MODBUS MANUAL
For the
AccUView
UV Transmission Monitor

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Catalog No. 24570  (1/05)
Rev. 1.0
1.0 Overview
The HF Scientific AccUView uses a communication protocol called Modbus. A company called Modicon, for use with their programmable controllers, developed the Modbus protocol. Since that time Modbus has evolved into common communication protocol in industry.

The communication method involves using a master-slave technique, in which there is one master and several slaves. The AccUView is a slave device. Only the master can initiate queries. These queries are directed to an individual slave device and the appropriate slave responds with the requested data.

A broadcast message can be sent to all slaves. The slave devices do not answer these broadcasts.

There are two transmission modes. These modes are known as RTU (Remote Terminal Unit) and ASCII (American Standard Code for Information Interchange).

The AccUView can be setup in a network of up to 255 slave devices. Each device must have a different address (1-255). The AccUView can be set for either RTU or ASCII mode.
2.0 Electrical Connections

All of the electrical connections to the instrument are made through the field terminal box, which should be located directly under the sensor portion of the instrument. The connections are labeled within the terminal box and are self-descriptive (see Figure 1). Please follow all local and government recommendations and methods for installation of electrical connections to and between the instrument and other peripheral devices.

A plug is inserted into the RS-485 cable bulkhead when shipped, to ensure a watertight seal. This plug should be removed and discarded when cabling to this connection.

The bulkhead will accept cable diameters from 5.8mm (.230 in.) up to 10 mm (.395 in.). The terminals are designed to accept wires in the range of 14-28 AWG. All wires should be stripped to a length of 6 mm.

It is the user’s responsibility to assure that the watertight seal is maintained after the terminal box has been wired for operation. If any of the bulkheads are not tightened properly around a cable or plug, the ratings of the instrument will be jeopardized and there is a possibility of creating a shock hazard.

Note: Only qualified electricians should be allowed to perform the installation of the instrument as it involves a line voltage that could endanger life.

![Figure 1: Electrical Connections for the Instrument](image-url)
2.1 **RS-485**: The RS-485 half-duplex (2-wire) digital interface operates with differential levels that are not susceptible to electrical interferences. This is why cable lengths up to 3000 ft can be implemented. The last device on every bus may require a 120-ohm termination resistor to eliminate the possibilities of signal reflection on the line. Do not run RS-485 cables in the same conduit as power.

Ensure each instrument is not powered when connecting the RS-485 line. To prevent damage to the instrument, ensure that power is disconnected prior to making connections.
3.0 Operation

3.1 Selecting the Output (O/P)
The first configuration selection is the O/P. The selections are 4-20 for the 4-20 mA output, 485 for the RS-485 and OFF if no outputs are required. Select the desired output by using the ↑ and ↓ buttons. Once the desired output has been set, press the ↵ button to accept it. The next prompts will depend on the output selected.

3.2 Configuring the RS–485 Port
If the I/O selection is changed to 485, prompts will appear for setting the baud rate and the address.

Select the correct baud rate (1200, 2400, 4800, 9600, or 19200) for operation of the I/O port by pressing the ↑ or ↓ buttons to change the displayed baud rate.

Press the ↓ button to continue on and select the desired instrument address (1-255) using the ↑ or ↓ buttons. Once the selection is satisfactory, press the ↵ button.

Select the operating mode either ASCII or RTU using the ↑ or ↓ buttons. Press the MODE key to complete the Modbus setup.
3.2 Configuring the RS–485 Port (continued)
For Modbus some applications, especially involving the ASCII operation mode, it may be necessary to set a different protocol than the default setting (8 bits, 1 stop bit, no parity). Menus are available for this in the Extended Settings portion of the configuration CONFIG mode.

While in the CONFIG mode, press the ↓ button, several times until the Extended Settings is as shown below. Select On using the ↑ or ↓ buttons.

Press the ↓ button a few times until the menus appear for BITS, PRTY (Parity) and STOP (Stop Bits). Set each one to the desired setting using the ↑ and ↓ buttons.
4.0 The Modbus RS-485 Output & Commands Implemented
The default communication parameters are 8 bits, no parity and 1 stop bit. Please note that all Modbus communication is via RS-485. The instruments can support a two wire multidrop network of 255 units. If the connection is to the master on RS-232 serial port, an RS-485 to RS-232 converter is required. If the connection to the master is USB, an RS-485 to USB converter is required.

4.1 Coils
These single-bit values are readable and changeable from the master. The data will be returned with the lowest addressed coil in the LSB of the data. Unused bits in the data will be set to 0. True is a 1 and False is 0.

4.1.1 Valid Command(s)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x01</td>
<td>Read Coil Status</td>
<td>No</td>
</tr>
<tr>
<td>0X05</td>
<td>Force Single Coil</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.1.2 Format
16-bit word format

<table>
<thead>
<tr>
<th>MSB</th>
<th>Bit 15</th>
<th>Bit 14</th>
<th>Bit 13</th>
<th>Bit 12</th>
<th>Bit 11</th>
<th>Bit 10</th>
<th>Bit 9</th>
<th>Bit 8</th>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
</table>

4.1.3 Valid Addresses
00001 – 00XXX

4.1.4 Definitions

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>00001</td>
<td>Offset added</td>
<td>False</td>
</tr>
<tr>
<td>00002</td>
<td>Flow alarm selected</td>
<td>False</td>
</tr>
<tr>
<td>00003</td>
<td>Access code enabled</td>
<td>False</td>
</tr>
<tr>
<td>00004</td>
<td>Ultrasonic cleaning enabled (if available)</td>
<td>True</td>
</tr>
<tr>
<td>00005</td>
<td>Desiccant set as error (True) or warnings (False)</td>
<td>True</td>
</tr>
</tbody>
</table>
4.2 Input Status
These single-bit values are readable from the master. The data will be returned with the lowest addressed input status in the LSB of the data. Unused bits in the data will be set to 0.

4.2.1 Valid Command(s)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x02</td>
<td>Read Input Status</td>
<td>No</td>
</tr>
</tbody>
</table>

4.2.2 Format
16-bit word format

| MSB      | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | LSB |
|----------|--------|--------|--------|--------|--------|--------|------|------|------|------|------|------|------|------|------|------|

4.2.3 Valid Addresses
10001 – 10XXX

4.2.4 Definitions

<table>
<thead>
<tr>
<th>Address</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001</td>
<td>Instrument error</td>
</tr>
<tr>
<td>10002</td>
<td>Alarm 1 active</td>
</tr>
<tr>
<td>10003</td>
<td>Alarm 2 active</td>
</tr>
<tr>
<td>10004</td>
<td>Calibration error</td>
</tr>
<tr>
<td>10005</td>
<td>Desiccant error</td>
</tr>
</tbody>
</table>
4.3 Holding Registers

These 16-bit values are readable and changeable from the master. The data is stored and transmitted with the MSB first and then the LSB.

4.3.1 Valid Command(s)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x03</td>
<td>Read Holding Registers</td>
<td>No</td>
</tr>
<tr>
<td>0x06</td>
<td>Preset Single Register</td>
<td>Yes</td>
</tr>
<tr>
<td>0X16</td>
<td>Preset Multiple Registers</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.3.2 Format

Float – stored in two consecutive addresses, with the first address containing the least significant word (lower part of mantissa) and the second address containing the most significant word (sign, exponent, and upper part of mantissa).

4.3.3 Valid Addresses

40001 – 40XXX

4.3.4 Definitions

<table>
<thead>
<tr>
<th>Address</th>
<th>Type</th>
<th>Register</th>
<th>Value</th>
<th>Default</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001, 40002</td>
<td>Float</td>
<td>Offset value</td>
<td></td>
<td>0.0</td>
<td>0.0 – 2.0</td>
</tr>
<tr>
<td>40003</td>
<td>Int</td>
<td>Decimal places</td>
<td>0</td>
<td>2</td>
<td>XXXXX.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>XXX.X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>XXX.XX</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>XX.XXX</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>X.XXXX</td>
<td></td>
</tr>
<tr>
<td>40004</td>
<td>Int</td>
<td>Response time</td>
<td>--</td>
<td>10</td>
<td>1-100 seconds</td>
</tr>
<tr>
<td>40005</td>
<td>Int</td>
<td>LCD backlight</td>
<td>--</td>
<td>8</td>
<td>1 – 10 (brightest)</td>
</tr>
<tr>
<td>40006</td>
<td>Int</td>
<td>Output option</td>
<td>0</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>4-20 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>RS-485</td>
<td>(if available)</td>
</tr>
<tr>
<td>40007, 40008</td>
<td>Float</td>
<td>4-20 mA minimum value</td>
<td>--</td>
<td>0.02</td>
<td>0.0 to max range of instrument</td>
</tr>
<tr>
<td>40009, 40010</td>
<td>Float</td>
<td>4-20 mA maximum value</td>
<td>--</td>
<td>10.0</td>
<td>0.0 to max range of instrument</td>
</tr>
<tr>
<td>40011</td>
<td>Int</td>
<td>RS-485 baud rate</td>
<td>0</td>
<td>3</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2,400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4,800</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>9,600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>19,200</td>
<td></td>
</tr>
<tr>
<td>40012</td>
<td>Int</td>
<td>Instrument address</td>
<td>--</td>
<td>1</td>
<td>1 – 255</td>
</tr>
<tr>
<td>40013</td>
<td>Int</td>
<td>Modbus serial mode</td>
<td>0</td>
<td>0</td>
<td>RTU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>ASCII</td>
<td></td>
</tr>
<tr>
<td>40014</td>
<td>Int</td>
<td>Alarm 1 type</td>
<td>0</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Low alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>High alarm</td>
<td></td>
</tr>
<tr>
<td>40015, 40016</td>
<td>Float</td>
<td>Alarm 1 set point</td>
<td>--</td>
<td>1.0</td>
<td>0.0 to max range of instrument</td>
</tr>
<tr>
<td>Address</td>
<td>Type</td>
<td>Register</td>
<td>Value</td>
<td>Default</td>
<td>Function</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>------------------</td>
<td>-------</td>
<td>---------</td>
<td>---------------------</td>
</tr>
<tr>
<td>40017</td>
<td>Int</td>
<td>Alarm 1 delay on</td>
<td>--</td>
<td>1</td>
<td>1 – 30 seconds</td>
</tr>
<tr>
<td>40018</td>
<td>Int</td>
<td>Alarm 1 delay off</td>
<td>--</td>
<td>1</td>
<td>1 – 30 seconds</td>
</tr>
<tr>
<td>40019</td>
<td>Int</td>
<td>Alarm 2 type</td>
<td>0</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Low alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>High alarm</td>
<td></td>
</tr>
<tr>
<td>40020</td>
<td>Int</td>
<td>Not used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40021, 40022</td>
<td>Float</td>
<td>Alarm 2 set point</td>
<td>--</td>
<td>1.0</td>
<td>0.0 to max range of instrument</td>
</tr>
<tr>
<td>40023</td>
<td>Int</td>
<td>Alarm 2 delay on</td>
<td>--</td>
<td>1</td>
<td>1 – 30 seconds</td>
</tr>
<tr>
<td>40024</td>
<td>Int</td>
<td>Alarm 2 delay off</td>
<td>--</td>
<td>1</td>
<td>1 – 30 seconds</td>
</tr>
<tr>
<td>40025</td>
<td>Int</td>
<td>Units (scaling)</td>
<td>1</td>
<td>1</td>
<td>NTU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>FNU</td>
</tr>
</tbody>
</table>
4.4 Input Registers
These 16-bit values are readable by the master. The data is stored with the MSB first and then the LSB.

4.4.1 Valid Command(s)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x04</td>
<td>Read Input Registers</td>
<td>No</td>
</tr>
</tbody>
</table>

4.4.2 Format
Float – stored in two consecutive addresses, with the first address containing the least significant word (lower part of mantissa) and the second address containing the most significant word (sign, exponent, and upper part of mantissa).

4.4.3 Valid Addresses
30001 – 30XXX

4.4.4 Definitions

<table>
<thead>
<tr>
<th>Address</th>
<th>Type</th>
<th>Register</th>
<th>Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001, 30002</td>
<td>Float</td>
<td>Sensor reading</td>
<td>--</td>
<td>The meter reading</td>
</tr>
<tr>
<td>30003, 30004</td>
<td>Float</td>
<td>Sensor reading raw</td>
<td>--</td>
<td>Sensor reading to six significant places</td>
</tr>
<tr>
<td>30005</td>
<td>Int</td>
<td>Version major</td>
<td>--</td>
<td>Software version major number</td>
</tr>
<tr>
<td>30006</td>
<td>Int</td>
<td>Version minor</td>
<td>--</td>
<td>Software version minor number</td>
</tr>
<tr>
<td>30007</td>
<td>Int</td>
<td>Version revision</td>
<td>--</td>
<td>Software version revision number</td>
</tr>
<tr>
<td>30008</td>
<td>Int</td>
<td>Model number</td>
<td>--</td>
<td>Product number</td>
</tr>
<tr>
<td>30009</td>
<td>Int</td>
<td>Model suffix number</td>
<td>--</td>
<td>0 if no options</td>
</tr>
<tr>
<td>30010</td>
<td>Int</td>
<td>Reading status</td>
<td>1</td>
<td>normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>over range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>under range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>reading problem</td>
</tr>
<tr>
<td>30011</td>
<td>Int</td>
<td>Instrument error summary (bit-mapped)</td>
<td>0x0000</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0001</td>
<td>Error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0002</td>
<td>Alarm 1 is active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0004</td>
<td>Alarm 2 is active</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0008</td>
<td>Calibration error</td>
</tr>
<tr>
<td>30012</td>
<td>Int</td>
<td>Errors (bit-mapped)</td>
<td>0x0000</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0001</td>
<td>Replace desiccant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0002</td>
<td>Break in the 4-20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0004</td>
<td>Calibration error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0010</td>
<td>Data over-range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0020</td>
<td>Flow switch alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0040</td>
<td>Lamp problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0080</td>
<td>Auto-cleaning problem</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0100</td>
<td>General error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x0200</td>
<td>General error</td>
</tr>
</tbody>
</table>
### 4.5 Exception Responses Implemented

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>--</td>
<td>No error</td>
</tr>
<tr>
<td>01</td>
<td>ILLEGAL FUNCTION</td>
<td>The function code is not allowed in the device.</td>
</tr>
<tr>
<td>02</td>
<td>ILLEGAL DATA ADDRESS</td>
<td>The data address is not allowed in the device</td>
</tr>
<tr>
<td>03</td>
<td>ILLEGAL DATA VALUE</td>
<td>A value contained in the query field is wrong for the device</td>
</tr>
</tbody>
</table>
5.0 Warranty

HF scientific, inc., as vendor, warrants to the original purchaser of this instrument that it will be free of defects in material and workmanship, in normal use and service, for a period of one year from date of delivery to the original purchaser. HF scientific, inc.’s, obligation under this warranty is limited to replacing, at its factory, the instrument or any part thereof. Parts, which by their nature are normally required to be replaced periodically, consistent with normal maintenance, specifically reagent, desiccant, sensors, electrodes and fuses are excluded. Also excluded are accessories and supply type items.

Original purchaser is responsible for return of the instruments, or parts thereof, to HF scientific, inc.’s factory. This includes all freight charges incurred in shipping to and from HF scientific, inc.’s factory.

HF scientific, inc. is not responsible for damage to the instrument, or parts thereof, resulting from misuse, environmental corrosion, negligence or accident, or defects resulting from repairs, alterations or installation made by any person or company not authorized by HF scientific, inc.

HF scientific, inc. assumes no liability for consequential damage of any kind, and the original purchaser, by placement of any order for the instrument, or parts thereof, shall be deemed liable for any and all damages incurred by the use or misuse of the instruments, or parts thereof, by the purchaser, its employees, or others, following receipt thereof.

Carefully inspect this product for shipping damage, if damaged, immediately notify the shipping company and arrange an on-site inspection. HF scientific, inc. cannot be responsible for damage in shipment and cannot assist with claims without an on-site inspection of the damage.

This warranty is given expressly and in lieu of all other warranties, expressed or implied. Purchaser agrees that there is no warranty on merchantability and that there are no other warranties, expressed or implied. No agent is authorized to assume for HF scientific, inc. any liability except as set forth above.

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