Rapidlogger Systems

Rapidlogger Signal Simulators for Troubleshooting and Verification of Rapidlogger and its Cables and Sensors

This tech note describes how to use the two Rapidlogger signal simulator kits, 00-94803 (current) and 00-94805 (frequency), to check that a Rapidlogger unit, its sensor cables and its inputs are working, and to find out whether a wrong or missing reading is caused by the sensor, the cable or the Rapidlogger.

The Two Kits

Every new Rapidlogger unit is shipped with two small signal simulator kits. Each kit is a simulator wired to a short cable that ends in the same connector as the sensor it stands in for, with a heat shrink label saying which channels it is for. The simulators take their power from the Rapidlogger through the sensor cable. They have no battery and no power switch.

Kit	**Part number**	**Stands in for**	**Plugs into**
Current Simulator Kit	00-94803	A 2-wire 4-20 mA sensor: pressure transducer, electronic load cell, level sensor	The 6-pin connector at the sensor end of a pressure transducer cable (00-92167)
Frequency Simulator Kit	00-94805	A pulse sensor: pump prox switch, engine RPM pickup, turbine flowmeter	The M12 socket at the sensor end of a prox switch cable (00-92169), or the 3-pin plug of a turbine flowmeter cable (00-92170)

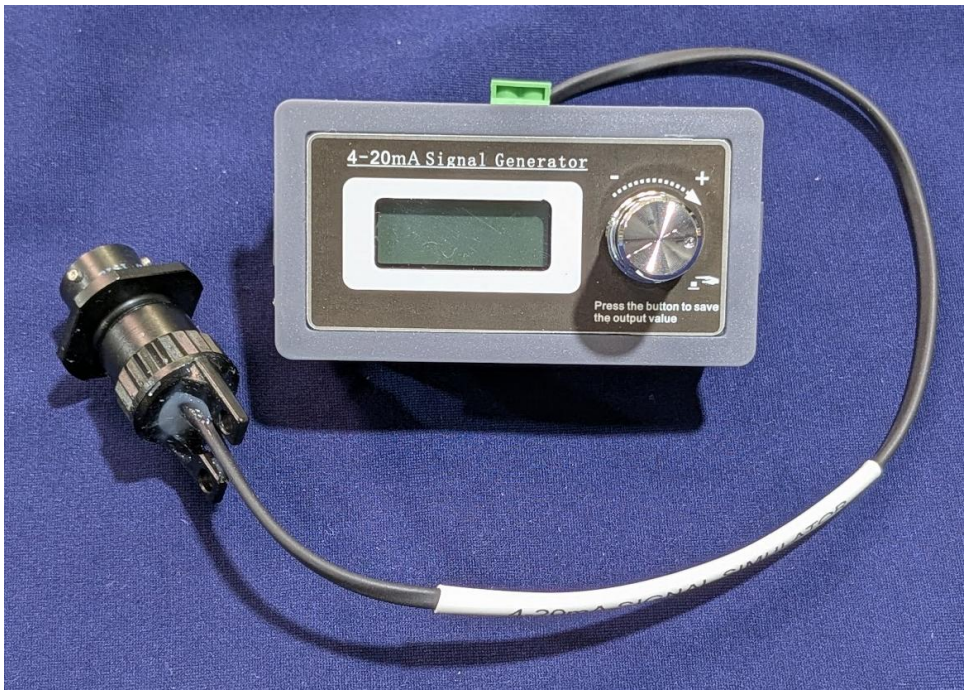


Figure 1: Current Simulator Kit 00-94803: 4-20 mA simulator, cable and 6-pin connector

The current simulator has a knob and a display. Turning the knob sets the current anywhere between 4.00 and 20.00 mA; the display shows the value being sent. Pressing the button holds the value.

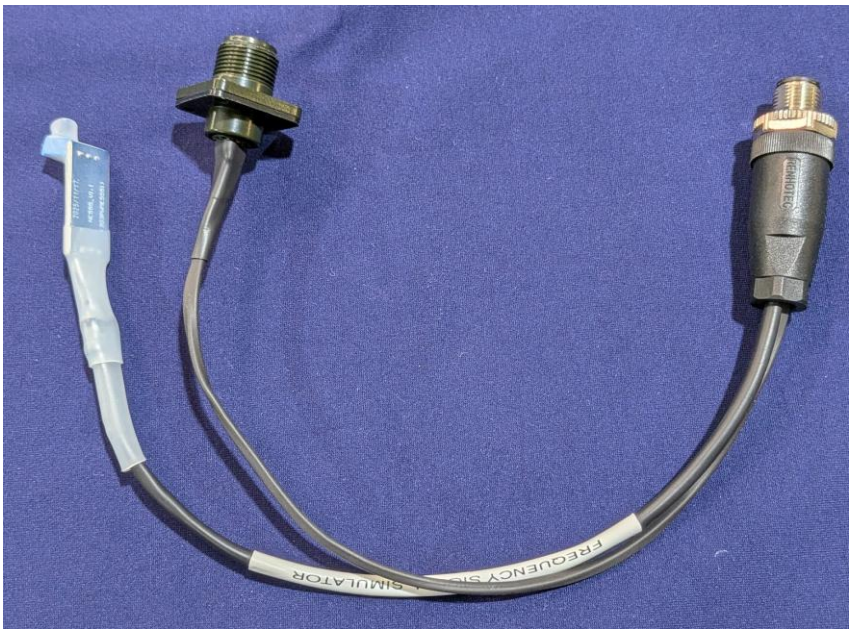


Figure 2: Frequency Simulator Kit 00-94805: pulse simulator board (in clear heat shrink), M12 plug and 3-pin connector

The frequency simulator is a small circuit board, sealed in clear heat shrink, that puts out a steady train of pulses as soon as it is powered. It is set at the factory to about 78 pulses per second (78 Hz), which a pump rate channel with the Rapidlogger factory pump settings displays as about 1 bpm. Both the M12 plug and the 3-pin connector carry the same signal, so the kit fits a prox switch cable or a turbine flowmeter cable without any change.

NOTE: The small trimmer screw on the frequency simulator board sets the frequency. It was adjusted at the factory. We do not advise changing it.

How the Check Works

The simulator is plugged in at the far end of the sensor cable, where the sensor normally connects. The Rapidlogger then powers the simulator and reads its signal through the same connector, the same cable and the same input terminal that the sensor uses. If the Rapidlogger shows the value the simulator is producing, the input, the cable and the connectors are good, and any remaining problem is in the sensor itself or in the way it is installed. If the Rapidlogger does not show that value, the problem is in the

cable, the connectors or the Rapidlogger input, and the sensor can be ruled out.

NOTE: Always plug a simulator in at the sensor end of the cable, in place of the sensor. Do not plug the current simulator straight into the Rapidlogger connector: the pins are the other way round at that end and the simulator will not work.

Reading the Raw Inputs on the Keypad

The Rapidlogger has a diagnostics screen that shows the raw value at each input terminal before any multiplier or offset is applied. It is the best place to see the simulator signal, because it does not depend on how the variables are set up.

1. From the main screen press F6 (Menu) and then F6 (System). The system menu appears (Figure 3).
2. Press F5 (Diag).
3. For a 4-20 mA input press F1 (Analog) and then F1 (ADC). The screen lists analog inputs 01 to 08. Press F5 (V/mA/C) until the top line of the screen shows [mA]; the values are then in milliamps.
4. For a frequency input press F2 (Digital). The screen lists frequency inputs 01 to 08 in Hz.
5. Press Exit to return to the main screen when the check is finished.

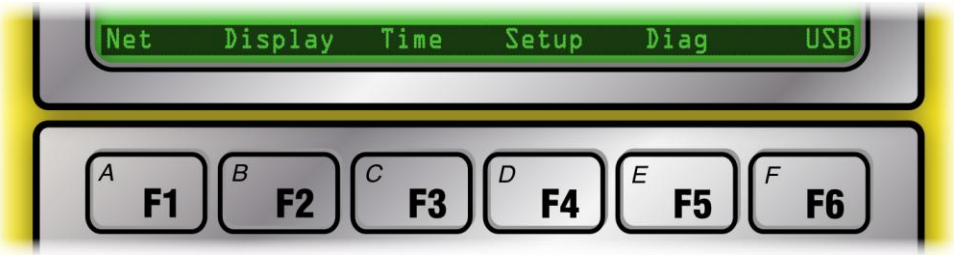


Figure 3: System menu (F6, F6): Diag is F5

The input numbers on these screens follow the terminals: mA1 (JB1-12) is analog input 01, mA2 (JB1-13) is 02, and so on. F1 (JB1-20) is frequency input 01 and F2 (JB1-21) is 02. A turbine flowmeter wired to QA1 (JB1-16) appears as frequency input 05 when the unit is set to Quadrature as Frequency (Tech Note #103). Refer to the wiring sheet

supplied with your unit to see which input each sensor cable goes to.

Checking a 4-20 mA Input with the Current Simulator

1. Unscrew the pressure transducer (or other 4-20 mA sensor) from the 6-pin connector at the end of its cable and plug the current simulator onto the cable in its place. Screw the coupling ring down.
2. The simulator display lights up as soon as it receives power from the Rapidlogger. If it stays blank, no 24 V is reaching the end of the cable: check the Rapidlogger fuse (Tech Note #32), the connector pins and the cable.
3. Turn the knob until the display reads 4.00 mA and press the button to hold it.
4. Bring up the analog diagnostics screen (F6, F6, F5, F1, F1, then F5 until [mA] is shown). The input the cable is wired to should read 4.00 mA or very close to it. On the main display the variable should read its zero value, for example 0 psi for a pressure transducer.
5. Set the simulator to 12.00 mA. The diagnostics screen should read 12.00 mA and the variable half of its range, for example 7,500 psi for a 15,000 psi transducer.
6. Set the simulator to 20.00 mA. The diagnostics screen should read 20.00 mA and the variable its full range, for example 15,000 psi.
7. Unplug the simulator and reconnect the sensor.

Simulator setting	**Diagnostics screen**	**Variable (15,000 psi transducer)**
4.00 mA	4.00 mA	0 psi
12.00 mA	12.00 mA	7,500 psi
20.00 mA	20.00 mA	15,000 psi

NOTE: A tension/compression load cell variable is set up to read zero at 12 mA, so it shows minus full scale at 4 mA, zero at 12 mA and plus full scale at 20 mA. If the diagnostics screen is right but the variable is not, the hardware is good and the variable's Multiplier, Offset or input number needs correcting (Tech Notes #104 and #112).

Checking a Frequency Input with the Frequency Simulator

1. Unscrew the prox switch from the M12 socket at the end of its cable and screw the frequency simulator's M12 plug into the socket in its place. For a turbine flowmeter cable, unplug the flowmeter and plug the cable onto the 3-pin connector of the kit.
2. The simulator starts sending pulses as soon as it is powered. There is nothing to set.
3. Bring up the frequency diagnostics screen (F6, F6, F5, F2). The input the cable is wired to should read about 78 Hz, and the reading should be steady.
4. On the main display, a pump rate variable with the Rapidlogger factory pump settings (0.000215 bbl per pulse, rate multiplier 0.0129) reads about 1.0 bpm, and its total counts up by about 1 bbl every minute. With other multipliers the rate reads 78 times the rate multiplier. An engine RPM variable reads 78 times its multiplier.
5. Unplug the simulator and reconnect the sensor.

What the Results Mean

What you see	What it means	What to do
Diagnostics screen and variable both correct	The Rapidlogger input, the cable and the connectors are good	The fault is in the sensor or its installation. Check the sensor, its mounting and its process connection, or fit a spare sensor.
Diagnostics screen correct, variable wrong	The hardware is good; the variable setup is wrong	Check the Multiplier, Offset, I/O type and input number in the Rapidlogger Utility (Tech Notes #4, #104, #112, #113).
Current simulator display stays blank, or no reading at all	No power at the end of the cable, or an open circuit	Check the fuse (Tech Note #32), the connector pins for damage, corrosion or water, and the cable for cuts. Move the cable to another input

		of the same type: if the simulator then works, the first input is at fault; if it still does not, the cable is.
Reading present but wrong or unsteady	Damaged cable, poor connector contact or a wrong input setting	Wiggle each connector while watching the screen. Inspect the cable. For a frequency input check that it is set up as the correct type (Tech Note #103).
Frequency reads zero on a flowmeter cable	QA1/QA2 are not set to Quadrature as Frequency	Enable Quadrature as Frequency in System Setup (Tech Note #103), or move the cable to an F input.

Connector Pin Assignments

For checking a cable with a meter, the kit connectors are wired as follows. The simulator pins match the sensor end of the Rapidlogger cables.

Kit connector	**Pin**	**Signal**
Current simulator, 6-pin Amphenol (00-93494)	A	+ (24 V from the Rapidlogger)
	B	- (4-20 mA signal back to the Rapidlogger mA input)
	C, D, E, F	Not used
Frequency simulator, M12 plug (00-94807)	1	+24 V from the Rapidlogger
	3	Ground
	4	Pulse signal to the Rapidlogger frequency input
	2	Not used
Frequency simulator, 3-pin MS3102A10SL-3P	A	+24 V from the Rapidlogger
	B	Ground

	C	Pulse signal to the Rapidlogger frequency input

Ordering

Both kits are supplied with every new Rapidlogger unit. Replacement or additional kits can be ordered from sales@rapidlogger.com by part number: 00-94803 Rapidlogger Current Simulator Kit and 00-94805 Rapidlogger Frequency Simulator Kit.

The check is now complete. Related tech notes: #4 (using the Rapidlogger Utility), #32 (main board fuse), #103 (frequency input mapping), #104 (multiplier and offset), #112 (pressure transducer calibration), #113 (pump stroke counter).