

## Interfacing With Vaisala's Line of Instrumentation

### 1.0 General

The CPP-3794 supports serial interfaces with the following Vaisala instruments;

Model HMP 230/233 Transmitter.

The HMP 233 provides temperature, relative humidity, and dew point readings. The HMP 230 provides these parameters and can also provide additional parameters. The CPP polls the instrumentation once a minute. The HMP233 requires two interrogations. The first Interrogation is to retrieve the present data reading, and the second interrogation is to retrieve the instrument status. The retrieved status information is decoded by the CPP and appended to the data values status word.

The operator can also communicate directly with the instrumentation. This feature is presented in the Operator/Instrument Interface section of this appendix. Internal error conditions can be further isolated by communicating with the unit in this mode.

### 2.0 Connections

The cable connecting the HMP233 to the CPP should have a male connector on one end and stripped wires on the other end. The Vaisala unit is easily opened by loosening the four hex bolts located on each corner of the unit. Run the stripped ends through the fitting provided in the bottom of the unit and connect the wire connected to pin 2 of the 9 pin male connector to X6-TX. This is data transmitted from the Vaisala to the CPP. Connect the wire connected to pin 3 of the 9 pin male connector to X6-RX. This is data transmitted from the CPP and received by the Vaisala. Connect the ground wire, pin 5 of the 9 pin male connector to X6-GND.

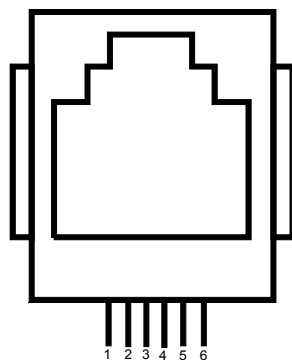
In an RS-232 operating mode, only one Vaisala unit can be connected to a comm port. More than one can be connected to a common comm port if the units are set up to operate in a RS-485, half-duplex mode and each given a separate ID in the channel configuration, discussed below .

The comm ports in both the CPP and the HMP233 can be setup for either RS-232 or RS-485 communications. Jumper connections in the HMP233 select the type of operation. Both should be set to the same mode.

The HMP232 defaults to 4800 Baud operation. This can be changed, but it is better to stick with factory defaults if possible. It is only important that the baud rate in both the CPP and the instrument be the same. The HMP233 RS-232 word length should always be set to the factory default of 7 bits, even parity, and one stop bit.

### RJ-11 Connectors

H2NS installs a 6 pin, RJ11, connector into the CPP rear panel. The majority of applications only use four of the 6 pins, which are pins 2,3,4,5. A null modem can be readily implemented by either twisting or not twisting the cable, which is readily detectable because the cable is color coded. **Standard, purchased telephone cables are twisted.** Presented below are the pin assignments set up by H2NS for the RJ11 connector.



- 1 RTS Output
- 2 TX+ Output of CPP
- 3 Gnd (TX- in RS-422/485)
- 4 Gnd (RX- in RS-422/485)
- 5 RX+ Input to CPP
- 6 CD Input

H2NS can also provide RS-232 connectors that are terminated in an RJ11 connector. One of the RS-232 connectors can be connected to an instrument and then connected with an RJ11 cable to the CPP. The wire colors for the 9 pin, DB male and female connectors are given below

Pin	9 Pin Male	9 Pin Female
1	Blu	Wht
2	Yel	Blk
3	Grn	Red
4	Red	Grn
5	Blk	Yel
6	Wht	Blu

### 3.0 Initialization

The CPP is initialized via the operator port, comm port #4. Entering an **I<cr>** results in the CPP presenting a main selection menu. Selecting channel initialization results in the CPP asking a series of questions as presented below. Operator responses are in **bold**, and **<cr>** means a carriage return. The numbers 1.), 2.) and so forth are used for discussion purposes only and are not printed in an actual system initialization.

- 1.) Channel # = **5<cr>**
- 2.) Name = NAME **TEMP<cr>**
- 3.) Units = UNITS **DEG F<cr>**
- 4.) Full Scale = 100.0 **150.0<cr>**
- 5.) Zero = 0.0 **-40.0<cr>**
  
- 6.) Instrument Manufacturer  
00 = Other  
01 = API  
02 = CLI  
03 = Thermo  
04 = Vaisala
- 7.) Setting = 01 **04<cr>**
- 8.) VAS MODEL #  
01 = RH-HMP  
02 = TMP-HMP  
03 = TD-HMP
- 9.) Setting = 01 **2<cr>**
  
- 10.) Comm Port (3-00 Thru 3-08) = 3-01 3- **02<cr>**
  
- 11.) Baud Rate  
1 = 300, 2 = 1200, 3 = 2400, 4 = 4800, 5 = 9600, 6 = 19.2K, 7 = 38.4K = 5 **4<cr>**
  
- 12.) Instrument ID = 00 **<cr>**
- 13.) IMD Installed = 00 **<cr>**
- 14.) # Points For Interim Avg = 01 **04<cr>**
- 15.) # Points For Final Avg = 01 **9<cr>**
  
- 16.) Channel # = **<cr>**

**Line one** simply asks which channel is to be initialized. A carriage return here exits back to the main menu. In other steps, a carriage return input leaves the setting unchanged and the CPP goes to the next question. In cases where the operator must provide an input, the CPP asks the same question again. In this example, the operator has selected channel number 5.

**Lines 2 through 5** request information that is not required for proper operation when interfaced to an instrument over the serial port. It is, however, good operating procedures to set these inputs to match those in the instrument. The correct full scale and zero values are required if data stored in the CPP is being output to some other device (for example,

Odessa Engineering's Envicom program) in a binary format. This is also true of channels set up as ADC input channels.

Channel names and the units can be up to six characters in length. The full scale and zero values can be four digits in length and the number of digits after the decimal point ( if a decimal point is used ) must be the same in the full scale and zero inputs. The inputs can also have a minus sign.

**Line 6** lists all of the manufacturer drivers that are resident in this software version. In the example, four manufacturers are presented. As the manufacturers are alphabetized, the numbers delineating the various manufacturers will change depending on how many drivers are installed.

**In Line 7** of our example, the operator selected Vaisala as the manufacturer. The CPP then prints a list of the model numbers that are supported for the Vaisala instrument line.

**In Line 8 & 9**, the operator inputs a 2 which selects the temperature parameter.

**In Line 10** the CPP asks to which comm port this analyzer is going to be connected. This is the connector on the CPP into which the cable from the instrument is plugged. The allowable inputs are 00-08, which is nine comm ports. In our example, the operator selected comm port 3-02. The comm port nomenclature should not be made overly complicated or confusing. Although comm Ports 3-00 through 3-08 are independent serial ports, internally the comm port 3 designation references interfacing to the instrumentation. Comm port 3-00 addresses comm port #3 physically located on the CPP printed circuit board and labeled comm #3 on the CPP back panel. Comm ports 3-01 through 3-08 address comm ports physically located on the expansion printed circuit board and are labeled comm 3-01 through comm 3-08 on the CPP back panel.

It should be noted that comm port #2 can be used to interface to some instrumentation. The Vaisala line of instrumentation is **not** included in that group, and should always be assigned to a comm port number 3 designation. Comm port #2 is usually used with instruments that broadcast, which is normally meteorological instrumentation.

**In line 11**, the CPP is asking what baud rate should be used to communicate with this instrument. This setting must be the same as that set up in the instrument.

**Line 12** asks if an instrument ID is required. Instrument ID's are not required with the Vaisala instruments, unless they are being operated in an RS-485 multidrop configuration. Input the appropriate two digit ID. In the example, the user input a 00 which indicates that no ID is required or being used.. This could have been any two digit code as well, e.g., 22.

**Line 13** is asking if an IMD (Intelligent Multidrop Device) is installed in this comm port cabling. The IMD, manufactured by H2NS, allows a number of different instruments to be connected to a single comm cable. The instruments can have different protocols and even different baud rates. This is very useful when a collection of instrumentation is located remotely from the CPP. The IMD allows only one cable to be run between the CPP and the instruments, with the IMD providing the instrument multiplexing locally at the instruments. The IMD supports addresses from 01 through 60. An address of 00 indicates that an IMD is not installed in this comm cabling.

**Lines 14 & 15** are questions regarding data validity qualifiers. The first (line 13) asks how many valid one minute samples the CPP must have to qualify the interim average as valid. Question 14 asks the same in regards to the final average. Reference section 3.5 of the CPP manual for a more detailed discussion of status

#### 4.0 Internal/External Status

Please reference section ?? of the CPP manual for a more detailed discussion of internal and external control and status features. These quite often tie into the overall system calibration schemes. On an individual basis, with each data poll the CPP also sends the ERRS command which returns the instruments status. If an error condition is detected the data is flagged with an I, indicating an instrument alarm.

#### 5.0 Operator/Instrument Interface

This section explains how an operator can communicate directly with the instruments over comm port #4. To communicate with the instruments with the central software reference the H2NS DataLink Users Manual.

Via comm port #4, the CPP has a menu that defines the appropriate commands associated with the instrument selected. Input **D43<cr>** and the CPP allows the user to communicate directly with the instrumentation. The CPP prints a table of the instruments that have been connected to it. An example is presented below.

Chn#	Manu	Mdl#	Type
01 =	THERMO	SO2-43C	- SO2
02 =	THERMO	NOX-42C	- NOX
03 =	THERMO	NO2-42C	- NOX
04 =	API	300C	- O3
04 =	VAISALA	RH-HMP	- RH
05 =	VAISALA	TMP-HMP	- TMP

Selection = **5<cr>**  
05 = VAISALA TMP-HMP -TMP   SELECTED

CMD> **?<cr>**

Output One Reading(%SEND)  
Output Error Messages(%ERRS)  
Serial Interface Echo On/Off(%ECHO)  
MORE> **%ERRS<cr>**

**Note** - this is an example, the actual list is much longer. The MORE> indicates that more commands are available. At this point commands can be sent to the instruments as well as from the CMD> prompt. A carriage return input presents more commands.

The CPP will provide a menu of the available commands for the selected instrument. To send a command to the Vaisala the user should enter the string in the parenthesis e.g., ( **%ERRS<cr>**).

The parenthesis ( ) are for clarity only. The percent sign (%) is required as it apprises the CPP that the string input by the operator is to be sent to the instrument. The CPP will insert the instrument ID if one has been set up in the system configuration.

The instrument response is presented. A "No Response" message is printed if the instrument does not respond. For this example, the HMP233 returns a > prompt if there are no error conditions. If error conditions do exist, the the HMP233 provides a listing of the outstanding error conditions.

To terminate the pass through mode input [**^<cr>**] at the CMD> prompt. If a character is not input for two minutes, the CPP times out and the pass through mode is exited automatically.

The CPP remains on line collecting data even in the pass through mode. Operator commands are interlaced with the CPP normal polling or interrogation commands.

## 6.0 Error Log

The CPP maintains a running error log that lets the user determine if communications are occurring properly. After connecting instrumentation clear the error log by inputting an **EC<cr>**. After some period of time (two to three minutes) check the error log (**E<cr>**) for errors. In proper operation, there should be no errors. The Error Log lists the following.

No Response	- No response from the instrument to an interrogation
Response Error field	- CPP received response but detected an error in the data field
Unknown Response	- CPP received a response but could not decode the response
Model # Error	- CPP received a response but not from the type of Instrument it is configured to interrogate on this channel. More information regarding the error log is presented in section ?? of the CPP manual.

The three most common causes of errors are, the cable does or does not need a null modem, or the cable is connected to the wrong comm port on the CPP, or the baud rate set in the CPP does not match that set in the instrument. With the Vaisala instrumentation, two other sources of potential errors are the CPP in an RS-232 mode and the HMP233 in an RS-485 mode, and an instrument ID set up in the HMP233 and none set up in the CPP.

## 7.0 Setting up The HMP 230

The CPP is designed to operate with most factory settings of the HMP 230. The only thing that the operator needs to change is to set the serial attributes to "Poll" mode. See the setup directions in the HMP 230 Users Manual for detailed instructions on these items.