double-clicking its program shortcut.
3. In the device connection manager, open the device list and select the COM port assigned to the sonar interface.

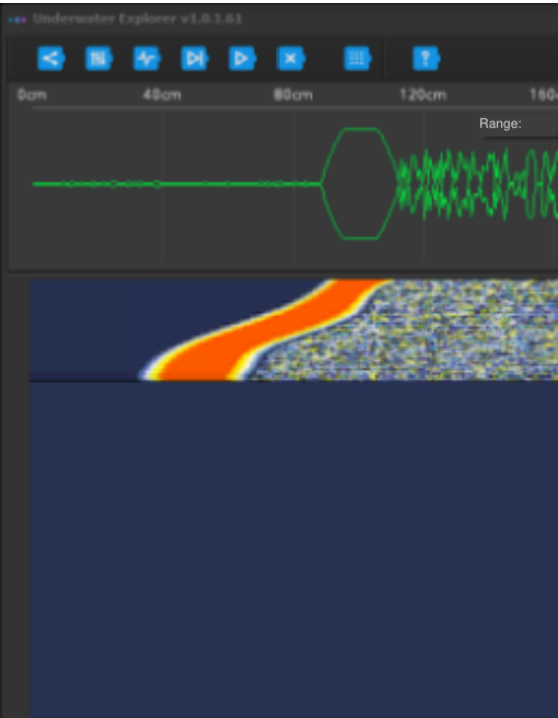


Example from the supplied software interface, with English labels added for this guide. COM1 is an example; select the COM port assigned on your computer.

4. Click **Test**. If the connection succeeds, the software reports the corresponding version information.
5. Click **OK** to confirm, or **Cancel** to close the dialog.

The supplied manual names UnderwaterExplore but does not include an installer or a software download address. Obtain the matching application package for the sonar before setup.

4. Software interface and toolbar



Toolbar
Connection, configuration, measurement and help controls.

Echo waveform
Displays the return signal along the distance axis.

Echo waterfall
Shows successive echo returns using the selected colour palette.

The waveform and waterfall are genuine examples retained from the supplied manual. They are not new test results.



Toolbar icons 1-8, from left to right:

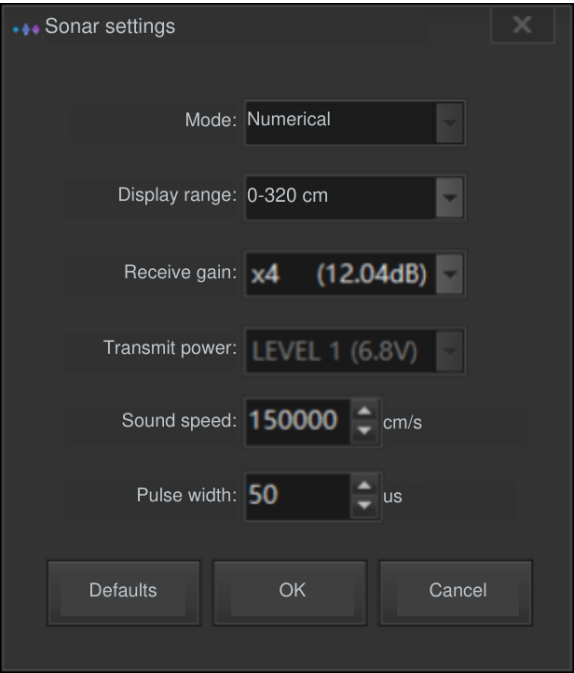
1. Connection manager	Connect to the device.
2. Sensor settings	Configure basic sonar parameters.
3. Display settings	Set the waterfall colour style and display processing.
4. Single measurement	Perform one measurement using a single pulse group.
5. Continuous measurement	Perform continuous pulse-group measurements.
6. Stop measurement	Stop the measurement process.
7. Measurement tools	Show cursors for measuring the waveform after acquisition stops.
8. Help	The question-mark icon provides the help control.

5. Connection and sensor settings

Connection manager

Select the appropriate COM port from the device list and click **Test**. A successful connection reports the device version. See the example on page 4.

Sensor settings

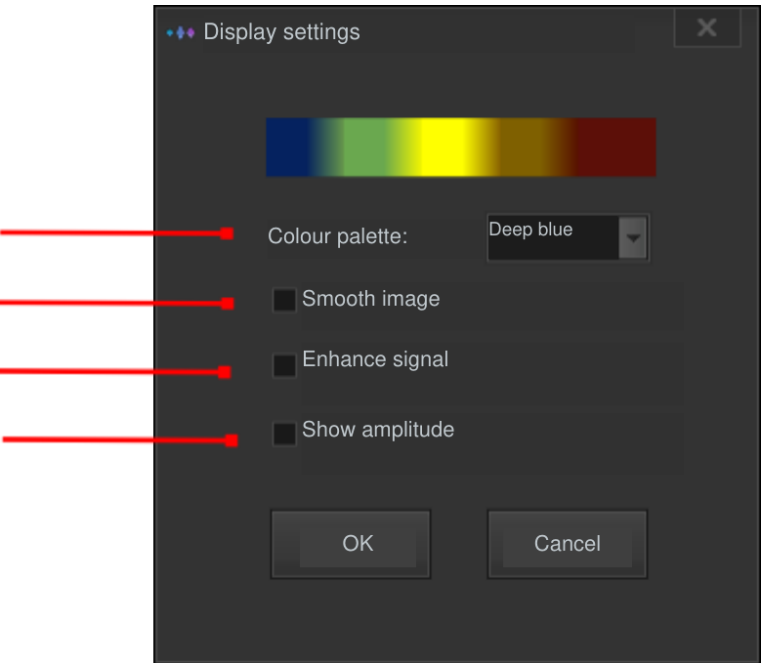


- Mode:** numerical or graphical presentation.
- Display range:** select the distance span to show. The supplied software description lists 0-3 m as the smallest range, 0-25 m as the largest, and 3 m as the default.
- Receive gain:** default x4. Select a higher gain for weak echoes in difficult underwater conditions. Listed selection range: x4 to x256.
- Transmit power:** this setting is not supported in the software version described.
- Sound speed:** adjust for operating conditions. The default is 1500 m/s for fresh water.
- Pulse width:** selectable from 50 to 1000 us. Increasing pulse width may help weak echoes, but increases the blind distance.

The illustrated dialog shows 150000 cm/s, which is the same as 1500 m/s, and a 50 us pulse width. Original numeric settings are retained.

The display-range menu described above belongs to the software example in the source manual. It must not be confused with the sonar's 50 m maximum measurement-range rating or its 300 m depth rating.

6. Display settings



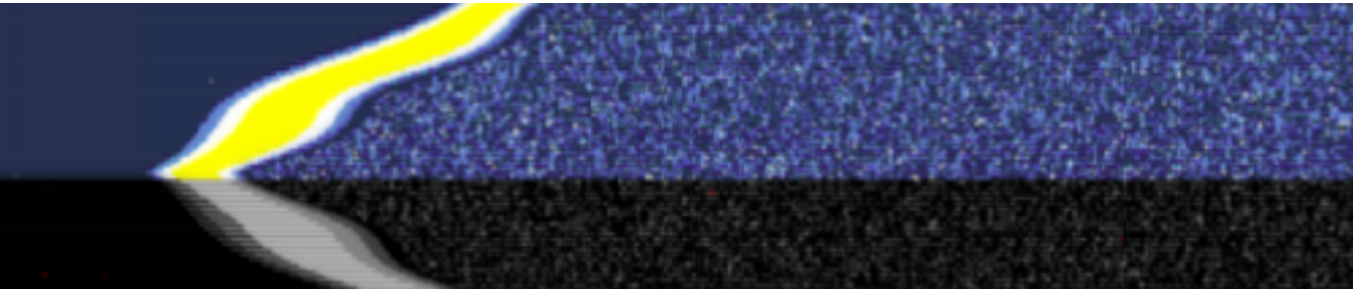
Colour palette: select one of eight colour styles.

Smooth image: apply image smoothing to the waterfall.

Enhance signal: display more signal detail.

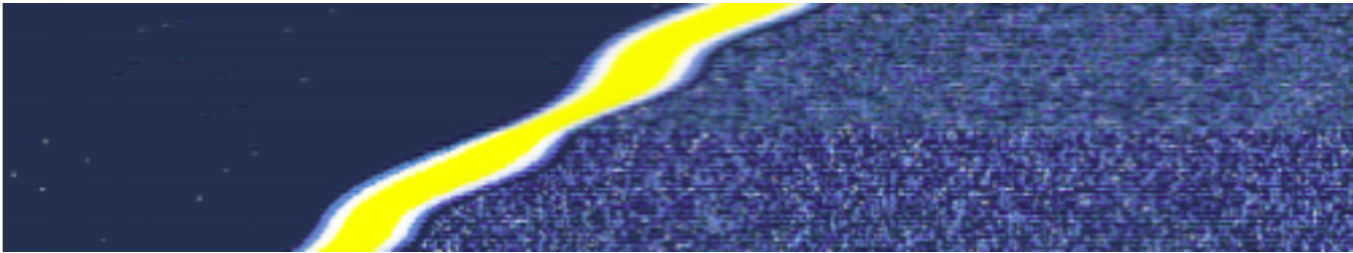
Show amplitude: display the echo-voltage amplitude.

Waterfall colour example



Original waterfall example after selecting a colour style.

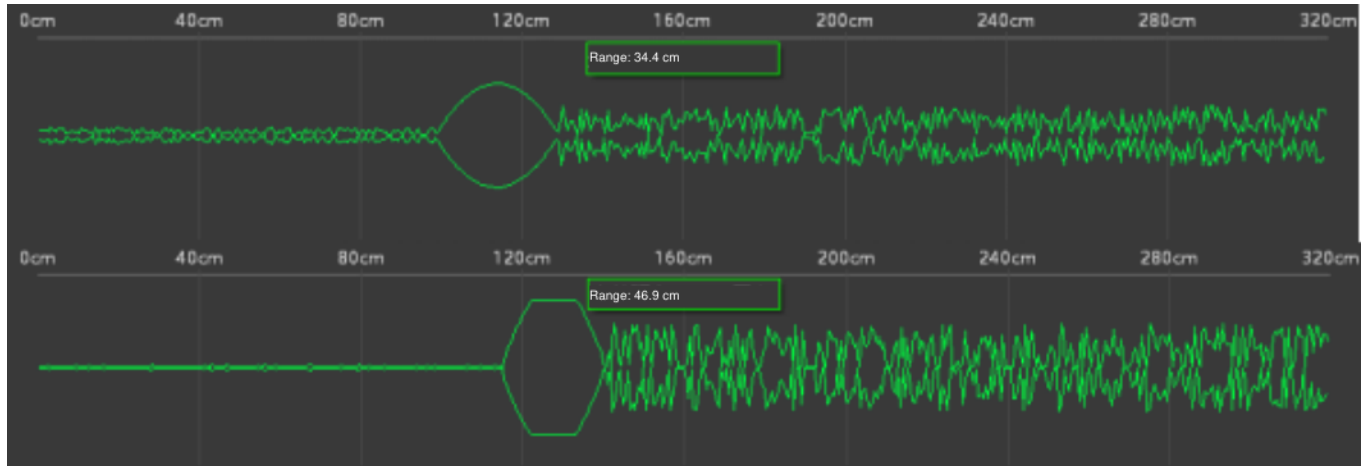
Image smoothing example



Original waterfall example with image smoothing selected.

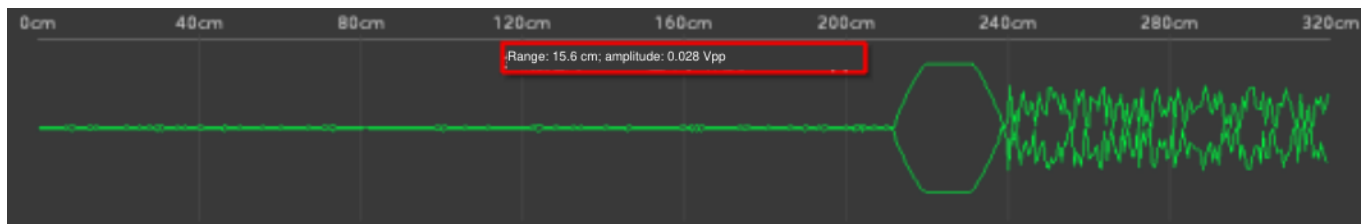
7. Signal and cursor measurement

Signal enhancement



Signal enhancement displays additional signal detail more clearly. Original waveform traces and example readings are retained.

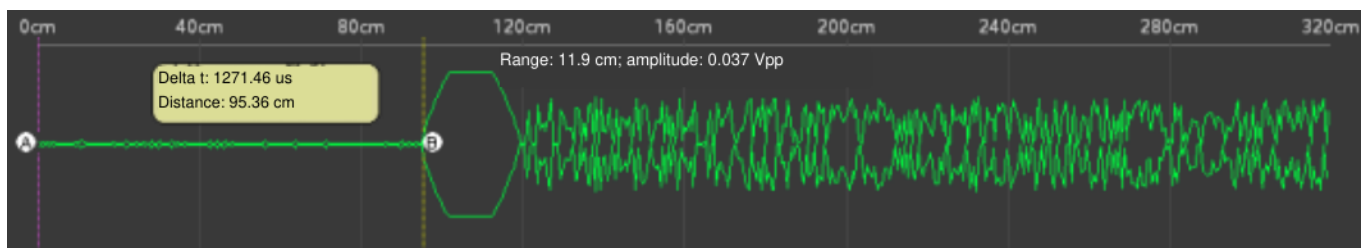
Amplitude display



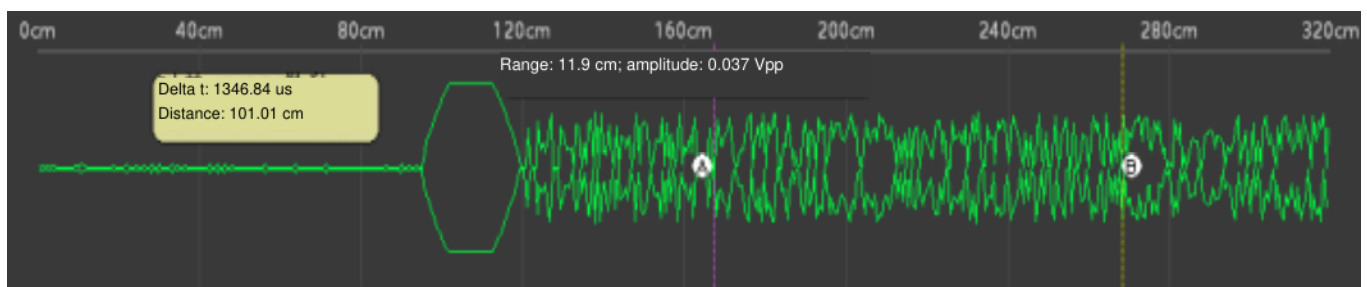
The interface displays the echo-voltage value. In the illustrated interface the amplitude is labelled Vpp.

Measurement tools

The software automatically tracks a current distance on the waveform. Because the underwater environment can be complex, that automatically detected value is a reference. Use the measurement cursors when a more precise reading is required.



Click the measurement tool to show cursors A and B. Drag a cursor to measure the distance between them. Cursor A starts at zero.



After stopping measurement, move the cursors freely to measure an absolute distance or the separation between two targets.

8. Developer interface

Communication structures transcribed from the supplied manual; comments translated into English.

Distance request: tSendFrame

```
typedef struct
{
    uint16_t length;
    uint8_t  method;
    uint8_t  Params[40];
    uint8_t  crc;
} tSendFrame;
```

length	Length from method through crc, fixed at 42.
method	Command value, fixed at 5.
Params[40]	Parameter bytes, fixed at 0.
crc	CRC calculated from length onward, excluding the crc byte itself.

Distance response: tRecvFrame

```
typedef struct
{
    uint16_t Head;
    int32_t  temperature;
    uint32_t Distancemm;
} tRecvFrame;
```

Head	Packet header marker, fixed at 0xFCFC.
temperature	Sensor temperature in degrees Celsius: divide the stored integer by 10000.
Distancemm	Measured distance in millimetres.

The source excerpt does not specify byte order or compiler structure packing. Confirm these details for the device firmware before using a C structure directly as a wire-format buffer.

9. CRC8 reference

The source manual supplies the following CRC8 function for checking the communication packet. Polynomial: $x^8 + x^2 + x + 1$ (0x07). Initial CRC value: 0.

```
uint8_t CRC8(uint8_t *ptr, uint8_t len)
{
    uint8_t crc = 0;
    while (len--)
    {
        crc ^= *ptr++;
        for (uint8_t i = 0; i < 8; i++)
        {
            if (crc & 0x80)
            {
                crc = (crc << 1) ^ 0x07;
            }
            else
            {
                crc <<= 1;
            }
        }
    }
    return crc;
}
```

Request CRC coverage

As stated in the source structure comments, start CRC calculation at the **length** field and exclude the final **crc** field itself.

The CRC function and message identifiers are retained from the supplied example. Translating this manual does not change the device firmware or define any additional protocol fields.

Keep the request and response structures together with the CRC reference when implementing the serial interface. Use the correct hardware supplies and communication connection described on page 3.