



**ACPM-01**

3-Phase AC Power Meter

**Version 1.0**

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**Setup Guide**

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**IMPORTANT:** The ACPM-1 communicates **exclusively** via Modbus RTU. Therefore, if there are MEXM units connected to a Davicom via Modbus TCP, they will have to be reconnected using TCP because Davicom units do not support simultaneous use of Modbus RTU and TCP.

1) First, please read both the WattNode instruction manual and the installation manual for very important information. You can get them from our website in the **Resources** section, or directly from the *Continental Control Systems* website, which also contains a wealth of information.

2) Figure 1 represents the DIP switches that are on the top of the ACPM-1. Set it with both #1 and #8 switches to "ON" (or 1) and set all the other switches to "OFF" (or 0). This gives the ACPM-1 an RTU address of 1 and a data communication speed of 19200 bps.

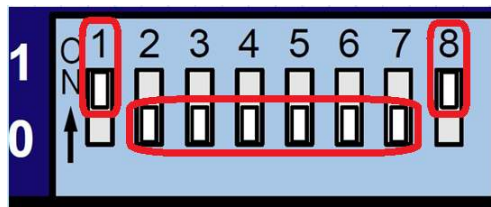


Figure 1.

**NOTE:** If you already have MEXM units and/or Modbus accessories connected in RTU to your Davicom, you will have to assign the ACPM-1 with an RTU address different than 1 (default). To do so, set the ACPM-1 DIP switch as per the chart in Figure 2.

DIP Switch	1	2	3	4	5	6	7
Up (1) Value	1	2	4	8	16	32	64
Address	Examples						
1	1, Up	0, Down	0, Down	0, Down	0, Down	0, Down	0, Down
1+2+4 = 7	1, Up	1, Up	1, Up	0, Down	0, Down	0, Down	0, Down
4+16 = 20	0, Down	0, Down	1, Up	0, Down	1, Up	0, Down	0, Down
1+2+16+32+64 = 115	1, Up	1, Up	0, Down	0, Down	1, Up	1, Up	1, Up

Figure 2.

3) As shown in Figure 3, connect the 3 wires of the USB adapter on the ACPM-1. Then connect the USB adapter to the rear USB port of the Davicom.

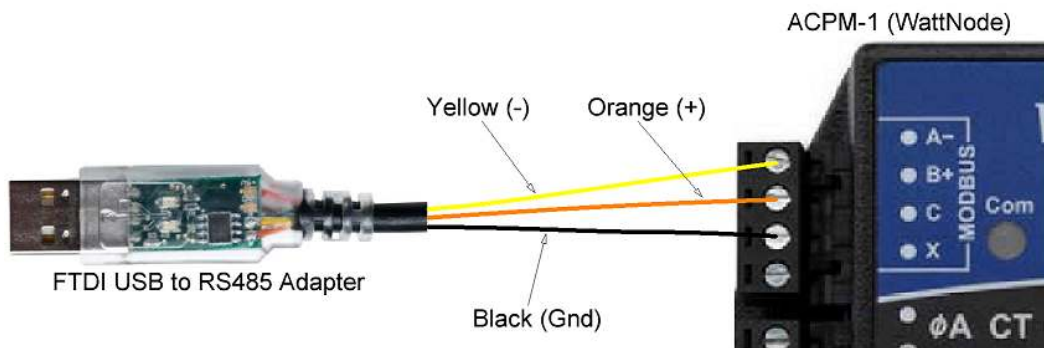


Figure 3.

4) Apply power to the ACPM-1 and look at the Com light on the top. After a few seconds, it should turn to solid green. If not, check for wiring errors or bad electrical contact in the sockets. Also, make sure the USB adapter is fully inserted into the USB port of the Davicom unit. Also, when the communication link is OK between the Davicom unit and the ACPM-1, there will be a blinking LED visible on the USB adapter clear body which serves as an indicator.

5) Next, set the USB-to-RS485 adapter communication parameters in the Davicom unit. Launch DavLink and connect to the Davicom. In DavLink top menu, click on *Unit > Configuration > Devices > USB Devices*, and check that the USB adapter appears in the list, as seen in Figure 4.

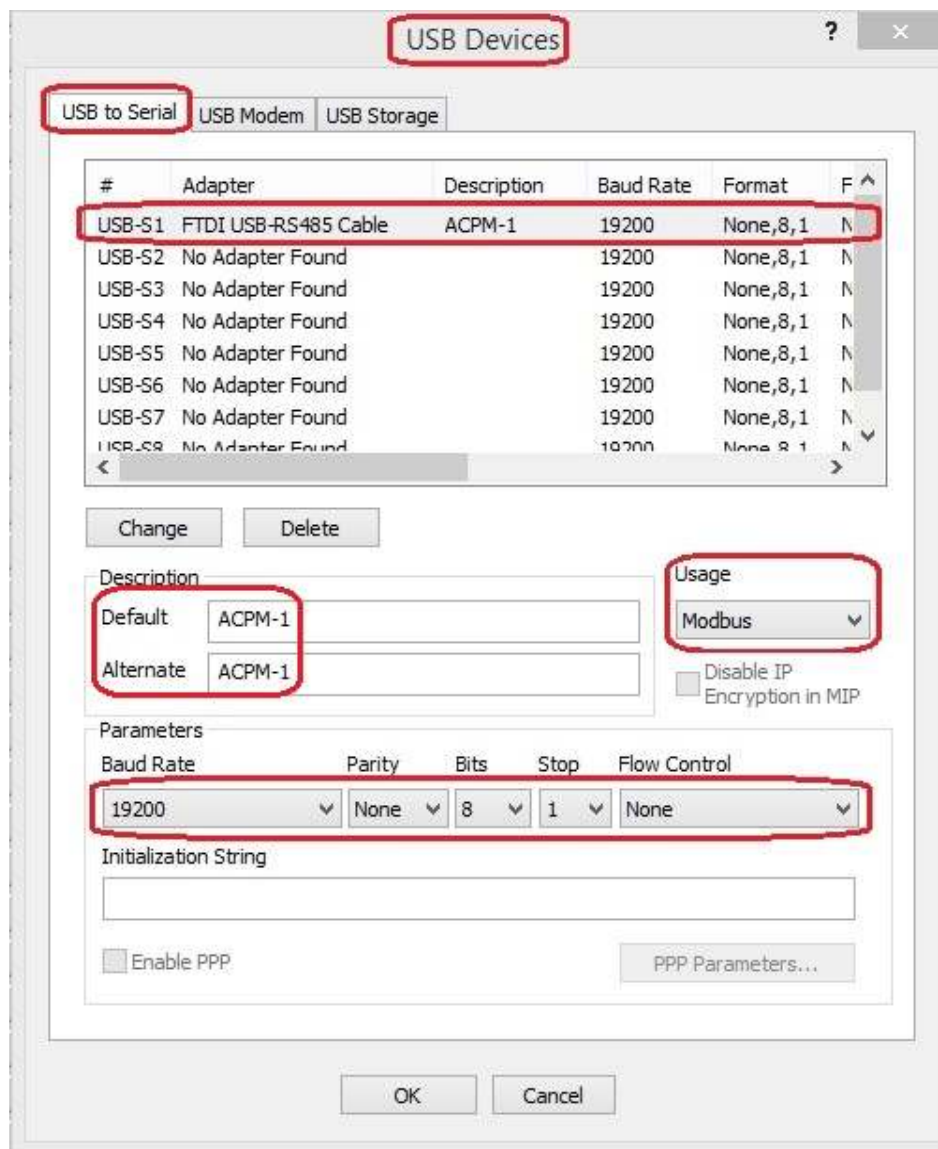


Figure 4.

6) Next, set the Modbus parameters of the ACPM-1 in the Davicom. Still in DavLink top menu, go to *Unit > Configuration > Devices > Modbus Setup* and set the fields as shown in Figure 5. Make sure that the "STATE" field shows "OK", not "Fail".

In this example, the RTU address of the installed Modbus device is 1, but if you already have one or more MEXM units or other Modbus accessories connected to your Davicom, you will have to select a different RTU address.

The screenshot shows the 'Modbus Setup' dialog box. The 'Mode' is set to 'RTU' and the 'IP Port' is '502'. The 'Slave Setup' tab is active, showing a table with the following data:

Coil	Status	Register	State	Alternate Des
00001:0	10001:0	30001:0x16	OK	

Below the table, the 'Enable' checkbox is checked. The 'IP/RTU Address' is set to '1'. The 'Parameters' section shows:

- Output Coils Address: Start: 00001, Len: 0
- Input Status Address: Start: 10001, Len: 0
- Input Registers Address: Start: 43476, Len: 14

The 'Coding Scheme' is set to 'Offset Binary' and the '32 Bits' checkbox is unchecked.

Figure 5.

7) Figure 6 is a chart listing the most common and useful AC power measurements available from the ACPM-1 (for more info about all the available registers, please consult the WattNode user manual). The chart is actually a list of WattNode registers that have been internally remapped so they can all be made contiguous in order to easily obtain readings (no reading gaps or jumps are allowed with Modbus registers).

ACPM-1 Remapped Integer Register List				
Name	Units	Registers	Description	Davicom Input Register Addresses
PowerFailCount	0	3476	Power failure count	43476
PowerSum	PowerIntScale	3477	Total power	43477
PowerA	PowerIntScale	3478	Power for phase A (watts)	43478
PowerB	PowerIntScale	3479	Power for phase B (watts)	43479
PowerC	PowerIntScale	3480	Power for phase C (watts)	43480
PowerIntScale	0	3481	Power(W) = PowerIntScale * CtAmps * IntPowerReg	43481
VoltA	0.1 V	3482	RMS voltage (line to neutral) for phase A	43482
VoltB	0.1 V	3483	RMS voltage (line to neutral) for phase B	43483
VoltC	0.1 V	3484	RMS voltage (line to neutral) for phase C	43484
CurrentA	CurrentIntScale	3485	RMS current for phase A (amps)	43485
CurrentB	CurrentIntScale	3486	RMS current for phase B (amps)	43486
CurrentC	CurrentIntScale	3487	RMS current for phase C (amps)	43487
CurrentIntScale	0	3488	Current = CurrentIntScale * FloatCurrent / CtAmpsX	43488
Freq	0.1 Hz	3489	Line frequency (Hz)	43498

Figure 6.

The 5-digit Input Register Addresses (in green) are the Davicom Modbus registers holding the measurement values which will be read by the Davicom unit and displayed in the DavLink workspace.

Note that you don't have to use all listed 14 registers, you can use only the ones that are of interest to you. For example, if you only want to get the voltage and current readings from the three phases, you would select registers 43482 to 43487, which gives a length ("Len") of 6. Or, if you would like to get power measurements only, you would select registers from 43478 to 43480, which gives a length ("Len") of 3. Using only the required registers allows saving Davicom Modbus inputs for other Modbus accessories. Again, keep in mind that all Modbus registers you want to read must be contiguous, no gap or jump is allowed.

If you want to have the ACPM-1 measurement values displayed into a DavLink workspace, you will need to either use our free "Mega Workspace" or edit any workspace you may already have (if you need help to edit a workspace, you can either refer to the Davicom User Manual or contact us). It's best to edit a workspace when connected to a Davicom which got a powered ACPM-1 linked to it.

For example, if your ACPM-1 has an RTU address at 1, the following Davicom Modbus I/O's would have to be added to a workspace in order to view their content: **1MA01**, **1MA02**, **1MA03**, etc. The "M" stands for Modbus, the "A" stands for Analog (now called Metering), and the last two digits represent the actual I/O number. If your ACPM-1 has an RTU address other than 1, use its RTU address number as prefix in the Davicom Modbus I/O names (**2MAxx**, **3MAxx**, **4MAxx**, etc.)

## 8) Configuring Modbus Metering Inputs in the Davicom unit.

As seen in Figure 7, the Modbus inputs are accessible from the Davicom unit Metering Input configuration screen. Click on the drop-down arrow of the top-left "Input Number" field and select the desired input you want to configure.

The number of Modbus inputs showing in the drop-down list is determined by the "Len" (length) value set in the Modbus setup config screen (see Figure 5). In this example, because we have set a Len of 14, there are 14 Modbus inputs accessible in the *Input Number* menu: 1MA01 to 1MA14.

**NOTE:** In order to access the Modbus Metering inputs, a powered ACPM-1 module must be connected and detected by the Davicom.

Metering Inputs: Name: EAGLE CREEK ID: 54298

Input Number: 1MA01  Enable Qualifier  State   Auto Read

Descriptions: 1A01, 1A02, 1A03, 1A04, 1A05, 1A06, 1A07, 1A08, 1A09, 1A10, 1A11, 1A12, 1A13, 1A14

Default:  Voltage Range: 10 Measurement Unit: V Normal Value: 0

Alternate:  Sensor Coefficients: A: 0, B: 1.00, C: 0, D: 0

Graph:  $y = A x^2 + B x + C$  for  $D = 0$ , or  $y = D \text{ Log } ( A x^2 + B x + C )$

Actions:

Level 1:  Alarm List:  Hysteresis: 0 High: \* Hysteresis: 0

Limits: (\*=don't care) 2 3 4 5 6

Control:

Level 2: Action Type: CMD Alarm List:  Low: \* Hysteresis: 0 High: \* Hysteresis: 0

Limits: (\*=don't care) 1 2 3 4 5 6

Controlled Relays:

Automatic Limit Change: Qualifier:  Multiplier: 1.00

Meter Window: Low:  High:

Signaling On:  Alarm  Return to Normal

Delays: Before Action (sec): 0 Before Return to Normal: 0

Logging:  Custom Log

Figure 7.

9) Still at the same Metering Input config screen and as seen in Figure 8, go to the "Voltage Range" selection menu and select "RAW". You can now configure all the other window fields just like you would do with any other regular Metering input.

In order to manage floating point values more easily, some measurement values returned by Modbus equipment are very large and must be divided by 10, 100 or 1000. Based on the expected value range, if you notice that a measurement seems too high, you may have to enter 0.1, 0.01 or 0.001 in the "B" coefficient field. Example of such a high value would be "601" for a line frequency reading when the actual value is 60.1 Hz. In this case, a division by 10 is required to get the proper value. Entering "0.1" in the "B" coefficient field would allow such division.

Set all the other Metering Input settings (description, high & low limits, alarm types, etc.) as per your requirements.

Figure 8.

10) Visualizing the ACPM-1 measurements in DavLink.

By default, the workspace that comes with DavLink does not contain Modbus inputs, so we made a dedicated workspace that includes everything needed. You can get it from our web site by following this path: *Support > Resources > Tech Tips, Notes, Apps and more > **Workspace for ACPM-1.***

If you need assistance in setting up an ACPM-1 or for the edition of a workspace, simply contact us.