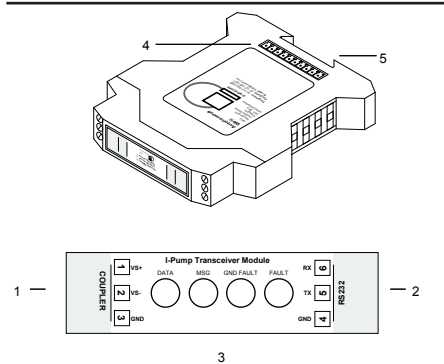


# I-Pump Transceiver User Manual



- 1 Coupler Connection
- 2 Engineer Connection RS232
- 3 Diagnostic LED
- 4 Autonomous Well Bus (12-24Vdc, RS485)
- 5 Symetric DIN Rail mount



### Warning – Lethal Voltages Present

Transceiver connect, via couplers, to the High Voltage Supply to the ESP. Only personnel trained in High Voltage Equipment and Operations should access this equipment.

### Warning – Voltages Present

Module outputs 200Vdc to ESP cable. Remove power to Transceiver prior to working on ESP 3-Phase Supply (a-well coupler, switchboard motor connections, junction box, well head connector).

### Warning – Spark Hazard

Voltage is applied to the ESP 3-Phase cable by the I-Pump Transceiver Module. Ensure the ALC Control Module Stack is not powered prior to removing the wellhead connector.

### Be Safe – Be Sure

If in doubt seek advice from Autonomous Well: [help@a-well.com](mailto:help@a-well.com)

I-Pump Transceiver Module is a Modbus RTU device, communicating with the I-Pump via the Coupler(s) and ESP 3 Phase System. Transceiver can be standalone or connected to an Autonomous Well display/ logging unit such as the Artificial Lift Controller (ALC)

I-Pump, the Autonomous Well's modular gauge system, is powered and controlled by this module which, running from 12-24 Vdc, can be used in a bus or as a portable unit. In common with all bus modules it is a Modbus Slave RTU and all live data [downhole pressures, temperatures, etc] are available as Input Registers. Set-up is via the Holding Register set or Engineer (RS232) Mode. All data is error-checked with 100% verified communications between gauge and surface.

For multi-well sites one single control solution may contain multiple gauge transceivers to simplify installation and maintenance and reduce cost. Each gauge transceiver is simply a separately addressed Modbus RTU and the data can be gathered by any Modbus Master.

See Installation/ Modbus Set-Up for information on Modbus port (addressing, serial port configuration).

See Modbus Register Map for register set-up.

Engineer Mode permits setup and logging using a PC/ RS232 connection.

### I-Pump System

I-Pump from Autonomous Well is a flexible and complete gauge system for ESP wells. Available as component parts for third party gauge manufacture or on-site repair, as well as complete systems I-Pump is unmatched in practicality, cost of use and its diversity of measurements.

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## Connections

Module has 2 sets of 3 way screw terminals and a 10 way bus connection. Transceiver module has rising clamp screw terminals similar to the ALC. Terminate wiring with bootlace ferrules.

### Coupler Connection

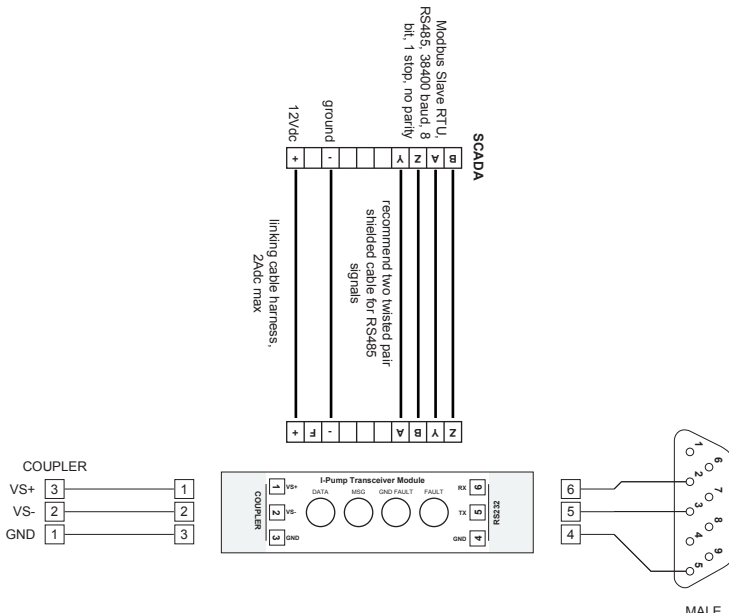
Three wire harness (200Vdc, 1A rated) is connected from the Transceiver Module to the Single Phase Coupler. This carries power to the downhole sensor and communicates to/from the sensor. Standard panel wire may be used (it does not require screening except where distance or expected noise is significant).

### Engineer/RS232 Connection

Terminals 4-5-6 permit connection to a PC. A cable is required to transform to a 9-way male connector, suitable for connection to a PC using a NULL Modem Cable. This RS232 port may be used to change the default setup of the module or log data directly to a PC.

### Autonomous Well Bus

This bus provides power to the module (12-24Vdc) and has an RS485 port that may be used in the default Modbus RTU mode. Port may be connected as 2 or 4 wire.



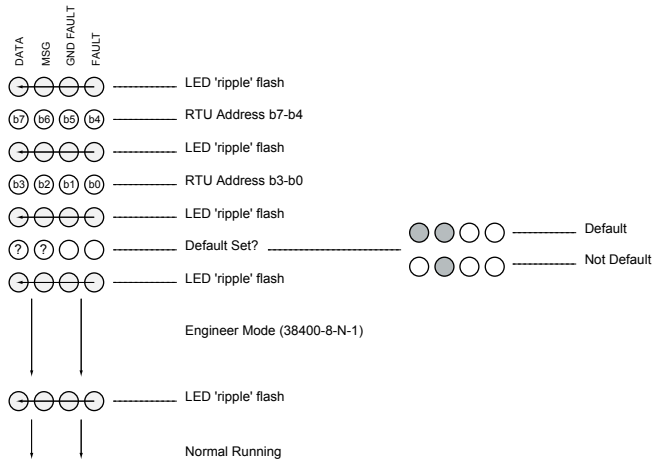
## Module Status LEDs

There are four LEDs on the Transceiver Module: two red, two yellow. Yellow LEDs are data status indications (data packet received and error checked, data packet being received). The outer yellow LED should come on within 60 seconds of the unit starting and remain lit whilst running. If it does extinguish then it should come back on within 60 seconds.

### Boot Up Diagnostics

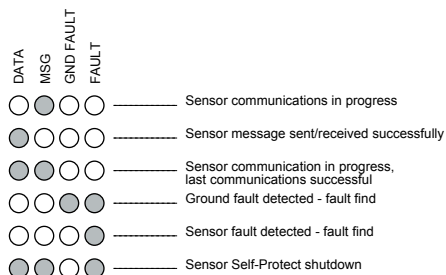
When the unit powers up the LED show a diagnostic sequence which shows if all the LED are working, outputs the Modbus RTU address (as two 4-bit sequences) and outputs a status indicating the module setup is in the default state or not. Between each sequences the LED show a diagnostic flash.

After these initial diagnostics the module enters Engineer Mode for 5 seconds. If there is no RS232 activity during these 5 seconds the module enters it's normal running state. If the module enters RS485 Modbus RTU mode (the default mode) then the LED show a diagnostic flash.



### Running Diagnostics

When running the LED show various diagnostic messages.



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## Engineer Mode

Engineer mode allows an ASCII terminal (e.g. Window's Hyperterminal) to change the module settings, including setting the module into constant RS232 mode to gather live data directly to the terminal/ PC.

This mode has a fixed port setup: 3 wire, no flow control, 38400 baud, 8 data bits, no parity, 1 stop bit.

**Note:** when in the engineer mode Modbus RTU communication is switched off.

To use the engineer mode first connect the module to your terminal. Power up the module and wait until the boot-up LED diagnostics are complete (4th 'ripple' flash of the LEDs). Hit the <Esc> key and the engineer's menu will appear:

### Menus

press <Esc> anytime for main menu

PN: PAW-XXXX-XX

FW: PAW-XXXX-XX

SN: XXXX

```
1      BAUD [<current setting>]  
2      RTU [<current setting>]  
3      Mode [<current setting>]  
4      Output [<current state>]  
5      Leak []  
6      Reset []
```

press <1> to change BAUD (press the number for the BAUD required)

BAUD:

```
1      2400  
2      4800  
3      9600  
4      19200  
5      38400
```

press <2> to set RTU address (enter a value, then press <CR>)

RTU [1-254]:

press <3> to set the normal running mode (press <r> for Modbus RTU or <t> for ASCII Terminal)

Mode [r=RTU, t=TERM]:

press <4> Output Toggles On/Off, main menu shows

press <5> Leakage is Set, main menu shows

press <6> (then press <y> to confirm factory reset)

Default? [y, n]:

press <shift><V> to show live data from the sensor. Press <Esc> to return to the main menu.

press <shift><Q> to exit the Engineer Mode (LED show a ripple flash). When exiting, the module has the setup as shown in the main menu.

## Value Output

When on the menu, pressing **<shift><V>** will temporarily enter the Value (logging) mode where all values are output to the terminal. To cancel this mode hit **<Esc>**. Terminal applications may let you capture this data to a file. Logs have no date and time and are sent to the terminal a regular intervals.

LED	GM	Pi [psi]	Pd [psi]	Ti [C]	Tmwt [C]	Vx [g]	Vy [g]
XX00	1	nnnn	nnnn	nnn.n	nnn.n	n.nnn	n.nnn
XX00	1	nnnn	nnnn	nnn.n	nnn.n	n.nnn	n.nnn
XX00	2	nnnn	nnnn	nnn.n	nnn.n	n.nnn	n.nnn
XX00	2	nnnn	nnnn	nnn.n	nnn.n	n.nnn	n.nnn

The LED column shows X = LED On, 0 = LED Off, reading left to right in the same order as the LED on the Transceiver module. GM is the Good Message count and should increase around 120 per hour (this is the count of error-checked packets received from the sensor).

**Note:** if the Mode setting is 'Term[inal]' the module will enter this Value mode after boot-up. This mode has been included to allow the Transceiver to be directly connected to a printer or terminal for data capture without using a wellsite display.

# Specification

<b>Document</b>	PAW-0279
<b>Product</b>	I-Pump Transceiver
<b>Part Number</b>	PAW-0062
<b>Mounted Dimensions</b>	99x35x114.5 mm
<b>Weight</b>	0.2 kg
<b>Power Supply</b>	12-24 Vdc
<b>Consumption</b>	5W
<b>Environment</b>	IP20 Operating -40 - +70C
<b>Isolation</b>	Input to Output 1000Vdc Output to Ground 250Vdc
<b>Modes</b>	Modbus RTU or Terminal
<b>Ports</b>	RS232 or RS485 BAUD: 38400-19200-9600-4800 8 bit, No Parity, 1 Stop bit
<b>Modbus Mode</b>	RTU 1-254 (255 Reserved)
<b>Modbus Registers</b>	00002: AutoSet Leakage 00003: Gauge On (1), Off (0) 10001: Message in Buffer 10002: Message in Transit 10004: Fault 10005: Ground Fault 10006: Sensor Auto-Shutdown 30000: Leakage mA*1000 30001: Good Message Packet Count 30128: Pi psi 30129: Ti C*10 30130: TmwT C*10 30131: Pi psi 30132: Vib-X g*1000 30133: Vib-Y g*1000 44096: BAUD (true value) 44097: RTU Address (0-255) 44101: Mode (0=RTU else Terminal) 44102: Serial Number
<b>Terminal Mode</b>	ASCII 38400-8-N-1
<b>Engineer Mode</b>	Live Data Log Setup Menu: >BAUD Rate >RTU Address (1-254) >Normal Mode (RTU or Term) >Sensor On/Off >Set Leakage >Factory Reset
<b>Accessories</b>	PAW-0252: RS232 Cable Pack

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## Change Record

<b>Document</b>	PAW-0279
<b>Product</b>	I-Pump Transceiver
<b>Part Number</b>	PAW-0062-02
<b>Firmware</b>	PAW-0101-05
<b>Date</b>	1 July 2004

<b>Firmware</b>	RS232 port (terminals 4-5-6) can be used as an alternate to the RS485 port (on the 10 way connector). It is an Alternate only – it cannot be used at the same time as the RS485 port.
<b>Firmware</b>	RS232 port has an auto-detect feature and will enter RS232 mode when there is RS232 activity.
<b>Firmware</b>	RS232 port has an Engineer/ Terminal mode. This mode is automatically entered at power on or can be entered by pressing ESCape 5 times in quick succession.
<b>Firmware</b>	In Engineer/Terminal mode the port is set to 38400-8-N-1. There is no character echo. Hyperterminal (Windows) can be used to work with the Transceiver. Select terminal emulation as Auto Detect.
<b>Firmware</b>	Engineer/ Terminal mode permits: <ul style="list-style-type: none"><li>&gt; baud rate changes</li><li>&gt; Modbus RTU address changes</li><li>&gt; switching between Modbus RTU and Terminal mode for normal running</li><li>&gt; toggle sensor On/Off</li><li>&gt; reset the current leakage measurement</li><li>&gt; reset the Transceiver setup</li><li>&gt; view the Firmware revision</li><li>&gt; view the Serial Number</li><li>&gt; switch to a rolling printout of the I-Pump data</li></ul>
<b>Firmware</b>	Power-On diagnostics have been added to the LEDs showing the Modbus Address and whether the setup is suitable for normal connection to an Autonomous Well ALC
<b>Firmware</b>	Diagnostic flashing of LED has been added to show when the unit is in RS232 Engineer/ Terminal mode
<b>Hardware</b>	Connection to the I-Pump Coupler is incorrect. Terminals should be 1-, 2-, 3-.
<b>Hardware</b>	RS232 port is not labelled. It should be labelled 4-, 5-, 6-.
<b>Hardware</b>	Specification labelling is incorrect. Modbus RTU address is set as 1 although maybe changed using the RS232 Port in Engineer/ Terminal mode.
<b>Hardware</b>	Specification labelling does not show the diagnostic states of the LEDs.

## PAW-0062 I-Pump Transceiver

### Change Record

#### Applies To

I-Pump Transceiver Modules (PAW-0062) revision 02 shipped after 01-07-2004 (hardware changes to all single modules before this date). Applies only to the single module version of the Transceiver. Early versions of single modules can be upgraded with new firmware.

#### Summary

Changes have been made to allow the Transceiver to be set-up by an engineer using a PC, for data capture to a PC or printer, for Modbus RS232, and for the Transceiver to be used in a display-less scenario with the engineer walking up to each well with a laptop or handheld PC running a terminal emulation (no ALC or SCADA required).

Labelling errors are corrected.

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# PAW-0062

## I-Pump Transceiver

### Change Record

**Hardware** Part number is PAW-0062-XX (XX is revision) with a duplicate number AW-SA-XXXX (sales reference for this part).