Vantage Pro and Vantage Pro2 Serial Support 2.2 - 01-25-2005

Important Note:

Please note, this information is provided as is, and we do not provide application engineering or comprehensive technical support. Also, we do not guarantee our station will meet the needs of your specific application. If you have questions, they should be submitted through email and they will be answered when resources are available. Also, although we would not do so without good reason, we reserve the right to modify our weather station design without warning at any time.

I. Introduction

Thank you for choosing Davis Instruments for your weather application. This document explains the serial data protocol between the Vantage Pro or Vantage Pro2 consoles (or Envoys) and a PC. This requires a WeatherLink for Vantage Pro data logger and connector. It is not possible to communicate with the console without it.

Note, the serial communication between Vantage Pro and Vantage Pro2 are very similar except in a few places noted in this document. Important differences are described in section III.

Serial communication parameters are:
8 data bits, 1 start bit, 1 stop bit, and no parity.
Default baud rate is 19200. User selectable between 1200, 2400, 4800, 9600, 14400, and 19200 baud.

The console with a WeatherLink data logger has 3 types of memory:

- 132 KB archive memory, which stores up to 2560 archive records
- 4 KB EEPROM memory, which is used for calibration numbers, station latitude/longitude/elevation/timezone values, transmitter configuration, and Console graph points
- 4 KB of processor memory, which is used to store the current sensor data, today's high/low values, and other real-time values. **This memory is not directly available to the PC!** Commands such as LOOP, provide access to the most useful and important of these data values.

Commands are primarily ASCII strings. Letters should be in ALL CAPS. Please note that in some strings numeric values are in decimal, while in others are in hexadecimal.

Multi-byte binary values are generally stored and sent least significant byte first. Negative numbers use 2's complement notation. CRC values are sent and received most significant byte first.

II. Differences from WeatherLink for Monitor II

1. An expanded LOOP packet is the only way to receive the current weather data. There is no command to get a single parameter (such as outside temperature).
2. Similarly there is a HILOWS command to receive all of the current daily, monthly, and yearly high/low values with corresponding dates and times.
3. A special DMPAFT command allows you to specify the last record you have previously downloaded so that only the records after that one are downloaded. There is no need to

clear the archive memory to keep download times short. The downloaded records are pre-sorted, so you do not have to determine where the first record is.

4. You can not reset individual high or low values. Instead there are commands to clear all the high values or all the low values.
5. You must make sure that the console is awake before sending commands to it.

III. Differences from Vantage Pro to Vantage Pro 2

The Vantage Pro2 serial support is almost the same as the Vantage Pro, but there are some important differences listed below.

1. Serial commands for Vantage Pro2 must be terminated by a single line feed or a single carriage return character, but not both. Older code that terminates commands with both a line feed and a carriage return will not work or will work intermittently. *Beware that some communciation programs translate a line feed to both a line feed and a carriage return.*
2. The locations of the graph data has changed in Vantage Pro2.
3. The transmission packet interval of the Vantage Pro2 ISS is 1/16 of a second longer for every station ID number. For example, ID 1 transmits at an interval of every 2.5625 seconds rather than 2.5 seconds.
4. "GAIN" command is supported in Vantage Pro but not in Vantage Pro2.
5. "STRMON" command returns data packet in different format for Vantage Pro2.
6. Vantage Pro2 does not support different transmitting period. It only supports the normal ISS transmit period.
7. Vantage Pro2 does not support SensorLink station type.

IV. Waking up the Console

In order to conserve battery power, the console spends as much time "asleep" as possible, waking up only when required. Receiving a character on the serial port will cause the console to wake up, but it might not wake up fast enough to read the first character correctly. Because of this, you should always perform a wakeup procedure before sending commands to the console:

Console Wakeup procedure:

1. Send a Line Feed character, '\n' (decimal 10, hex 0x0A).
2. Listen for a returned response of Line Feed and Carriage Return characters, ('\n\r').
3. If there is no response within a reasonable interval (say 1.2 seconds), then try steps 1 and 2 again up to a total of 3 attempts.
4. If the console has not woken up after 3 attempts, then signal a connection error

After the console has woken up, it will remain awake for 2 minutes. Every time the Vantage receives another character, the 2 minute timer will be reset.

Please note that this is **NOT TRUE** for the LOOP command. In the LOOP mode, we expect that the LOOP packets will be sent over time, so the Vantage will go to sleep immediately between each packet.

V. Blackout Periods

The console will not process commands when it is in any of the Setup screens (except the first: "Receiving From…"). It will also not process commands when the console is in a number entry mode (e.g. setting an alarm value).

Similarly, when a Download is in progress, the console will not respond to key presses and will not receive data packets from remote sensors.

VI. Command Formats

The command strings given in the following sections must be followed by a Line Feed characters (‘\n’ or 0x0A or decimal 10) before the console will execute the command.

Command parameters are shown with “<parameter name-decimal>”, “<parameter name-hex>”, or “<parameter name-binary>”. For the –decimal and –hex parameters, substitute an ASCII string. For the –binary parameters, send the character value.

Please note that using the correct number of spaces is very important. For example the command `"LOOP <number of LOOP packets to send-decimal>"` should be realized with the string `"LOOP 4"`.

There are several different types of command responses. These responses come before any other returned data values.

1. ACK response: when this command is recognized, the console responds with an ASCII ACK (0x06) character. If the command parameters are invalid, a Not Acknowledge response of (0x21) is used. If a block of data is sent with a CRC code, the response CANCEL (0x18) means that the data did not pass the CRC check.
2. “OK” response: when this command is recognized, the console responds with the character string “\n\rOK\n\r”.
3. “DONE” response: Some commands take some time to complete their operation. For example the command “CLRGRA” will clear all the console graph points. The Vantage will respond with an “OK” when it receives the command, and “DONE” when it is finished. Do not attempt to send any commands to the console until the “DONE\n\r” response has been received.

VII. Command Summary

1. Testing commands

`"TEST"`

Sends the string “TEST\n” back.

`"WRD"<0x12><0x4d>`, ACK

Responds with a weather station type that is backward compatible with earlier Davis weather products.

`"RXCHECK"`

Sends the Console Diagnostics report.

`"STRMON"`

Echos all of the data packets sent by sensor transmitters.

"STRMOFF"

Stops sending sensor packets.

"VER"

Sends the firmware date code as a text string.

"RECEIVERS"

Sends the bit map of station IDs that the console can hear, This is not the byte for indicating what the console selects to listen from.

2. Current Data commands

"LOOP <number of LOOP packets to send-decimal>"

Sends the specified number of LOOP packets, 1 every 2 seconds. Console sleeps between packets.

"HILOWS"

Sends all the current high/low data in a single 436 byte data block, plus 2 CRC bytes.

"PUTRAIN <Yearly Rain in rain clicks-decimal>"

Set the Yearly rainfall amount on the Vantage Console.

"PUTET <Yearly ET in 100th inch-decimal"

Set the Yearly ET amount on the Vantage Console.

3. Download Commands

"DMP"

Downloads the entire archive memory. See the sections IX.5 and IX.3 for more details.

"DMPAFT"

Downloads the records after a specified date and time. See the sections IX.5 and IX.3 for more details.

4. EEPROM Commands

"GETEE"

Reads the full 4K EEPROM in one data block.

"EEWR <EE address-hex> <EE data-hex>"

Writes one byte of data to the specified address in the EEPROM.

"EERD <EE address-hex> <number of bytes to read-hex>"

Reads the specified number of bytes starting at the specified address. Results are given as hex strings, one byte per line.

"EEBWR <EE address-hex> <number of bytes to write-hex>"

Writes data to the EEPROM. The data and CRC are given in binary format following an ACK response.

"EEBRD <EE address-hex> <number of bytes to read-hex>"

Reads data from the EEPROM. The data and CRC are given in binary format following an ACK response.

5. Calibration Commands

"CALED"

Sends a block of data with the current temperature and humidity values for setting calibration values.

"CALFIX"

Updates the display when calibration numbers have been changed.

"BAR=<bar value to display (in Hg * 1000)-decimal> <elevation (ft)-decimal>"

Sets the elevation and barometer offset values when setting the barometer for a new location.

"BARDATA"

Displays of the current barometer calibration parameters in text.

6. Clearing Commands

`"CLRLOG"`

Clears the archive data.

`"CLRALM"`

Clears all the alarm thresholds.

`"CLRCAL"`

Clears all the Temperature and Humidity calibration offsets.

`"CLRGRA"`

Clears all of the graph points on the Vantage console.

`"CLRVAR <Data variable-decimal>"`

Clears a rain or ET data value.

`"CLRHIGHS <0, 1, or 2>"`

Clears all of the daily (0), monthly (1), or yearly (2) high values.

`"CLRLOWS <0, 1, or 2>"`

Clears all of the daily (0), monthly (1), or yearly (2) low values.

`"CLRBITS"`

Clears the active alarm bits. Alarms will be reactivated if the alarm condition is still present.

`"CLRDATA"`

Clears all current data values to dashes.

7. Configuration Commands

`"BAUD <New baud rate-decimal>"`

Sets the console to a new baud rate. Valid values are 1200, 2400, 4800, 9600, 14400, and 19200.

`"SETTIME"`

Sets the time and date on the Vantage console. Data in a binary format is sent after ACK.

`"GAIN <Gain State: '0' (off) or '1' (on)>"`

Sets the gain of the radio receiver. This command is currently not supported in Vantage Pro2.

`"GETTIME"`

Retrieves the current time and date on the Vantage console. Data is sent in a binary format.

`"SETPER <Archive interval in minutes-decimal>"`

Sets the Vantage archive interval. Valid values are (1, 5, 10, 15, 30, 60, and 120).

`"STOP"`

Disables the creation of archive records.

`"START"`

Enables the creation of archive records, if they have been halted with the STOP command.

`"NEWSETUP"`

Re-initialize the Vantage console after making certain configuration changes.

`"LAMPS <Lamp state: '0' (off) or '1' (on)>"`

Turns the lamps on the Vantage console on or off.

VIII. Command Details

All commands must be terminated by a single line feed character (‘\n’) or a single carriage return character (‘\r’). These are not shown in the command syntax, but are shown in the examples. Beware that some systems may translate a new line character into both a new line and a carriage return which will cause intermittent operation when using a Vantage Pro2 console.

In the following command examples, lines starting with “>” are set to the console, and lines starting with “<” are received from the console.

Character symbols

Symbol	Value	Name
`<CR>`	0x0D	Carriage return, “\r”
`<LF>`	0x0A	Line Feed, “\n”
`<ACK>`	0x06	Acknowledge
`<NAK>`	0x21	Not Acknowledge
`<CANCEL>`	0x18	Bad CRC code
`<0xdd>`	0xdd	Character code specified in hex.

1. Testing commands

"TEST"

It sends the string “TEST\n” back. Mostly useful when using HyperTerminal for testing a connection to the console.

Example:

```
>"TEST"<LF>
<"TEST"<LF><CR>
```

"WRD"<0x12><0x4d>

It is the same command sequence used by earlier Davis weather stations to read the Station Type value. The station will respond with an <ACK> and then a one byte identifier, which can be one of these values:

Value	Station	Value	Station
0	Wizard III	4	GroWeather
1	Wizard II	5	Energy Enviromontor
2	Monitor	6	Health Enviromonitor
3	Perception	16	Vantage Pro, Vantage Pro 2

Example:

```
>"WRD"<0x12><0x4D><LF>
<<ACK><16>
```

"RXCHECK"

It sends the Console Diagnostics report. The following values are sent on one line as a text string: total packets received, total packets missed, number of resynchronizations, the largest number of packets received in a row., and the number of CRC errors detected.

All values are recorded since midnight, or since the diagnostics are cleared manually.

Example:

```
>"RXCHECK"<LF>
```

```
<<LF><CR>”OK”<LF><CR>" 21629 15 0 3204 128"<LF><CR>
```

It shows we received 21,629 packets, missed 15 packets, there were no resynchronizations, the maximum number of packets received in a row without an error was 3204, and there were 128 CRC errors detected.

"STRMON"

It echos all of the data packets sent by sensor transmitters. The station will respond with an “OK” message and Davis Talk data packets when received by the console until the STRMOFF command is given.

For Vantage Pro, each packet contains six bytes and each byte is shown as a two-digit hex string per line, with a blank line between packets.

For VantagePro 2, each packet contains eight bytes instead of six and it returns the byte number along with the content for better clarity.

Example (VantagePro):

```
>"STRMON"<LF>
<<LF><CR>"OK"<LF><CR>
<"F7"<LF><CR>
<"07"<LF><CR>
<"E0"<LF><CR>
<"82"<LF><CR>
<"08"<LF><CR>
<"C4"<LF><CR> . . .
```

Example (VantagePro2):

```
>"STRMON"<LF>
<<LF><CR>"OK"<LF><CR>
<"0 = 81"<LF><CR>
<"1 = 0"<LF><CR>
<"2 = 0"<LF><CR>
<"3 = ff"<LF><CR>
<"4 = c5"<LF><CR>
<"5 = 0"<LF><CR>
<"6 = b7"<LF><CR>
<"7 = 42"<LF><CR><LF><CR> . . .
```

"STRMOFF"

It halts the flow of Davis Talk data packets started by the STRMON command. Note that this command is the only way to stop receiving Davis Talk data packets.

Example:

```
>"STRMOFF"<LF>
```

<<LF><CR>"OK"<LF><CR>

"VER"

It sends the firmware date code as a text string. Some functions on the console are implemented differently in different firmware versions. See the separate file "Vantage Console Firmware Release History.doc" or "Envoy Firmware Release History.doc" to determine which functions are available with each firmware version.

The date code is sent in the following format:
"Mmm dd yyyy"
Mmm is the three-letter English month abbreviation
dd is the day of the month
yyyy is the year.

Example:
>"VER"<LF>
<<LF><CR>"OK"<LF><CR>"Apr 24 2002"<LF><CR>

"RECEIVERS"

It sends a byte that contains the stations received in the "Receiving From …" setup screen. The station responds with "OK" followed by the bit map. For each bit position, a value of 1 indicates that that transmitter was received. Bit position 0 (least significant bit) corresponds with Tx ID 1 in the Davis Talk protocol.

Example:
>"RECEIVERS"<LF>
<<LF><CR>"OK"<LF><CR><0x01>

2. Current Data commands

"LOOP <number of LOOP packets to send-decimal>"

It sends the specified number of LOOP packets, 1 every 2 seconds. Console sleeps between each packet sent. The station responds with an <ACK> then with binary data packet every 2 seconds.

To halt the sending of LOOP packets before receiving all of the requested packets, send a <CR> by itself. Note that this is the same as the Wakeup sequence.

Each data packet is 99 bytes long and contains most of the current data values shown on the vantage console. In addition, the state of alarms, the battery status of the console and the transmitters, the weather forecast icon, and the sunrise and sunset times are included. Rev B and Vantage Pro2 firmware also have the 3 hour barometer trend value. A CRC value is calculated and transmitted so that the PC can validate the transmission accuracy of the data. The data format is described in detail in section IX.1

Example (request 4 LOOP packets):
>"LOOP 4"<LF>
<<ACK>
<<99 byte loop packet> . . .

"HILOWS"

It sends all the current high/low data in a single data block. The station responds with an <ACK> then a 436 byte data block that includes all the daily, monthly, and yearly high and low values on the Vantage console, and then a 2 byte CRC value. This is so that the PC can validate the transmission accuracy of the data. The data format is described in detail in section IX.2 .

Example:
>"HILOWS"<LF>
<<ACK>
<<436 byte hi/low packet><2-Byte CRC>

"PUTRAIN <Yearly Rain in rain clicks-decimal>"

It sets the Yearly rainfall amount on the console.

Example (set the Yearly rain to 24.83 inches):
>"PUTRAIN 2483"<LF>
<<ACK>

The console shows yearly rain of 24.83 inches (assuming that the rain collector is configured for a 0.01" collector).

"PUTET <Yearly ET in 100th inch-decimal"

It sets the Yearly ET amount on the console

Example (set the Yearly ET to 24.83 inchex):
>"PUTET 2483"<LF>
<<ACK>

The console display shows yearly ET 24.83 inches.

3. Download Commands

"DMP"

It downloads the entire archive memory. See the sections IX.5 and IX.3 for more details on downloading data.

"DMPAFT"

It downloads the records after a specified date and time. See the sections IX.5 and IX.3 for more details on downloading data.

4. EEPROM Commands

"GETEE"

It reads the full 4K EEPROM in one data block. There is also a 2 byte CRC.

Example:

```
>"GETEE"<LF>
<<ACK>
<<4096 byte block of EEPROM data>
<<2-Byte CRC>
```

"EERD <EE address-hex> <number of bytes to read-hex>"

It reads the specified number of bytes starting at the specified address. Results are given as hex strings, one byte per line. See section XII for more details on accessing EEPROM data.

Example (Read the station Longitude [-122.1]):

```
>"EERD 0D 02"<LF>
<"OK"<LF><CR>
<"3B"<LF><CR>
<"FB"<LF><CR>
```

-- 0xFB3B = -1221

"EEWR <EE address-hex> <EE data-hex>"

It writes one byte of data to the specified address in the EEPROM. See section XII for more details on accessing EEPROM data.

Example (It writes 0x87 to EEPROM address 0x58.):

```
>"EEWR 58 87"<LF>
<<LF><CR>"OK"<LF><CR>
```

"EEBRD <EE address-hex> < number of bytes to read-hex>"

Reads data in binary format from the EEPROM. The data and CRC is given in binary format following an ACK response. See section XII for more details on accessing EEPROM data.

Example (It reads three bytes from the EEPROM at location 0x32.)

```
>"EEBRD 32 03"<LF>
<<ACK>
<<0x05><0xFA><0x0E><2-Byte CRC>
```

"EEBWR <EE address-hex> <number of bytes to write-hex>"

It writes data to the EEPROM. The data and CRC is given in binary format following an ACK response. See section XII for more details on accessing EEPROM data.

Example (Set the time alarm to 7:15 am, the TIME_COMP field must also be set):

```
>"EEBWR 54 04"<LF>
<<ACK>
><0xCB><0x02><0x34><0xFD><2-Byte CRC>
```

5. Calibration Commands

"CALED"

It sends a block of data with the current temperature and humidity values for setting calibration values. These values are the current CALIBRATED sensor values. The data format is the same that is used in the **"CALFIX"** command.

Example:

```
>"CALED"<LF>
<<ACK>
<<43 bytes of data block with current data values><2-Byte CRC>
```

"CALFIX"

It updates the display when temperature and humidity calibration numbers have been changed. The values sent should be UN-CALIBRATED sensor values.

Example:

```
>"CALFIX"<LF>
<<ACK>
><43 bytes of data block with raw sensor values><2-Byte CRC>
<<ACK>
```

"BAR=<bar value to display (in Hg * 1000)-decimal> <elevation (ft)-decimal>"

It sets the elevation and barometer offset values when setting the barometer for a new location.

<bar value to display (in Hg * 1000)-decimal>

If you have a current barometer reading from a very reliable nearby reference, you can use this parameter to force the display to an exact setting. The console uses this value to fine-tune its own adjusted barometric pressure calculations. Do not use this setting alone to correct your barometer to sea-level.

Use a value of zero when you do not have an exact barometer value that you want the Vantage console to display. This also clears out any existing offset value previously set.

This value should either be zero or between 20.000" Hg and 32500" Hg.

< elevation (ft)-decimal>

This is the primary means to correct the barometer measurement. Negative values for elevation can be used.

This value should be between -2000 ft and 15000 ft.

Example (No local Barometer value, elevation 132 ft):
```
>"BAR=0 132"<LF>
<<ACK>
```

Example (Barometer value = 29.491 in Hg, elevation 0 ft):
```
>"BAR=29491 0"<LF>
<<ACK>
```

Example (Barometer value = 29.991 in Hg, elevation -75 ft):
```
>"BAR=29991 -75"<LF>
<<ACK>
```

"BARDATA"

It retrieves the current barometer calibration parameters in text. These tell you what the current elevation setting and barometer offset values are, plus some details on the barometer correction factor being used.

Example:
```
>"BARDATA"<LF>
<<LF><CR>"OK"<LF><CR>
<"BAR 29775"<LF><CR>
<"ELEVATION 27"<LF><CR>
<"DEW POINT 56"<LF><CR>
<"VIRTUAL TEMP 63"<LF><CR>
<"C 29"<LF><CR>
<"R 1001"<LF><CR>
<"BARCAL 0"<LF><CR>
<"GAIN 1533"<LF><CR>
<"OFFSET 18110"<LF><CR>
```

Name	Value in example	Explanation
BAR	29.775 in Hg	The most recent barometer measurement.
ELEVATION	27 ft	Elevation in feet
DEW POINT	56 °F	Dew point when the barometer measurement was taken
VIRTUAL TEMP	63 °F	Temperature used in correction formula (12 hour average)
C	29	Humidity correction factor used in the formula
R	1.001	Correction ratio. Multiply the raw sensor value by this to get the corrected measurement.
BARCAL	0.000 in Hg	Constant offset correction factor. See **"BAR="** command.
GAIN		These are the factory set values to calibrate the barometer sensor on this console.
OFFSET		

6. Clearing Commands

"CLRLOG"

It clears the archived data.

Example:
>"CLRLOG"<LF>
<<ACK>

"CLRALM"

It clears all the alarm thresholds. Use **"CLRBITS"** to clear any active alarms.

This command takes time to perform, so you must wait for the console to send "DONE" before sending any further commands

Example:
>"CLRALM"<LF>
<<LF><CR>"OK"<LF><CR>
-- After some time passes --
<"DONE"<LF><CR>

"CLRCAL"

Clears all the Temperature and Humidity calibration offsets to zero.

Note that the values displayed on the console do not use the new calibration values until a new data packet arrives for that sensor. You must use the procedure from section XIII.1 to force the current display to use the new cal numbers

Example:
>"CLRCAL"<LF>
<"OK"<LF><CR>
-- After some time passes --
<"DONE"<LF><CR>

"CLRGRA"

It clears all of the graph points on the Vantage console.

Example:
>"CLRGRA"<LF>
<"OK"<LF><CR>
-- After some time passes --
<"DONE"<LF><CR>

"CLRVAR <Data variable-decimal>"

It clears a rain or ET data value from the following table:

Rain Variable Name	Number	ET Variable Name	Number
Daily Rain	13	Day ET	26
Storm Rain	14	Month ET	25
Month Rain	16	Year ET	27
Year Rain	17		

Results are undefined if you use a number not on this list

Example (Clear Month Rain value):
```
>"CLRVAR 16"<LF>
<<ACK>
```

"CLRHIGHS <0, 1, or 2>"

It clears all of the daily (0), monthly (1), or yearly (2) high values

Example (Clear Monthly High values):
```
>"CLRHIGHS 1"<LF>
<<ACK>
```

"CLRLOWS <0, 1, or 2>"

It clears all of the daily (0), monthly (1), or yearly (2) low values

Example (Clear Yearly Low values):
```
>"CLRLOWS 2"<LF>
<<ACK>
```

"CLRBITS"

It clears the active alarm bits. They will reactivate if the alarm condition is still present.

Example:
```
>"CLRBITS"<LF>
<<ACK>
```

"CLRDATA"

It clears all current data values to dashes.

Example:
```
>"CLRDATA"<LF>
<<ACK>
```

7. Configuration Commands

"BAUD <New baud rate-decimal>"

It sets the console to a new baud rate. Valid values are 1200, 2400, 4800, 9600, 14400, and 19200. If the new baud rate is accepted, an "OK" will be returned at the new baud rate. If it is not, a "NO" will be returned and the baud rate will not be changed.

Example (to set 9600 baud):
```
>"BAUD 9600"<LF>
<<LF><CR>"OK"<LF><CR>
```

"SETTIME"

It sets the time and date on the console. Data in a binary format is sent after ACK.

The data is 6 bytes plus a 2 bytes of CRC. The each field is one byte. The fields, in order, are: seconds, minutes, hour (24 hour format), day, month, year – 1900. See section XI for more information on calculating CRC values.

Example (to set 3:27:00 pm, June 4, 2003):
```
>"SETTIME"<LF>
<<ACK>
><0><27><15><4><6><103><2 Bytes of CRC>
<<ACK>
```

"GETTIME"

It retrieves the current time and date on the console. Data is sent in a binary format. The format is the same as the SETTIME command.

Example (Vantage responds with 5:17:42 am, January 28, 1998):
```
>"GETTIME"<LF>
<<ACK>
><42><17><5><28><1><98><2 Bytes of CRC>
```

"GAIN <Gain State: '0' (off) or '1' (on)>"

This command only works with the VantagePro station and is not currently implemented on the VantagePro 2 station.

It sets the gain of the radio receiver, same as pressing the HI/LOW key on the console diagnostics screen. "GAIN 1" turns the gain on. "GAIN <Anything else>" turns the gain off:

Example (Turn on the Radio Gain):
```
>"GAIN 1"<LF>
<<LF><CR>"OK"<LF><CR>
```

Example (Turn off the Radio Gain):
```
>"GAIN 0"<LF>
<<LF><CR>"OK"<LF><CR>
```

"SETPER <Archive interval in minutes-decimal>"

It sets the console archive interval. This is the interval that archive data records are recorded into the archive memory. The smaller this value is, the faster the archive memory will fill up.

Valid values are (1, 5, 10, 15, 30, 60, and 120). Results are undefined if you try to select an archive period not on the list.

This command automatically clears the archive memory. Use the "**CLRLOG**" command to clear the archive memory. WeatherLink clears the archive memory so that all archived records in the archive memory use the same archive interval.

Example (set a 10 minute archive interval):

```
>"SETPER 10"<LF>
<<ACK>
```

"STOP"

It disables the creation of archive records.

"START"

It enables the creation of archive records, if they have been halted with the STOP command.

These two commands are not needed for normal operation.

"NEWSETUP"

It re-initializes the console after making certain configuration changes.

Make sure to issue this command after you set the Latitude or Longitude, and after you change any of the Setup bits in the EEPROM (address 43 = 0x2B) especially the Rain collector type,

Example (set a 10 minute archive interval):

```
>"NEWSETUP"<LF>
<<ACK>
```

"LAMPS <Lamp state: ’0’ (off) or ‘1’ (on)>"

It turns the lamps on the Vantage console on or off.

Example (turn the lamps off):

```
>"LAMPS 0"<LF>
<<LF><CR>"OK"<LF><CR>
```

IX. Data Formats

1. LOOP data format

There are two different loop data formats. Rev "A" firmware, dated before April 24, 2002 uses the old format. Rev "B" firmware, dated on or after April 24, 2002 uses the new format. The only difference between these formats is the inclusion of the current 3 hour barometer trend in place of the fixed value "P" in the fourth byte of the data packet.

Only values read directly from sensors are included in the LOOP packet. Desired values (i.e., Dew Point or Wind Chill) must be calculated on the PC. The LOOP packet also contains information on the current status of all Vantage Alarm conditions, battery status, weather forecasts, and sunrise and sunset times.

Contents of the LOOP packet.

Field	Offset	Size	Explanation
"L"	0	1	Spells out "LOO" for Rev B packets and "LOOP" for Rev A packets. Identifies a LOOP packet
"O"	1	1	
"O"	2	1	
"P" (Rev A) Bar Trend (Rev B)	3	1	Signed byte that indicates the current 3-hour barometer trend. It is one of these values: -60 = Falling Rapidly = 196 (as an unsigned byte) -20 = Falling Slowly = 236 (as an unsigned byte) 0 = Steady 20 = Rising Slowly 60 = Rising Rapidly 80 = ASCII "P" = Rev A firmware, no trend info is available Any other value means that the Vantage does not have the 3 hours of bar data needed to determine the bar trend.
Packet Type	4	1	Has the value zero. In the future we may define new LOOP packet formats and assign a different value to this field.
Next Record	5	2	Location in the archive memory where the next data packet will be written. This can be monitored to detect when a new record is created.
Barometer	7	2	Current Barometer. Units are (in Hg / 1000). The barometric value should be between 20 inches and 32.5 inches in Vantage Pro and between 20 inches and 32.5 inches in both Vantatge Pro Vantage Pro2. Values outside these ranges will not be logged.
Inside Temperature	9	2	The value is sent as 10^{th} of a degree in F. For example, 795 is returned for 79.5°F.
Inside Humidity	11	1	This is the relative humidity in %, such as 50 is returned for 50%.
Outside Temperature	12	2	The value is sent as 10^{th} of a degree in F. For example, 795 is returned for 79.5°F.
Wind Speed	14	1	It is a byte unsigned value in mph. If the wind speed is dashed because it lost synchronization with the radio or due to some other reason, the wind speed is forced to be 0.
10 Min Avg Wind Speed	15	1	It is a byte unsigned value in mph.
Wind Direction	16	2	It is a two byte unsigned value from 0 to 360 degrees. (0° is North, 90° is East, 180° is South and 270° is West.)
Extra Temperatures	18	7	This field supports seven extra temperature stations. Each byte is one extra temperature value in whole degrees F with an offset of 90 degrees. For example, a value of 0 = -90°F ; a value of 100 = 10°F ; and a value of 169 = 79°F.

Field	Offset	Size	Explanation
Soil Temperatures	25	4	This field supports four soil temperature sensors, in the same format as the Extra Temperature field above
Leaf Temperatures	29	4	This field supports four leaf temperature sensors, in the same format as the Extra Temperature field above
Outside Humidity	33	1	This is the relative humitiy in %.
Extra Humidties	34	7	Relative humidity in % for extra seven humidity stations.
Rain Rate	41	2	This value is sent as 100^{th} of a inch per hour. For example, 256 represent 2.56 inches/hour.
UV	43	1	The unit is in UV index.
Solar Radiation	44	2	The unit is in watt/meter^2.
Storm Rain	46	2	The storm is stored as 100^{th} of an inch.
Start Date of current Storm	48	2	Bit 15 to bit 12 is the month, bit 11 to bit 7 is the day and bit 6 to bit 0 is the year offseted by 2000.
Day Rain	50	2	This value is sent as the 100^{th} of an inch.
Month Rain	52	2	This value is sent as the 100^{th} of an inch.
Year Rain	54	2	This value is sent as the 100^{th} of an inch.
Day ET	56	2	This value is sent as the 100^{th} of an inch.
Month ET	58	2	This value is sent as the 100^{th} of an inch.
Year ET	60	2	This value is setnt as the 100^{th} of an inch.
Soil Moistures	62	4	The unit is in centibar. It supports four soil sensors.
Leaf Wetnesses	66	4	This is a scale number from 0 to 15 with 0 meaning very dry and 15 meaning very wet. It supports four leaf sensors.
Inside Alarms	70	1	Currently active inside alarms. See the table below
Rain Alarms	71	1	Currently active rain alarms. See the table below
Outside Alarms	72	2	Currently active outside alarms. See the table below
Extra Temp/Hum Alarms	74	8	Currently active extra temp/hum alarms. See the table below
Soil & Leaf Alarms	82	4	Currently active soil/leaf alarms. See the table below
Transmitter Battery Status	86	1	
Console Battery Voltage	87	2	Voltage = ((Data * 300)/512)/100.0
Forecast Icons	89	1	
Forecast Rule number	90	1	
Time of Sunrise	91	2	The time is stored as hour * 100 + min.
Time of Sunset	93	2	The time is stored as hour * 100 + min.
"\n" <LF> = 0x0A	95	1	
"\r" <CR> = 0x0D	96	1	
CRC	97	2	
Total Length	99		

Forecast Icons in LOOP packet

Field	Byte	Bit #	
Forecast Icons	89		Bit maps for forecast icons on the console screen.
Rain		0	
Cloud		1	
Partly Cloudy		2	
Sun		3	
Snow		4	

Forecast Icon Values

Value Decimal	Value Hex	Segments Shown	Forecast
8	0x08	Sun	Mostly Clear
6	0x06	Partial Sun + Cloud	Partially Cloudy
2	0x02	Cloud	Mostly Cloudy
3	0x03	Cloud + Rain	Mostly Cloudy, Rain within 12 hours
18	0x12	Cloud + Snow	Mostly Cloudy, Snow within 12 hours
19	0x13	Cloud + Rain + Snow	Mostly Cloudy, Rain or Snow within 12 hours
7	0x07	Partial Sun + Cloud + Rain	Partially Cloudy, Rain within 12 hours
22	0x16	Partial Sun + Cloud + Snow	Partially Cloudy, Snow within 12 hours
23	0x17	Partial Sun + Cloud + Rain + Snow	Partially Cloudy, Rain or Snow within 12 hours

Currently active alarms in the LOOP packet

This table shows which alarms correspond to each bit in the LOOP alarm fields. Not all bits in each field are used. The Outside Alarms field has been split into 2 1-byte sections.

Field	Byte	Bit #	
Inside Alarms	70		Currently active inside alarms.
Falling bar trend alarm		0	
Rising bar trend alarm		1	
Low inside temp alarm		2	
High inside temp alarm		3	
Low inside hum alarm		4	
High inside hum alarm		5	
Time alarm		6	
Rain Alarms	71		Currently active rain alarms.
High rain rate alarm		0	
15 min rain alarm		1	Flash Flood alarm
24 hour rain alarm		2	
Storm total rain alarm		3	
Daily ET alarm		4	
Outside Alarms	72		Currently active outside alarms.
Low outside temp alarm		0	
High outside temp alarm		1	
Wind speed alarm		2	
10 min avg speed alarm		3	
Low dewpoint alarm		4	
High dewpoint alarm		5	
High heat alarm		6	
Low wind chill alarm		7	
Outside Alarms, byte 2	73		
High THSW alarm		0	
High solar rad alarm		1	
High UV alarm		2	
UV Dose alarm		3	

Field	Byte	Bit #	
Outside Humidity Alarms	74	1	Currently active outside humidity alarms.
Low Humidity alarm		2	
High Humidity alarm		3	
Extra Temp/Hum Alarms	75 - 81	7	Each byte contains four alarm bits (0 – 3) for a single extra Temp/Hum station. Bits (4 – 7) are not used and reserved for future use. Use the temperature and humidity sensor numbers, as described in Section XIII.4 to locate which byte contains the appropriate alarm bits. In particular, the humidity and temperature alarms for a single station will be found in different bytes.
Low temp X alarm		0	
High temp X alarm		1	
Low hum X alarm		2	
High hum X alarm		3	
Soil & Leaf Alarms	82 - 85	4	Currently active soil/leaf alarms.
Low leaf wetness X alarm		0	
High leaf wetness X alarm		1	
Low soil moisture X alarm		2	
High soil moisture X alarm		3	
Low leaf temp X alarm		4	
High leaf temp X alarm		5	
Low soil temp X alarm		6	
High soil temp X alarm		7	

2. HILOW data format

The "**`HILOWS`**" command sends a 436 byte data packet and a 2 byte CRC value. The data packet is broken up into sections of related data values.

Contents of the HILOW packet.

Field	Offset	Size	Explanation
Barometer Section	0	16	
Daily Low Barometer	0	2	
Daily High Barometer	2	2	
Month Low Bar	4	2	
Month High Bar	6	2	
Year Low Barometer	8	2	
Year High Barometer	10	2	
Time of Day Low Bar	12	2	
Time of Day High Bar	14	2	
Wind Speed Section	16	5	
Daily Hi Wind Speed	16	1	
Time of Hi Speed	17	2	
Month Hi Wind Speed	19	1	
Year Hi Wind Speed	20	1	
Inside Temp Section	21	16	

Field	Offset	Size	Explanation
Day Hi Inside Temp	21	2	
Day Low Inside Temp	23	2	
Time Day Hi In Temp	25	2	
Time Day Low In Temp	27	2	
Month Low In Temp	29	2	
Month Hi In Temp	31	2	
Year Low In Temp	33	2	
Year Hi In Temp	35	2	
Inside Humidity Section	37	10	
Day Hi In Hum	37	1	
Day Low In Hum	38	1	
Time Day Hi In Hum	39	2	
Time Day Low In Hum	41	2	
Month Hi In Hum	43	1	
Month Low In Hum	44	1	
Year Hi In Hum	45	1	
Year Low In Hum	46	1	
Outside Temp Section	47	16	
Day Low Out Temp	47	2	
Day Hi Out Temp	49	2	
Time Day Low Out Temp	51	2	
Time Day Hi Out Temp	53	2	
Month Hi Out Temp	55	2	
Month Low Out Temp	57	2	
Year Hi Out Temp	59	2	
Year Low Out Temp	61	2	
Dew Point Section	63	16	
Day Low Dew Point	63	2	
Day Hi Dew Point	65	2	
Time Day Low Dew Point	67	2	
Time Day Hi Dew Point	69	2	
Month Hi Dew Point	71	2	
Month Low Dew Point	73	2	
Year Hi Dew Point	75	2	
Year Low Dew Point	77	2	
Wind Chill Section	79	8	
Day Low Wind Chill	79	2	
Time Day Low Chill	81	2	
Month Low Wind Chill	83	2	
Year Low Wind Chill	85	2	
Heat Index Section	87	8	
Day High Heat	87	2	
Time of Day High Heat	89	2	
Month High Heat	91	2	
Year High Heat	93	2	

Field	Offset	Size	Explanation
THSW Index Section	95	8	
Day High THSW	95	2	
Time of Day High THSW	97	2	
Month High THSW	99	2	
Year High THSW	101	2	
Solar Radiation Section	103	8	
Day High Solar Rad	103	2	
Time of Day High Solar	105	2	
Month High Solar Rad	107	2	
Year High Solar Rad	109	2	
UV Section	111	5	
Day High UV	111	1	
Time of Day High UV	112	2	
Month High UV	114	1	
Year High UV	115	1	
Rain Rate Section	116	10	
Day High Rain Rate	116	2	
Time of Day High Rain Rate	118	2	
Hour High Rain Rate	120	2	
Month High Rain Rate	122	2	
Year High Rain Rate	124	2	
Extra/Leaf/Soil Temps	126	150	Each field has 15 entries. Indexes 0 – 6 = Extra Temperatures 2 – 8 Indexes 7 – 10 = Leaf Temperatures 1 – 4 Indexes 11 – 14 = Soil Temperatures 1 – 4
Day Low Temperature	126	15	(15 * 1)
Day Hi Temperature	141	15	(15 * 1)
Time Day Low Temperature	156	30	(15 * 2)
Time Day Hi Temperature	186	30	(15 * 2)
Month Hi Temperature	216	15	(15 * 1)
Month Low Temperature	221	15	(15 * 1)
Year Hi Temperature	236	15	(15 * 1)
Year Low Temperature	251	15	(15 * 1)
Outside/Extra Hums	276	80	Each field has 8 entries Index 0 = Outside Humidity Index 1 – 7 = Extra Humidities 2 – 8
Day Low Humidity	259	8	(8 * 1)
Day Hi Humidity	267	8	(8 * 1)
Time Day Low Humidity		16	(8 * 2)
Time Day Hi Humidity		16	(8 * 2)
Month Hi Humidity		8	(8 * 1)
Month Low Humidity		8	(8 * 1)
Year Hi Humidity		8	(8 * 1)
Year Low Humidity		8	(8 * 1)
Soil Moisture Section	356	40	Each field has 4 entries. Indexes 0 – 3 = Soil Moistures 1 – 4

Field	Offset	Size	Explanation
Day Hi Soil Moisture		4	(4 * 1)
Time Day Hi Soil Moisture		8	(4 * 2)
Day Low Soil Moisture		4	(4 * 1)
Time Day Low Soil Moisture		8	(4 * 2)
Month Low Soil Moisture		4	(4 * 1)
Month Hi Soil Moisture		4	(4 * 1)
Year Low Soil Moisture		4	(4 * 1)
Year Hi Soil Moisture		4	(4 * 1)
Leaf Wetness Section	496	40	Each field has 4 entries. Indexes 0 – 3 = Leaf Wetness 1 – 4
Day Hi Leaf Wetness		4	(4 * 1)
Time Day Hi Leaf Wetness		8	(4 * 2)
Day Low Leaf Wetness		4	(4 * 1)
Time Day Low Leaf Wetness		8	(4 * 2)
Month Low Leaf Wetness		4	(4 * 1)
Month Hi Leaf Wetness		4	(4 * 1)
Year Low Leaf Wetness		4	(4 * 1)
Year Hi Leaf Wetness		4	(4 * 1)
CRC	436	2	

3. DMP and DMPAFT data format

There are two different archived data formats. Rev "A" firmware, dated before April 24, 2002 uses the old format. Rev "B" firmware dated on or after April 24, 2002 uses the new format. The fields up to ET are identical for both formats. The only differences are in the Soil, Leaf, Extra Temperature, Extra Humidity, High Solar, High UV, and forecast fields (reedOpen and reedClosed fields are removed).

You can use the VER command and parse the date returned to determine the archive data format, or you can examine byte 42 in the archive record. In a Rev B record, it will have the value 0x00. In a Rev A record, this byte is used for "Leaf Wetness 4" which is never assigned a real data value, so it will always contain 0xFF. Future record formats may assign different values for this field.

Each archive record is 52 bytes. Records are sent to the PC in 264 byte pages. Each page contains 5 archive records and 4 unused bytes. See section 5 for more details on performing download operations.

The value in the “Dash Value” column is what you will see if that field is not updated at all during the archive interval. A dash value can appear for several reasons, and different weather variables are treated differently. For example, if you see 32767 for Outside Temperature that could be because of a communication problem, the sensor was unplugged, or the sensor has failed. Note, a dashed value is not always the sign of a problem. For example, the rainfall reading could be 0 if no rain fell in that interval. To determine if a problem exists, often times you will need to look at more than one weather variable.

Contents of the Rev "A" archive record.

Field	Offset	Size	Dash Value	Explanation
Date Stamp	0	2	Not applicable	These 16 bits hold the date that the archive was written in the following format: Year (7 bits) | Month (4 bits) | Day (5 bits) or: day + month*32 + (year-2000)*512)
Time Stamp	2	2	Not applicable	Time on the Vantage that the archive record was written: (Hour * 100) + minute.
Outside Temperature	4	2	32767	Either the Average Outside Temperature, or the Final Outside Temperature over the archive period. Units are (°F / 10)
High Out Temperature	6	2	-32768	Highest Outside Temp over the archive period.
Low Out Temperature	8	2	32767	Lowest Outside Temp over the archive period.
Rainfall	10	2	0	Number of rain clicks over the archive period
High Rain Rate	12	2	0	Highest rain rate over the archive period, or the rate shown on the console at the end of the period if there was no rain. Units are (rain clicks / hour)
Barometer	14	2	0	Barometer reading at the end of the archive period. Units are (in Hg / 1000)
Solar Radiation	16	2	32767	Average Solar Rad over the archive period. Units are (Watts / m^2)
Number of Wind Samples	18	2	0	Number of packets containing wind speed data received from the ISS or wireless anemometer.
Inside Temperature	20	2	32767	Either the Average Inside Temperature, or the Final Inside Temperature over the archive period. Units are (°F / 10)
Inside Humidity	22	1	255	Inside Humidity at the end of the archive period
Outside Humidity	23	1	255	Outside Humidity at the end of the archive period
Average Wind Speed	24	1	255	Average Wind Speed over the archive interval. Units are (MPH)
High Wind Speed	25	1	0	Highest Wind Speed over the archive interval. Units are (MPH)
Direction of Hi Wind Speed	26	1	32767	Direction code of the High Wind speed. 0 = N, 1 = NNE, 2 = NE, … 14 = NW, 15 = NNW, 255 = Dashed
Prevailing Wind Direction	27	1	32767	Prevailing or Dominant Wind Direction code. 0 = N, 1 = NNE, 2 = NE, … 14 = NW, 15 = NNW, 255 = Dashed Firmware before July 8, 2001 does not report direction codes of 255. Software should substitute the dash value whenever the High Wind Speed is zero.
Average UV	28	1	255	Average UV Index. Units are (UV Index / 10)
ET	29	1	0	ET accumulated over the last hour. Only records "on the hour" will have a non-zero value. Units are (in / 1000)
Invalid data	30	1		This byte is contains invalid data in Rev A data records
Soil Moistures	31	4	255	4 Soil Moisture values. Units are (cb)
Soil Temperatures	35	4	255	4 Soil Temperatures. Units are (°F + 90)

Field	Offset	Size	Dash Value	Explanation
Leaf Wetnesses	39	4	255	4 Leaf Wetness values. Range is 0 – 15
Extra Temperatures	43	2	32767	2 Extra Temperature values. Units are (°F + 90)
Extra Humidities	45	2	255	2 Extra Humidity values
Reed Closed	47	2	0	Count of the number of time the anemometer reed switch was closed
Reed Opened	49	2	0	Count of the number of time the anemometer reed switch was opened
Unused Byte	51	1		

Contents of the Rev "B" archive record.

Field	Offset	Size	Dash Value	Explanation
Date Stamp	0	2	Not applicable	These 16 bits hold the date that the archive was written in the following format: Year (7 bits) | Month (4 bits) | Day (5 bits) or: day + month*32 + (year-2000)*512)
Time Stamp	2	2	Not applicable	Time on the Vantage that the archive record was written: (Hour * 100) + minute.
Outside Temperature	4	2	32767	Either the Average Outside Temperature, or the Final Outside Temperature over the archive period. Units are (°F / 10)
High Out Temperature	6	2	-32768	Highest Outside Temp over the archive period.
Low Out Temperature	8	2	32767	Lowest Outside Temp over the archive period.
Rainfall	10	2	0	Number of rain clicks over the archive period
High Rain Rate	12	2	0	Highest rain rate over the archive period, or the rate shown on the console at the end of the period if there was no rain. Units are (rain clicks / hour)
Barometer	14	2	0	Barometer reading at the end of the archive period. Units are (in Hg / 1000).
Solar Radiation	16	2	32767	Average Solar Rad over the archive period. Units are (Watts / m^2)
Number of Wind Samples	18	2	0	Number of packets containing wind speed data received from the ISS or wireless anemometer.
Inside Temperature	20	2	32767	Either the Average Inside Temperature, or the Final Inside Temperature over the archive period. Units are (°F / 10)
Inside Humidity	22	1	255	Inside Humidity at the end of the archive period
Outside Humidity	23	1	255	Outside Humidity at the end of the archive period
Average Wind Speed	24	1	255	Average Wind Speed over the archive interval. Units are (MPH)
High Wind Speed	25	1	0	Highest Wind Speed over the archive interval. Units are (MPH)
Direction of Hi Wind Speed	26	1	32767	Direction code of the High Wind speed. 0 = N, 1 = NNE, 2 = NE, … 14 = NW, 15 = NNW, 255 = Dashed
Prevailing Wind Direction	27	1	32767	Prevailing or Dominant Wind Direction code. 0 = N, 1 = NNE, 2 = NE, … 14 = NW, 15 = NNW, 255 = Dashed Firmware before July 8, 2001 does not report direction codes of 255
Average UV Index	28	1	255	Average UV Index. Units are (UV Index / 10)

Field	Offset	Size	Dash Value	Explanation
ET	29	1	0	ET accumulated over the last hour. Only records "on the hour" will have a non-zero value. Units are (in / 1000)
High Solar Radiation	30	2	0	Highest Solar Rad value over the archive period. Units are (Watts / m^2)
High UV Index	32	1	0	Highest UV Index value over the archive period. Units are (Watts / m^2)
Forecast Rule	33	1	193	Weather forecast rule at the end of the archive period.
Leaf Temperature	34	2	255	2 Leaf Temperature values. Units are (°F + 90)
Leaf Wetnesses	36	2	255	2 Leaf Wetness values. Range is 0 – 15
Soil Temperatures	38	4	255	4 Soil Temperatures. Units are (°F + 90)
Download Record Type	42	1		0xFF = Rev A, 0x00 = Rev B archive record
Extra Humidities	43	2	255	2 Extra Humidity values
Extra Temperatures	45	3	32767	3 Extra Temperature values. Units are (°F + 90)
Soil Moistures	48	4	255	4 Soil Moisture values. Units are (cb)

4. Alarm thresholds data format

The alarm thresholds data does not have a dedicated command to set or retrieve the values. Instead see section XII for more information on reading and writing EEPROM data.

Field	Offset	Size	Explanation
ALARM_START	82=0x52	94	Starting location for the Alarm threshold data. See section 0 for more details on setting alarm thresholds
BAR_RISE_ALARM	0	1	3 hour rising bar trend alarm. Units are in Hg * 1000
BAR_FALL_ALARM	1	1	3 hour falling bar trend alarm. Units are in Hg * 1000
TIME_ALARM	2	2	Time alarm. Hours * 100 + minutes
TIME_COMP_ALARM	4	2	1's compliment of TIME_ALARM to validate alarm entries
LOW_TEMP_IN_ALARM	6	1	Threshold is (data value – 90) °F
HIGH_TEMP_IN_ALARM	7	1	Threshold is (data value – 90) °F
LOW_TEMP_OUT_ALARM	8	1	Threshold is (data value – 90) °F
HIGH_TEMP_OUT_ALARM	9	1	Threshold is (data value – 90) °F
LOW_TEMP_ALARM	10	15	7 extra temps, 4 soil temps, 4 leaf temps
HIGH_TEMP_ALARM	25	15	7 extra temps, 4 soil temps, 4 leaf temps
LOW_HUM_IN_ALARM	40	1	Inside humidity is one byte unsigned number in decimal, such as 100 represent 100%.
HIGH_HUM_IN_ALARM	41	1	Inside humidity is one byte unsigned number in decimal, such as 100 represent 100%.
LOW_HUM_ALARM	42	8	First entry is the current Outside Humidity setting
HIGH_HUM_ALARM	50	8	First entry is the current Outside Humidity setting
LOW_DEW_ALARM	58	1	Threshold is (data value – 120) °F
HIGH_DEW_ALARM	59	1	Threshold is (data value – 120) °F
CHILL_ALARM	60	1	Threshold is (data value – 120) °F
HEAT_ALARM	61	1	Threshold is (data value – 90) °F
THSW_ALARM	62	1	Threshold is (data value – 90) °F
SPEED_ALARM	63	1	Current Wind Speed alarm. Units are MPH
SPEED_10MIN_ALARM	64	1	10 minute average Wind Speed alarm. Units are MPH
UV_ALARM	65	1	Current UV index alarm. Units are (UV Index * 10)
UV_DOSE_ALARM	66	1	Daily UV Dose alarm. Units are MEDS * 10

Field	Offset	Size	Explanation
LOW_SOIL_ALARM	67	4	Low soil moisture alarm with unit in centibar.
HIGH_SOIL_ALARM	71	4	High soil moisture alarm with unit in centibar.
LOW_LEAF_ALARM	75	4	Low leaf wetness alarm with index 0 to 15. 0 is very dry and 15 is very wet.
HIGH_LEAF_ALARM	79	4	High leaf wetness alarm with index 0 to 15. 0 is very dry and 15 is very wet.
SOLAR_ALARM	83	2	Solar energy alarm with unit in watt/meter^2.
RAIN_RATE_ALARM	85	2	Rain rate alarm is set with 0.01 inch per hour.
RAIN_15MIN_ALARM	87	2	15-minute rain alarm is set with 0.01inch resolution.
RAIN_24HR_ALARM	89	2	24-hour rain alarm is set with 0.01 inch resolution.
RAIN_STORM_ALARM	91	2	Rain storm alarm is set with 0.01 inch resolution.
ET_DAY_ALARM	93	1	Units are (0.001 inches)

5. CALED and CALFIX data format

The "`CALED`" and "`CALFIX`" commands send and receive a block of temperature and humidity data used to update the current display whenever the calibration offsets are changed. The format of this data block is:

Field	Offset	Size	Explanation
Inside Temperature	0	2	
Outside Temperature	2	2	
Extra Temperature	4	14	(7 * 2)
Soil Temperatures	18	8	(4 * 2)
Leaf Temperatures	26	8	(4 * 2)
Inside Humidity	34	1	
Outside Humidity	35	1	
Extra Humidities	36	7	

X. Download Protocol

There are two commands you can use to get archived data records from the console. "`DMP`" download all data records, while "`DMPAFT`" only downloads the records archived "after" a selected time and date. The other advantage of the "`DMPAFT`" command is that the data blocks are sorted so that the oldest data downloaded is in the first page sent. The "`DMP`" command on the other hand always starts with "page zero" which may not be the oldest data if the archive memory has filled up.

This section will concentrate on the operation of the "`DMPAFT`" command. The "`DMP`" command is identical in operation except that you do not send or receive any additional data between sending the command and receiving archive records.

In order to use the "`DMPAFT`" command you need to determine the time and date-stamp of the last record that you already have, AND this record should match one of the records already archived in the WeatherLink data logger. (if the data is not found, then the entire contents of the data archive will be downloaded.)

To calculate the time and date-stamps, use these formulas: (hour is in 24 hour format, both of these values are 2-byte values)

vantageDateStamp = day + month*32 + (year-1900)*512);
vantageTimeStamp = (100*hour + minute);

Use zero for both of these values (and the CRC) to force a full download.

Send the command "**DMPAFT**" to the Vantage Pro
When you get an <ACK> back, send the 2 byte vantageDateStamp, the 2 byte vantageTimeStamp, and a 2 byte CRC value calculated from them. See section XI for more information on calculating CRC values. Send the MSB of the CRC first, then the LSB.

If the CRC is correct, the will send back another <ACK> the number of "pages" that will be send (2 bytes), the location within the first page of the first record, and 2 Byte CRC.
If the CRC is not correct, the vantage will respond with 0x18. If you do not sent 6 bytes, it will respond with 0x21.

Note that while the console tells you which record in the first page it sends contains the first new data record, it does not tell you which record in the last page it sends is the last new data record. Records after the most recent will either contain all 0xFF bytes (if the archive has never been completely filled), or will contain old data records.

At this point you can either send an <ESC> = 0x1B to cancel the download, or an <ACK> to start the download.

After receiving each page of data, calculate the CRC value. If the CRC was incorrect, send 0x21 (really "!" but used as <NAK>) to have the Vantage send the page again.
Otherwise, send <ACK> to receive the next page (if there is one), or <ESC> to cancel the download early.

Each "Page" is 267 bytes and contains 5 records of data. There are a total of 512 pages of archive memory for a total of 2560 records. If a "**DMPAFT**" command results in downloading the entire archive, 513 pages will be downloaded. The first and last pages in this case are identical.

The format of each page is:
1 Byte sequence number (starts at 0 and wraps from 255 back to 0)
52 Byte Data record
52 Byte Data record
52 Byte Data record
52 Byte Data record
52 Byte Data record
4 Byte unused bytes
2 Byte CRC

See section IX.3 for details on the format of the archive data record.

Example (download records after June 6, 2003 9:30am [270 pages, the first valid record is 2]):
>"DMPAFT"<LF>
<<ACK>
-- Send the Date and Time stamp --
><0xC6><0xCE><0xA2><0x03>
-- Send the calculated CRC 0xE2B4 –
><0xE2><0xB4>
<<ACK>
-- Vantage responds with the number of pages it will send --
<<0x0E><0x01><0x02><0x00><2 Bytes of CRC Data>
-- Begin the download – Use <ESC> instead to cancel it
><ACK>
-- Block sequence number
<<0x00>
<<52 byte data record 0>
<<52 byte data record 1>
-- The next record is the first record with new data
<<52 byte data record 2>
<<52 byte data record 3>
<<52 byte data record 4>
<<4 unused bytes>
<<2 byte CRC>
-- At this point verify the CRC and send either <ACK>, <0x21>, or <ESC>

XI. CRC calculation

The console uses the same CRC calculation that was used by earlier Davis Instruments weather stations.

The CRC checking used by the WeatherLink is based on the CRC-CCITT standard. The heart of the method involves a CRC-accumulator that uses the following formula on each successive data byte. After all the data bytes have been "accumulated", there will be a two byte CRC checksum that will get processed in the same manner as the data bytes. If there has been no transmission error, then the final CRC-accumulator value will be 0 (assuming it was set to zero before accumulating data).

In the following code, "crc" is the crc accumulator (16 bits or 2 bytes), "data" is the data or CRC checksum byte to be accumulated, and "crc_table" is the table of CRC values found in the CCITT.h header file. The operator "^" is an exclusive-or (XOR), ">> 8" shifts the data right by one byte (divides by 256), and "<< 8" shifts the data left by one byte (multiplies by 256).

```
crc = crc_table [(crc >> 8) ^ data] ^ (crc << 8);
```

When sending a CRC to the console, always send the most significant byte first. This is the opposite of how regular data values are sent where the least significant byte is sent first.

Example, calculating the CRC in the DMPAFT example above:

Old CRC	Data byte	Table index	Table Value	New CRC
0x0000	0xC6	(0x00 ^ 0xC6) = 0xC6	0xB98A	(0x0000 ^ 0xB98A) = 0xB98A
0xB98A	0xCE	(0xB9 ^ 0xCE) = 0x77	0x0E70	(0x8A00 ^ 0x0E70) = 0x8470
0x8470	0xA2	(0x84 ^ 0xA2) = 0x26	0x44A4	(0x7000 ^ 0x44A4) = 0x34A4
0x34A4	0x03	(0x34 ^ 0x03) = 0x37	0x46B4	(0xA400 ^ 0x46B4) = **0xE2B4**

If you continue processing the received CRC value of 0xE2B4 it will look like this:

Old CRC	Data byte	Table index	Table Value	New CRC
0xE2B4	0xE2	(0xE2^ 0xE2) = 0x00	0x0000	(0xB400 ^ 0x0000) = 0xB400
0xB400	0xB4	(0xB4^ 0xB4) = 0x00	0x0000	(0x0000^ 0x0000) = **0x0000**

The final CRC of zero indicates that the "packet" passed its CRC check.

XII. EEPROM configuration settings

There are two different ways to access data from the EEPROM. The commands "`EERD`" and "`EEWR`" provide a text based interface that you can use with a terminal emulation program, such as HyperTerminal. All numerical data is sent and received as ASCII strings that represent hexadecimal numbers. You can read as many values as you want with one "`EERD`" command, but you can only write one byte of data for each "`EEWR`" command.

The commands "`EEBRD`" and "`EEBWR`" use similar hex strings to specify what data you want to read or write, but the actual EEPROM data is send and received as binary bytes. You can read and write as many bytes as you would like to in a single command.

Both read and written data includes a CRC code. A CRC is required for data written with the "`EEBWR`" command.

There are several EEPROM data locations that should not be written with the "`EEWR`" or "`EEBWR`" commands. These are either factory calibration values that should not be changed, or else they are values that can be set from a different command. For example, use the "`SETPER`" command to set the ARCHIVE_PERIOD value, and the "`BAR=`" command to set the BAR_CAL and ELEVATION values. It is safe to read these EEPROM values.

The table below gives the addresses and sizes of the most useful EEPROM data values. The address of each field is given both in decimal and in hex. Use the hex value in all "`EE...` " commands. There is a supplemental list of the locations where the Vantage graph data is stored in section XIV.

EEPROM address table

Name	Hex	Dec	Size	Description
BAR_GAIN	1	1	2	These are the factory barometer calibration values.
BAR_OFFSET	3	3	2	**Do not modify them!**
BAR_CAL	5	5	2	Barometer Offset calibration. **Use the "BAR=" command to set this value!**
HUM33	7	7	2	These are the factory inside humidity calibration values.
HUM80	9	9	2	**Do not modify them!**
LATITUDE	0B	11	2	Station Latitude in tenths of a degree. Negative values = southern hemisphere
LONGITUDE	0D	13	2	Station Longitude in tenths of a degree. Negative values = western hemisphere
ELEVATION	0F	15	2	Station elevation in feet. **Use the "BAR=" command to set this value!**
TIME_ZONE	11	17	1	String number of the time zone selected on the setup screen.
MANUAL_OR_AUTO	12	18	1	1 = manual daylight savings, 0 = automatic daylight savings
DAYLIGHT_SAVINGS	13	19	1	This is the configuration bit for the day light savings mode when it is set in manual mode. 1 = daylight savings is now on, 0 = daylight savings is now off. When automatic daylight savings mode is selected, this bit is ignored and it does not indicate whether the daylight savings is on or not.
GMT_OFFSET	14	20	2	The time difference between GMT and local time (a 2-byte signed number in hundredths of hours. For example, a value of 850 would be +8.50 hours. Negative values in 2's complements, represent western hemisphere.
GMT_OR_ZONE	16	22	1	1 = use the GMT_OFFSET value, 0 = use the TIME_ZONE value
USETX	17	23	1	Bitmapped field that indicates which DavisTalk transmitters to listen to. Bit 0 = ID 1.
RE_TRANSMIT_TX	18	24	1	ID number to use for retransmit. 0 = don't retransmit, 1 = use ID 1.
STATION_LIST	19	25	16	2 bytes per transmitter ID. First byte is station type, second byte is <temp sensor # | hum sensor #>. See section XIII.4 for more details.

Name	Hex	Dec	Size	Description
UNIT_BITS	29	41	1	Barometer unit (bit 1:0): 0: 0.01 INCHES 1: 0.1 MM 2: 0.1 HPA 3: 0.1 MB Temperature unit (Bit 3:2): 0: ˚F (Whole degrees) 1: ˚F (Tenths of a degree) 2: ˚C (Whole degrees) 3: ˚C (Tenths of a degree) Elevation unit (Bit 4): 0: FEET 1: METERS RAIN unit (Bit 5): 0: INCHES 1: MM Wind unit (Bit 7:6): 0: MPH 1: M/S 2: Km/H 3: KNOTS
UNIT_BITS_COMP	2A	42	1	This should be the 1's complement of UNIT_BITS for validation.
SETUP_BITS	2B	43	1	AM/PM Time Mode (Bit 0): 0: AM 1: PM Is AM on (Bit 1): 0: AM OFF 1: AM ON Month/Day Format (Bit 2): 0: Shown as Month/Day 1: Shown as Day/Month Wind Cup Size (Bit 3): 0: Small Size 1: Large Size Rain Collector Size (Bit 5:4): 0: 0.01 INCHES 1: 0.2 MM 2: 0.1 MM Latitude (Bit 6): 0: South 1: North Longitude (Bit 7): 0: West 1: East
RAIN_SEASON_START	2C	44	1	Month that the Yearly rain total is cleared. 1 = January, etc
ARCHIVE_PERIOD	2D	45	1	Number of minutes in the archive period. **Use "SETPER" to set this value.**
Calibration values are 1 byte signed numbers that are offsets applied to the corresponding raw sensor value in the native sensor units (either 0.1 °F or 1 %)				
TEMP_IN_CAL	32	50	1	The setting range is from (-12.8 °F to 12.7 °F) with the most significant byte as the sign bit.
TEMP_IN_COMP	33	51	1	1's compliment of TEMP_IN_CAL to validate calibration data

Name	Hex	Dec	Size	Description
TEMP_OUT_CAL	34	52	1	The setting range is from (-12.8 °F to 12.7 °F) with the most significant byte as the sign bit.
TEMP_CAL	35	53	15	7 "extra" temperatures, 4 soil temperatures, and 4 leaf temperatures
HUM_IN_CAL	44	68	1	The inside humidity calibration value is ranged from 0 to 100%.
HUM_CAL	45	69	8	The first entry is the currently selected outside humidity sensor.
DIR_CAL	4D	77	2	2 byte wind direction calibration allows full 360° calibration in both directions.
DEFAULT_BAR_GRAPH	4F	79	1	These values control which time span to use on the console graph display when Rain, Barometer, or Wind Speed is shown.
DEFAULT_RAIN_GRAPH	50	80	1	
DEFAULT_SPEED_GRAPH	51	81	1	
ALARM_START	52	82	94	Starting location for the Alarm threshold data. See section XIII.5 for more details on setting alarm thresholds
BAR_RISE_ALARM	52	82	1	3 hour rising bar trend alarm. Units are in Hg * 1000
BAR_FALL_ALARM	53	83	1	3 hour falling bar trend alarm. Units are in Hg * 1000
TIME_ALARM	54	84	2	Time alarm. Hours * 100 + minutes
TIME_COMP_ALARM	56	86	2	1's compliment of TIME_ALARM to validate alarm entries
LOW_TEMP_IN_ALARM	58	88	1	Threshold is (data value – 90) °F
HIGH_TEMP_IN_ALARM	59	89	1	Threshold is (data value – 90) °F
LOW_TEMP_OUT_ALARM	5A	90	1	Threshold is (data value – 90) °F
HIGH_TEMP_OUT_ALARM	5B	91	1	Threshold is (data value – 90) °F
LOW_TEMP_ALARM	5C	92	15	7 extra temps, 4 soil temps, 4 leaf temps
HIGH_TEMP_ALARM	6B	107	15	7 extra temps, 4 soil temps, 4 leaf temps
LOW_HUM_IN_ALARM	7A	122	1	Low relative humidity alarm in %.
HIGH_HUM_IN_ALARM	7B	123	1	High relative humidity alarm in %.
LOW_HUM_ALARM	7C	124	8	First entry is the current Outside Humidity setting
HIGH_HUM_ALARM	84	132	8	First entry is the current Outside Humidity setting
LOW_DEW_ALARM	8C	140	1	Threshold is (data value – 120) °F
HIGH_DEW_ALARM	8D	141	1	Threshold is (data value – 120) °F
CHILL_ALARM	8E	142	1	Threshold is (data value – 120) °F
HEAT_ALARM	8F	143	1	Threshold is (data value – 90) °F
THSW_ALARM	90	144	1	Threshold is (data value – 90) °F
SPEED_ALARM	91	145	1	Current Wind Speed alarm. Units are MPH
SPEED_10MIN_ALARM	92	146	1	10 minute average Wind Speed alarm. Units are MPH
UV_ALARM	93	147	1	Current UV index alarm. Units are (UV Index * 10)
LOW_SOIL_ALARM	95	149	4	Low soil moisture alarm in centibar. It supports four soil moisture sensors.
HIGH_SOIL_ALARM	99	153	4	High soil moisture alarm in centibar. It supports four soil moisture sensors.
LOW_LEAF_ALARM	9D	157	4	Low leaf wetness alarm with index 0 to 15. 0 is very dry and 15 is very wet.
HIGH_LEAF_ALARM	A1	161	4	High leaf wetness alarm with index 0 to 15. 0 is very dry and 15 is very wet.
SOLAR_ALARM	A5	165	2	Solar energy alarm is set with watts/meter^2.
RAIN_RATE_ALARM	A7	167	2	Rate rain alarm is set with inches/hour
RAIN_15MIN_ALARM	A9	169	2	15-minute alarm is set with 100th of an inch.
RAIN_24HR_ALARM	AB	171	2	24-hour alarm is set with 100th of an inch.
RAIN_STORM_ALARM	AD	173	2	Rain storm alarm is set with 100th of an inch.
ET_DAY_ALARM	AF	175	1	Evapotranspiration alarm is set with 1000th of an inch.

Name	Hex	Dec	Size	Description
Graph Pointers		177	8	See section XIV
Graph data		185	3898	See section XIV
Log Average Temperature	FFC	4092	1	Set this value to zero to enable logging of average temperature values. A non-zero value causes the temperature at the end of the archive period to be logged.
Password CRC	FFE	4094	2	WeatherLink uses these two bytes to hold the CRC of a password in order to provide some protection from unauthorized access. This is only enforced by software implementation. The value 0xFFFF indicates that no password is set.

XIII. Common Tasks

This section describes how to perform several common tasks, especially ones that need to be done in a particular way.

1. Setting Temperature and Humidity Calibration Values

The 28 EEPROM bytes starting at address 50 (0x32) contain the calibration offsets for temperature and humidity values. Unfortunately, if you modify these values in the EEPROM, the new calibration value will not take effect until the next time the Vantage receives a data packet containing that temperature or humidity value. In order to update the Vantage display with the new calibration values, you have to follow this procedure.

Create a data structure to hold all of the calibration values, and one to hold the results of the "**`CALED`**" command.

1. Use "**`EEBRD 32 2B`**" to read in the current calibration offset values.
2. Use "**`CALED`**" to read in the current calibrated sensor values.
3. Determine what the un-calibrated sensor values are by subtracting the calibration offset from the data value. Make sure that you only do this if the sensor has valid data (i.e. not 0x7FFF, or 0xFF).
4. Determine and write the new calibration values into the EEPROM using "**`EEBWR 32 2B`**".
5. Use "**`CALFIX`**" to send the un-calibrated sensor values to the Vantage to have the display update using the new calibration values.

You can use the "**`EERD 32 2B`**" command if you want to, but it is harder to process.

You do not have to set all of the calibration values, but you do have to send all of the sensor data values in the "**`CALFIX`**" command.

2. Setting the Time, Time Zone, and Daylight savings

The "**GETTIME**" and "**SETTIME**" commands will get and set the time and date on the Vantage console, but you will need to use additional commands to set the time zone and daylight savings settings.

Daylight Savings

To set up the automatic daylight savings mode (works for US, Europe, and Australia), use the command "**EEWR 12 00**" (or its "**EEBWR**" equivilant). To use manual daylight savings mode (or if daylight savings is not used at all) use the command "**EEWR 12 01**".

If you have selected manual daylight savings mode, use the command "**EEWR 13 00**" to set standard time and "**EEWR 13 01**" to set daylight savings time.

Time Zone

You can either choose a time zone from the list of timezones shown on the console time zone setup screen, or you can set the GMT offset directly.

To use a preset time zone, write the zone index number from the table below into the TIME_ZONE EEPROM field (i.e. "**EEWR 11 xx**"), and also write a zero into the GMT_OR_ZONE field (i.e. "**EEWR 16 00**").

To use a custom time zone, write the GMT offset – in (hours * 100 + minutes), to a 15 minute resolution, with negative values for time zones west of GMT – to the 2 byte GMT_OFFSET field. Also write a one to the GMT_OR_ZONE field (i.e. "**EEWR 16 01**").

Table of preset time zones on the Vantage and WeatherLink software.

Index	GMT Offset	Name
0	-1200	(GMT-12:00) Eniwetok, Kwajalein
1	-1100	(GMT-11:00) Midway Island, Samoa
2	-1000	(GMT-10:00) Hawaii
3	-900	(GMT-09:00) Alaska
4	-800	(GMT-08:00) Pacific Time, Tijuana
5	-700	(GMT-07:00) Mountain Time
6	-600	(GMT-06:00) Central Time
7	-600	(GMT-06:00) Mexico City
8	-600	(GMT-06:00) Central America
9	-500	(GMT-05.00) Bogota, Lima, Quito
10	-500	(GMT-05:00) Eastern Time
11	-400	(GMT-04:00) Atlantic Time
12	-400	(GMT-04.00) Caracas, La Paz, Santiago
13	-330	(GMT-03.30) Newfoundland
14	-300	(GMT-03.00) Brasilia
15	-300	(GMT-03.00) Buenos Aires, Georgetown, Greenland
16	-200	(GMT-02.00) Mid-Atlantic
17	-100	(GMT-01:00) Azores, Cape Verde Is.
18	0	(GMT) Greenwich Mean Time, Dublin, Edinburgh, Lisbon, London
19	0	(GMT) Monrovia, Casablanca

20	100	(GMT+01.00) Berlin, Rome, Amsterdam, Bern, Stockholm, Vienna
21	100	(GMT+01.00) Paris, Madrid, Brussels, Copenhagen, W Central Africa
22	100	(GMT+01.00) Prague, Belgrade, Bratislava, Budapest, Ljubljana
23	200	(GMT+02.00) Athens, Helsinki, Istanbul, Minsk, Riga, Tallinn
24	200	(GMT+02:00) Cairo
25	200	(GMT+02.00) Eastern Europe, Bucharest
26	200	(GMT+02:00) Harare, Pretoria
27	200	(GMT+02.00) Israel, Jerusalem
28	300	(GMT+03:00) Baghdad, Kuwait, Nairobi, Riyadh
29	300	(GMT+03.00) Moscow, St. Petersburg, Volgograd
30	330	(GMT+03:30) Tehran
31	400	(GMT+04:00) Abu Dhabi, Muscat, Baku, Tblisi, Yerevan, Kazan
32	430	(GMT+04:30) Kabul
33	500	(GMT+05:00) Islamabad, Karachi, Ekaterinburg, Tashkent
34	530	(GMT+05:30) Bombay, Calcutta, Madras, New Delhi, Chennai
35	600	(GMT+06:00) Almaty, Dhaka, Colombo, Novosibirsk, Astana
36	700	(GMT+07:00) Bangkok, Jakarta, Hanoi, Krasnoyarsk
37	800	(GMT+08:00) Beijing, Chongqing, Urumqi, Irkutsk, Ulaan Bataar
38	800	(GMT+08:00) Hong Kong, Perth, Singapore, Taipei, Kuala Lumpur
39	900	(GMT+09:00) Tokyo, Osaka, Sapporo, Seoul, Yakutsk
40	930	(GMT+09:30) Adelaide
41	930	(GMT+09:30) Darwin
42	1000	(GMT+10:00) Brisbane, Melbourne, Sydney, Canberra
43	1000	(GMT+10.00) Hobart, Guam, Port Moresby, Vladivostok
44	1100	(GMT+11:00) Magadan, Solomon Is, New Caledonia
45	1200	(GMT+12:00) Fiji, Kamchatka, Marshall Is.
46	1200	(GMT+12:00) Wellington, Auckland

3. Setting the Rain Collector type

The rain collector type is stored in the SETUP_BITS EEPROM data byte.

To read what the current rain collector type is:

1. Use "**`EEBRD 2B 01`**" to read the current setup bits into the variable `setup_bits`.
2. Calculate: `rain_type = setup_bits & 0x30`
3. `rain_type` will have one of the following values: 0x00 = 0.01 in, 0x10 = 0.2 mm, or 0x20 = 0.1 mm

To set a new rain collector type:

1. Use "**`EEBRD 2B 01`**" to read the current setup bits into the variable `setup_bits`.
2. Mask the rain collector bits to zero with `setup_bits = setup_bits & 0xCF`
3. Set `rain_type` to one of the rain collector values given above.
4. Calculate the new `setup_bits = setup_bits | rain_type`
5. Use "**`EEBWR 2B 01`**" to set the new rain collector type
6. Use "**`NEWSETUP`**" to have the Vantage use the new setting.

4. Setting up transmitter station ID's and retransmit function.

The 16 bytes of EEPROM data at STATION_LIST, plus the USETX field, control what transmitters the Vantage will listen to. These can be set for both wireless and cabled consoles, but the cabled ISS will always transmit on ID 1.

IMPORTANT!! You must use the "`NEWSETUP`" command after changing the transmitter ID or retransmit settings. This allows the console to use the new settings.

Use "`EEBRD 19 10`" to read in the 16 bytes of station data. The format will look like this:

Index	Contents	
	Upper nibble	Lower nibble
0	Tx period	ID 1 Transmiter type
1	Humidity Sensor #	Temperature Sensor #
2	Tx period	ID 2 Transmiter type
3	Humidity #	Temperature #
4	Tx period	ID 3 Transmiter type
5	Humidity #	Temperature #
6	Tx period	ID 4 Transmiter type
7	Humidity #	Temperature #
8	Tx period	ID 5 Transmiter type
9	Humidity #	Temperature #
10	Tx period	ID 6 Transmiter type
11	Humidity #	Temperature #
12	Tx period	ID 7 Transmiter type
13	Humidity #	Temperature #
14	Tx period	ID 8 Transmiter type
15	Humidity #	Temperature #

The Transmitter type field is taken from either the Rev A or Rev B station type tables below, depending on the firmware version date (April 24, 2002 and later use Rev B format).

The Tx period field will have one of these values: 0 = station turned off, 1 = ISS normal or Temp/Hum 4x, 4 = ISS 0.25x or Temp/Hum normal. Note that Vantage Pro2 does not support different transmit period. It only supports normal ISS period.

For example, a normal ISS would have the value (0x10 + 0x00) = 0x10. An ISS station being used as an extra Temp Hum station would have the value (0x10 + 0x03) = 0x13, and a standard Temp Hum station would have the value (0x40 + 0x03) = 0x43.

The humidity sensor number and temperature sensor number fields are only used if the transmitter type is a Temperature-Humidity station or a Temperature only station. These fields determine how the extra temperature and humidity data values are logged. These fields are ignored for other station types.

Starting with ID 1, the first transmitter with an extra Humidity sensor should be assigned the value 1, the second should have the value 2, etc.

In the same maner, the first extra temperature sensor should be assigned the value **ZERO**, the second should have the value 1, etc.

The USETX field holds bitmapped information on the transmitters that the Vantage will actively listen to. Bit 0 corresponds with ID 1, Bit 1 with ID 2, etc. Set this value after you have made any modifications to the STATION_LIST field.

IMPORTANT!! You must use the "`NEWSETUP`" command after changing the transmitter ID or retransmit settings. This allows the console to use the new settings.

Set Transmitters example (Rev B and VantagePro 2):

Index	Contents			Description
0	1	0	0x10	ID 1 = ISS
1	F	F	0xFF	
2	4	3	0x43	ID 2 = Temp/Hum
3	1	0	0x10	
4	1	3	0x13	ID 3 = Temp/Hum 4x
5	2	1	0x21	
6	1	8	0x18	ID 4 = Leaf/Soil
7	F	F	0xFF	
8	1	4	0x14	ID 5 = Wireles anemometer
9	F	F	0xFF	
10	0	A	0x0A	ID 6 = Not used
11	F	F	0xFF	
12	0	A	0x0A	ID 6 = Not used
13	F	F	0xFF	
14	0	A	0x0A	ID 6 = Not used
15	F	F	0xFF	
USETX			0x1F	

List of Station Types (Rev A):

Station Name	Station Type (hex)	"standard" period
ISS	0	1
Temperature Only Station	1	4
Humidity Only Station	2	4
Temperature/Humidity Station	3	4
Wireless Anemometer Station	4	1
Rain Station	5	1
Leaf Station	6	1
Soil Station	7	1
SensorLink Station	8	1
No station – OFF	9	0

List of Station Types (Rev B and VantagePro 2):

Station Name	Station Type (hex)	"standard" period
ISS	0	1
Temperature Only Station	1	4
Humidity Only Station	2	4
Temperature/Humidity Station	3	4
Wireless Anemometer Station	4	1
Rain Station	5	1
Leaf Station	6	1
Soil Station	7	1
Soil/Leaf Station	8	1
SensorLink Station *	9	1
No station – OFF	A	0

* Vantage Pro2 does not support SensorLink station type.

Retransmit feature
To activate the retransmit feature of the console, write the ID number (1-8) that you would like the Vantage to transmit on into the RE_TRANSMIT_TX field. This ID can not also be used to receive data from a remote sensor. Use the value 0 to turn retransmit off.

IMPORTANT!! You must use the "`NEWSETUP`" command after changing the transmitter ID or retransmit settings. This allows the console to use the new settings.

5. Setting Alarm Thresholds

The alarm values are stored in the EEPROM. Each alarm is described below along with its EEPROM address.

Field	Offset	Size	Explanation
ALARM_START	82=0x52	94	Starting location for the Alarm threshold data.
BAR_RISE_ALARM	0	1	The BAR_RISE alarms is 1 byte unsigned number. A zero value indicates the alarm is not set. A non-zero value of 1 to 255 represents .001 in to .255 in.
BAR_FALL_ALARM	1	1	The BAR_FALL alarms is 1 byte unsigned number. A zero value indicates the alarm is not set. A non-zero value of 1 to 255 represents .001 in to .255 in.
TIME_ALARM	2	2	The TIME_A alarm is a 2 byte number in the format HOURS * 100 + MINUTES.
TIME_COMP_ALARM	4	2	A value of 0xffff indicates an alarm is not set.
LOW_TEMP_IN_ALARM	6	1	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32 °F would be stored as 58°F. If the alarm is not set, a 255 is stored.
HIGH_TEMP_IN_ALARM	7	1	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32 °F would be stored as 58 °F. If the alarm is not set, a 255 is stored.

Field	Offset	Size	Explanation
LOW_TEMP_OUT_ALARM	8	1	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32°F would be stored as 58°F (-32 + 90). If the alarm is not set, a 255 is stored.
HIGH_TEMP_OUT_ALARM	9	1	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32°F would be stored as 58°F (-32 + 90). If the alarm is not set, a 255 is stored.
LOW_TEMP_ALARM	10	15	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32°F would be stored as 58°F (-32 + 90). If the alarm is not set, a 255 is stored. There are 15 bytes for the temperature alarm. Bytes 0 to 6 are for the extra temperature stations, bytes 7 to 10 are for the soil station temperature, and bytes 11 to 14 are for the leaf station temperature.
HIGH_TEMP_ALARM	25	15	The temperature alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32°F would be stored as 58°F (-32 + 90). If the alarm is not set, a 255 is stored. Bytes 0 to 6 are for the extra temperature stations, bytes 7 to 10 are for the soil station temperature, and bytes 11 to 14 are for the leaf station temperature.
LOW_HUM_IN_ALARM	40	1	The humidity alarm is stored in 1 unsigned byte in 1% resolution. A value of 255 indicates the alarm is not set.
HIGH_HUM_IN_ALARM	41	1	The humidity alarm is stored in 1 unsigned byte in 1% resolution. A value of 255 indicates the alarm is not set.
LOW_HUM_ALARM	42	8	The humidity alarm is stored in 1 unsigned byte in 1% resolution. A value of 255 indicates the alarm is not set. Note that the first byte is for the ISS outside humidity.
HIGH_HUM_ALARM	50	8	The humidity alarm is stored in 1 unsigned byte in 1% resolution. A value of 255 indicates the alarm is not set. . Note that the first byte is for the ISS outside humidity.
LOW_DEW_ALARM	58	1	The dew alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32 °F would be stored as 58 °F. If the alarm is not set, a 255 is stored.
HIGH_DEW_ALARM	59	1	The dew alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32 °F would be stored as 58 °F. If the alarm is not set, a 255 is stored.
CHILL_ALARM	60	1	The chill alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example -32 °F would be stored as 58 °F. If the alarm is not set, a 255 is stored.
HEAT_ALARM	61	1	The heat alarm is in 1 unsigned byte in 1 °F resolution. It has an offset of +90°F so every number is positive. For example
THSW_ALARM	62	1	The temperature alarm is in 1 unsigned byte in 1°F resolution. It has an offset of +90°F so every number is positive. For example, -32°F would be stored as -32 plus 90, which is 58°F.
SPEED_ALARM	63	1	Wind speed alarm is stored in 1 unsigned byte in 1 mph resolution. A value of 255 indicates the alarm is not set.
SPEED_10MIN_ALARM	64	1	10 minute average Wind Speed alarm is stored in 1 unsigned byte in 1 mph resolution. A value of 255 indicates the alarm is not set.

Field	Offset	Size	Explanation
UV_ALARM	65	1	The UV alarm is stored in 1 unsigned byte in the units of .1 index. A value of 255 indicats no alarm is set.
UV_DOSE_ALARM	66	1	The UV exposure alarm threshold is stored in the UV_DOSE_A_X location. However, this is an internal alarm that must be set throught he console.
LOW_SOIL_ALARM	67	4	The soil moisture alarm is stored in 1 byte unsigned values with resolution of 1 cb. A value of 255 indicates the alarm is not set. There are four bytes for the soil alarm, one for each of the four sensors.
HIGH_SOIL_ALARM	71	4	The soil moisture alarm is stored in 1 byte unsigned values with resolution of 1 cb. A value of 255 indicates the alarm is not set. There are four bytes for the soil alarm, one for each of the four sensors.
LOW_LEAF_ALARM	75	4	The leaf wetness alarm is stored in 1 byte unsigned value. Leaf wetness ranges from 0 to 15. A value of 255 indicates the alarm is not set. There are four bytes for the leaf alarm, one for each of the four sensors.
HIGH_LEAF_ALARM	79	4	The leaf wetness alarm is stored in 1 byte unsigned value. Leaf wetness ranges from 0 to 15. A value of 255 indicates the alarm is not set. There are four bytes for the leaf alarm, one for each of the four sensors.
SOLAR_ALARM	83	2	The solar radiation alarm is a 2 byte value stored in 1 W/m^2 resolution. Valid range is from 0 to 1800. A value of 0xffff (65535) indicates the alarm is not set.
RAIN_RATE_ALARM	85	2	The rain rate alarm is a 2 byte value stored in units of .01 inch. A value of 0xffff (65535) indicates the alarm is not set.
RAIN_15MIN_ALARM	87	2	The rain total alarm is stored in 2 bytes in the resolution of .01 inches. A value of 0xffff (65535) means no alarm is set.
RAIN_24HR_ALARM	89	2	The rain total alarm is stored in 2 bytes in the resolution of .01 inches. A value of 0xffff (65535) means no alarm is set.
RAIN_STORM_ALARM	91	2	The rain total alarm is stored in 2 bytes in the resolution of .01 inches. A value of 0xffff (65535) means no alarm is set.
ET_DAY_ALARM	93	1	The ET day alarm is stored in 1 unsigned byte in the resolution of .01 inches. A value of 255 means no alarm is set.

6. Calculating ISS reception

The "Number of Wind Samples" field in the archive record can tell you the quality of radio communication between the ISS (or wireless anemometer) and the console because wind speed data is send in almost all data packets. In order to use this, you need to know how many packets you could have gotten if you had 100 % reception. This is a function of both the archive interval and the transmitter ID that is sending wind speed. The formula for Vantage Pro2 console is different from the one for Vantage Pro console.

The formulas for determining the expected maximum number of packets containing wind speed are:

$$\frac{archive\_interval\_min * 60}{2.5 + \frac{ID - 1}{16.0}} - \frac{archive\_interval\_min * 60}{50.0 + (ID - 1) * 1.25} \qquad \text{(for Vantage Pro)}$$

or

$$\frac{archive\_interval\_min * 60}{\frac{41 + ID - 1}{16}} \qquad \text{(for Vantage Pro2)}$$

Here *archive_interval_min* is the archive interval in minutes and *ID* is the transmitter ID number between 1 and 8.

It is possible for the number of wind samples to be larger than the "expected" maximum value. This is because the maximum value is a long term average, rounded to an integer. The WeatherLink program displays 100% in these cases (i.e. not the 105% that the math would suggest).

XIV. EEPROM Graph data locations for Vantage Pro

```
GRAPH_START              176

NEXT_10MIN_PTR           GRAPH_START+1
NEXT_15MIN_PTR           GRAPH_START+2
NEXT_HOUR_PTR            GRAPH_START+3
NEXT_DAY_PTR             GRAPH_START+4
NEXT_MONTH_PTR           GRAPH_START+5
NEXT_YEAR_PTR            GRAPH_START+6
NEXT_RAIN_STORM_PTR      GRAPH_START+7
NEXT_RAIN_YEAR_PTR       GRAPH_START+8
START                    GRAPH_START+9 = 185
//                                                NUMBER  NUMBER
//                                                OF      OF
//                                                ENTRYS  BYTES
//                                                --------------
TEMP_IN_HOUR                 START +    0         // 24 ||  1
TEMP_IN_DAY_HIGHS            START +   24         // 24 ||  1
TEMP_IN_DAY_HIGH_TIMES       START +   48         // 24 ||  2
TEMP_IN_DAY_LOWS             START +   96         // 24 ||  1
TEMP_IN_DAY_LOW_TIMES        START +  120         // 24 ||  2
TEMP_IN_MONTH_HIGHS          START +  168         // 25 ||  1
TEMP_IN_MONTH_LOWS           START +  193         // 25 ||  1
TEMP_IN_YEAR_HIGHS           START +  218         //  1 ||  1
TEMP_IN_YEAR_LOWS            START +  219         //  1 ||  1

TEMP_OUT_HOUR                START +  220         // 24 ||  1
TEMP_OUT_DAY_HIGHS           START +  244         // 24 ||  1
TEMP_OUT_DAY_HIGH_TIMES      START +  268         // 24 ||  2
TEMP_OUT_DAY_LOWS            START +  316         // 24 ||  1
TEMP_OUT_DAY_LOW_TIMES       START +  340         // 24 ||  2
TEMP_OUT_MONTH_HIGHS         START +  388         // 25 ||  1
TEMP_OUT_MONTH_LOWS          START +  413         // 25 ||  1
TEMP_OUT_YEAR_HIGHS          START +  438         // 25 ||  1
TEMP_OUT_YEAR_LOWS           START +  463         // 25 ||  1

DEW_HOUR                     START +  488         // 24 ||  1
DEW_DAY_HIGHS                START +  512         // 24 ||  1
DEW_DAY_HIGH_TIMES           START +  536         // 24 ||  2
DEW_DAY_LOWS                 START +  584         // 24 ||  1
DEW_DAY_LOW_TIMES            START +  608         // 24 ||  2
DEW_MONTH_HIGHS              START +  656         // 25 ||  1
DEW_MONTH_LOWS               START +  681         // 25 ||  1
DEW_YEAR_HIGHS               START +  706         //  1 ||  1
DEW_YEAR_LOWS                START +  707         //  1 ||  1

CHILL_HOUR                   START +  708         // 24 ||  1
CHILL_DAY_LOWS               START +  732         // 24 ||  1
CHILL_DAY_LOW_TIMES          START +  756         // 24 ||  2
CHILL_MONTH_LOWS             START +  804         // 25 ||  1
CHILL_YEAR_LOWS              START +  829         //  1 ||  1

THSW_HOUR                    START +  830         // 24 ||  1
THSW_DAY_HIGHS               START +  854         // 24 ||  1
THSW_DAY_HIGH_TIMES          START +  878         // 24 ||  2
THSW_MONTH_HIGHS             START +  926         // 25 ||  1
THSW_YEAR_HIGHS              START +  951         //  1 ||  1

HEAT_HOUR                    START +  952         // 24 ||  1
HEAT_DAY_HIGHS               START +  976         // 24 ||  1
HEAT_DAY_HIGH_TIMES          START + 1000         // 24 ||  2
HEAT_MONTH_HIGHS             START + 1048         // 25 ||  1
HEAT_YEAR_HIGHS              START + 1073         //  1 ||  1

HUM_IN_HOUR                  START + 1074         // 24 ||  1
HUM_IN_DAY_HIGHS             START + 1098         // 24 ||  1
HUM_IN_DAY_HIGH_TIMES        START + 1122         // 24 ||  2
HUM_IN_DAY_LOWS              START + 1170         // 24 ||  1
HUM_IN_DAY_LOW_TIMES         START + 1194         // 24 ||  2
```

```
HUM_IN_MONTH_HIGHS          START + 1242            // 25 ||  1
HUM_IN_MONTH_LOWS           START + 1267            // 25 ||  1
HUM_IN_YEAR_HIGHS           START + 1292            //  1 ||  1
HUM_IN_YEAR_LOWS            START + 1293            //  1 ||  1

HUM_OUT_HOUR                START + 1294            // 24 ||  1
HUM_OUT_DAY_HIGHS           START + 1318            // 24 ||  1
HUM_OUT_DAY_HIGH_TIMES      START + 1342            // 24 ||  2
HUM_OUT_DAY_LOWS            START + 1390            // 24 ||  1
HUM_OUT_DAY_LOW_TIMES       START + 1414            // 24 ||  2
HUM_OUT_MONTH_HIGHS         START + 1462            // 25 ||  1
HUM_OUT_MONTH_LOWS          START + 1487            // 25 ||  1
HUM_OUT_YEAR_HIGHS          START + 1512            //  1 ||  1
HUM_OUT_YEAR_LOWS           START + 1513            //  1 ||  1

BAR_15_MIN                  START + 1514            // 24 ||  2
BAR_HOUR                    START + 1562            // 24 ||  2
BAR_DAY_HIGHS               START + 1610            // 24 ||  2
BAR_DAY_HIGH_TIMES          START + 1658            // 24 ||  2
BAR_DAY_LOWS                START + 1706            // 24 ||  2
BAR_DAY_LOW_TIMES           START + 1754            // 24 ||  2
BAR_MONTH_HIGHS             START + 1802            // 25 ||  2
BAR_MONTH_LOWS              START + 1852            // 25 ||  2
BAR_YEAR_HIGHS              START + 1902            //  1 ||  2
BAR_YEAR_LOWS               START + 1904            //  1 ||  2

WIND_SPEED_10_MIN_AVG       START + 1906            // 24 ||  1
WIND_SPEED_HOUR_AVG         START + 1930            // 24 ||  1
WIND_SPEED_DAY_HIGHS        START + 1954            // 24 ||  1
WIND_SPEED_DAY_HIGH_TIMES   START + 1978            // 24 ||  2
WIND_SPEED_DAY_HIGH_DIR     START + 2026            // 24 ||  1
WIND_SPEED_MONTH_HIGHS      START + 2050            // 25 ||  1
WIND_SPEED_MONTH_HIGH_DIR   START + 2075            // 25 ||  1
WIND_SPEED_YEAR_HIGHS       START + 2100            // 25 ||  1
WIND_SPEED_YEAR_HIGH_DIR    START + 2125            // 25 ||  1

WIND_DIR_HOUR               START + 2150            // 24 ||  1
WIND_DIR_DAY                START + 2174            // 24 ||  1
WIND_DIR_MONTH              START + 2198            // 24 ||  1
WIND_DIR_DAY_BINS           START + 2222            //  8 ||  2
WIND_DIR_MONTH_BINS         START + 2238            //  8 ||  2

RAIN_RATE_1_MIN             START + 2254            // 24 ||  2
RAIN_RATE_HOUR              START + 2302            // 24 ||  2
RAIN_RATE_DAY_HIGHS         START + 2350            // 24 ||  2
RAIN_RATE_DAY_HIGH_TIMES    START + 2398            // 24 ||  2
RAIN_RATE_MONTH_HIGHS       START + 2446            // 25 ||  2
RAIN_RATE_YEAR_HIGHS        START + 2496            // 25 ||  2

RAIN_15_MIN                 START + 2546            // 24 ||  1
RAIN_HOUR                   START + 2570            // 24 ||  2
RAIN_STORM                  START + 2618            // 25 ||  2
RAIN_STORM_START            START + 2668            // 25 ||  2
RAIN_STORM_END              START + 2718            // 25 ||  2
RAIN_DAY_TOTAL              START + 2768            // 25 ||  2
RAIN_MONTH_TOTAL            START + 2818            // 25 ||  2
RAIN_YEAR_TOTAL             START + 2868            // 25 ||  2

ET_HOUR                     START + 2918            // 24 ||  1
ET_DAY_TOTAL                START + 2942            // 25 ||  1
ET_MONTH_TOTAL              START + 2967            // 25 ||  2
ET_YEAR_TOTAL               START + 3017            // 25 ||  2

SOLAR_HOUR_AVG              START + 3067            // 24 ||  2
SOLAR_DAY_HIGHS             START + 3115            // 24 ||  2
SOLAR_DAY_HIGH_TIMES        START + 3163            // 24 ||  2
SOLAR_MONTH_HIGHS           START + 3211            // 25 ||  2
SOLAR_YEAR_HIGHS            START + 3261            //  1 ||  2

UV_HOUR_AVG                 START + 3263            // 24 ||  1
UV_MEDS_HOUR                START + 3287            // 24 ||  1
```

```
UV_MEDS_DAY              START + 3311            // 24 ||  1
UV_DAY_HIGHS             START + 3335            // 24 ||  1
UV_DAY_HIGH_TIMES        START + 3359            // 24 ||  2
UV_MONTH_HIGHS           START + 3407            // 25 ||  1
UV_YEAR_HIGHS            START + 3432            //  1 ||  1

LEAF_HOUR                START + 3433            // 24 ||  1
LEAF_DAY_LOWS            START + 3457            // 24 ||  1
LEAF_DAY_LOW_TIMES       START + 3481            // 24 ||  2
LEAF_DAY_HIGHS           START + 3529            // 24 ||  1
LEAF_DAY_HIGH_TIMES      START + 3553            // 24 ||  2
WIND_SPEED_HOUR_HIGHS    START + 3601            // 24 ||  1
LEAF_MONTH_LOWS          START + 3625            //  1 ||  1
LEAF_MONTH_HIGHS         START + 3626            // 25 ||  1
LEAF_YEAR_LOWS           START + 3651            //  1 ||  1
LEAF_YEAR_HIGHS          START + 3652            //  1 ||  1

SOIL_HOUR                START + 3653            // 24 ||  1
SOIL_DAY_LOWS            START + 3677            // 24 ||  1
SOIL_DAY_LOW_TIMES       START + 3701            // 24 ||  2
SOIL_DAY_HIGHS           START + 3749            // 24 ||  1
SOIL_DAY_HIGH_TIMES      START + 3773            // 24 ||  2
SOIL_MONTH_LOWS          START + 3821            // 25 ||  1
SOIL_MONTH_HIGHS         START + 3846            // 25 ||  1
SOIL_YEAR_LOWS           START + 3871            //  1 ||  1
SOIL_YEAR_HIGHS          START + 3872            //  1 ||  1
SOIL_YEAR_HIGHS_COMP     START + 3873            //  1 ||  1

RX_PERCENTAGE            START + 3874            //  24 ||  1

SAVE_MIN                 RX_PERCENTAGE+25 = 4084
SAVE_HOUR                SAVE_MIN+1
SAVE_DAY                 SAVE_HOUR+1
SAVE_MONTH               SAVE_HOUR+2
SAVE_YEAR                SAVE_HOUR+3
SAVE_YEAR_COMP           SAVE_HOUR+4
BAUD_RATE                SAVE_HOUR+5
DEFAULT_RATE_GRAPH       SAVE_HOUR+6
```

XV. EEPROM Graph data locations for VP2

```
#define GRAPH_START            176

NEXT_10MIN_PTR          GRAPH_START+1
NEXT_15MIN_PTR          GRAPH_START+2
NEXT_HOUR_PTR           GRAPH_START+3
NEXT_DAY_PTR            GRAPH_START+4
NEXT_MONTH_PTR          GRAPH_START+5
NEXT_YEAR_PTR           GRAPH_START+6
NEXT_RAIN_STORM_PTR     GRAPH_START+7
NEXT_RAIN_YEAR_PTR      GRAPH_START+8


#define START                   325

//                                                          NUMBER  NUMBER
//                                                           OF      OF
//                                                          ENTRYS  BYTES
//                                                          -------------
TEMP_IN_HOUR                START +    0            // 24 ||  1
TEMP_IN_DAY_HIGHS           START +   24            // 24 ||  1
TEMP_IN_DAY_HIGH_TIMES      START +   48            // 24 ||  2
TEMP_IN_DAY_LOWS            START +   96            // 24 ||  1
TEMP_IN_DAY_LOW_TIMES       START +  120            // 24 ||  2
TEMP_IN_MONTH_HIGHS         START +  168            // 25 ||  1
TEMP_IN_MONTH_LOWS          START +  193            // 25 ||  1
TEMP_IN_YEAR_HIGHS          START +  218            //  1 ||  1
TEMP_IN_YEAR_LOWS           START +  219            //  1 ||  1

TEMP_OUT_HOUR               START +  220            // 24 ||  1
TEMP_OUT_DAY_HIGHS          START +  244            // 24 ||  1
TEMP_OUT_DAY_HIGH_TIMES     START +  268            // 24 ||  2
TEMP_OUT_DAY_LOWS           START +  316            // 24 ||  1
TEMP_OUT_DAY_LOW_TIMES      START +  340            // 24 ||  2
TEMP_OUT_MONTH_HIGHS        START +  388            // 25 ||  1
TEMP_OUT_MONTH_LOWS         START +  413            // 25 ||  1
TEMP_OUT_YEAR_HIGHS         START +  438            // 25 ||  1
TEMP_OUT_YEAR_LOWS          START +  463            // 25 ||  1

DEW_HOUR                    START +  488            // 24 ||  1
DEW_DAY_HIGHS               START +  512            // 24 ||  1
DEW_DAY_HIGH_TIMES          START +  536            // 24 ||  2
DEW_DAY_LOWS                START +  584            // 24 ||  1
DEW_DAY_LOW_TIMES           START +  608            // 24 ||  2
DEW_MONTH_HIGHS             START +  656            // 25 ||  1
DEW_MONTH_LOWS              START +  681            // 25 ||  1
DEW_YEAR_HIGHS              START +  706            //  1 ||  1
DEW_YEAR_LOWS               START +  707            //  1 ||  1

CHILL_HOUR                  START +  708            // 24 ||  1
CHILL_DAY_LOWS              START +  732            // 24 ||  1
CHILL_DAY_LOW_TIMES         START +  756            // 24 ||  2
CHILL_MONTH_LOWS            START +  804            // 25 ||  1
CHILL_YEAR_LOWS             START +  829            //  1 ||  1

THSW_HOUR                   START +  830            // 24 ||  1
THSW_DAY_HIGHS              START +  854            // 24 ||  1
THSW_DAY_HIGH_TIMES         START +  878            // 24 ||  2
THSW_MONTH_HIGHS            START +  926            // 25 ||  1
THSW_YEAR_HIGHS             START +  951            //  1 ||  1

HEAT_HOUR                   START +  952            // 24 ||  1
HEAT_DAY_HIGHS              START +  976            // 24 ||  1
HEAT_DAY_HIGH_TIMES         START + 1000            // 24 ||  2
HEAT_MONTH_HIGHS            START + 1048            // 25 ||  1
HEAT_YEAR_HIGHS             START + 1073            //  1 ||  1

HUM_IN_HOUR                 START + 1074            // 24 ||  1
HUM_IN_DAY_HIGHS            START + 1098            // 24 ||  1
HUM_IN_DAY_HIGH_TIMES       START + 1122            // 24 ||  2
```

```
HUM_IN_DAY_LOWS            START + 1170           // 24 ||  1
HUM_IN_DAY_LOW_TIMES       START + 1194           // 24 ||  2
HUM_IN_MONTH_HIGHS         START + 1242           // 25 ||  1
HUM_IN_MONTH_LOWS          START + 1267           // 25 ||  1
HUM_IN_YEAR_HIGHS          START + 1292           //  1 ||  1
HUM_IN_YEAR_LOWS           START + 1293           //  1 ||  1

HUM_OUT_HOUR               START + 1294           // 24 ||  1
HUM_OUT_DAY_HIGHS          START + 1318           // 24 ||  1
HUM_OUT_DAY_HIGH_TIMES     START + 1342           // 24 ||  2
HUM_OUT_DAY_LOWS           START + 1390           // 24 ||  1
HUM_OUT_DAY_LOW_TIMES      START + 1414           // 24 ||  2
HUM_OUT_MONTH_HIGHS        START + 1462           // 25 ||  1
HUM_OUT_MONTH_LOWS         START + 1487           // 25 ||  1
HUM_OUT_YEAR_HIGHS         START + 1512           //  1 ||  1
HUM_OUT_YEAR_LOWS          START + 1513           //  1 ||  1

BAR_15_MIN                 START + 1514           // 24 ||  2
BAR_HOUR                   START + 1562           // 24 ||  2
BAR_DAY_HIGHS              START + 1610           // 24 ||  2
BAR_DAY_HIGH_TIMES         START + 1658           // 24 ||  2
BAR_DAY_LOWS               START + 1706           // 24 ||  2
BAR_DAY_LOW_TIMES          START + 1754           // 24 ||  2
BAR_MONTH_HIGHS            START + 1802           // 25 ||  2
BAR_MONTH_LOWS             START + 1852           // 25 ||  2
BAR_YEAR_HIGHS             START + 1902           //  1 ||  2
BAR_YEAR_LOWS              START + 1904           //  1 ||  2

WIND_SPEED_10_MIN_AVG      START + 1906           // 24 ||  1
WIND_SPEED_HOUR_AVG        START + 1930           // 24 ||  1
WIND_SPEED_HOUR_HIGHS      START + 1954           // 24 ||  1
WIND_SPEED_DAY_HIGHS       START + 1978           // 24 ||  1
WIND_SPEED_DAY_HIGH_TIMES  START + 2002           // 24 ||  2
WIND_SPEED_DAY_HIGH_DIR    START + 2050           // 24 ||  1
WIND_SPEED_MONTH_HIGHS     START + 2074           // 25 ||  1
WIND_SPEED_MONTH_HIGH_DIR  START + 2099           // 25 ||  1
WIND_SPEED_YEAR_HIGHS      START + 2124           // 25 ||  1
WIND_SPEED_YEAR_HIGH_DIR   START + 2149           // 25 ||  1

WIND_DIR_HOUR              START + 2174           // 24 ||  1
WIND_DIR_DAY               START + 2198           // 24 ||  1
WIND_DIR_MONTH             START + 2222           // 24 ||  1
WIND_DIR_DAY_BINS          START + 2246           //  8 ||  2
WIND_DIR_MONTH_BINS        START + 2262           //  8 ||  2

RAIN_RATE_1_MIN            START + 2278           // 24 ||  2
RAIN_RATE_HOUR             START + 2326           // 24 ||  2
RAIN_RATE_DAY_HIGHS        START + 2374           // 24 ||  2
RAIN_RATE_DAY_HIGH_TIMES   START + 2422           // 24 ||  2
RAIN_RATE_MONTH_HIGHS      START + 2470           // 25 ||  2
RAIN_RATE_YEAR_HIGHS       START + 2520           // 25 ||  2

RAIN_15_MIN                START + 2570           // 24 ||  1
RAIN_HOUR                  START + 2594           // 24 ||  2
RAIN_STORM                 START + 2642           // 25 ||  2
RAIN_STORM_START           START + 2692           // 25 ||  2
RAIN_STORM_END             START + 2742           // 25 ||  2
RAIN_DAY_TOTAL             START + 2792           // 25 ||  2
RAIN_MONTH_TOTAL           START + 2842           // 25 ||  2
RAIN_YEAR_TOTAL            START + 2892           // 25 ||  2

ET_HOUR                    START + 2942           // 24 ||  1
ET_DAY_TOTAL               START + 2966           // 25 ||  1
ET_MONTH_TOTAL             START + 2991           // 25 ||  2
ET_YEAR_TOTAL              START + 3041           // 25 ||  2

SOLAR_HOUR_AVG             START + 3091           // 24 ||  2
SOLAR_DAY_HIGHS            START + 3139           // 24 ||  2
SOLAR_DAY_HIGH_TIMES       START + 3187           // 24 ||  2
SOLAR_MONTH_HIGHS          START + 3235           //  1 ||  2
SOLAR_YEAR_HIGHS           START + 3237           //  1 ||  2
```

```
UV_HOUR_AVG                 START + 3239            // 24 ||  1
UV_MEDS_HOUR                START + 3263            // 24 ||  1
UV_MEDS_DAY                 START + 3287            // 24 ||  1
UV_DAY_HIGHS                START + 3311            // 24 ||  1
UV_DAY_HIGH_TIMES           START + 3335            // 24 ||  2
UV_MONTH_HIGHS              START + 3383            //  1 ||  1
UV_YEAR_HIGHS               START + 3384            //  1 ||  1

LEAF_HOUR                   START + 3385            // 24 ||  1
LEAF_DAY_LOWS               START + 3409            // 24 ||  1
LEAF_DAY_LOW_TIMES          START + 3433            // 24 ||  2
LEAF_DAY_HIGHS              START + 3481            // 24 ||  1
LEAF_DAY_HIGH_TIMES         START + 3505            // 24 ||  2
LEAF_MONTH_LOWS             START + 3553            //  1 ||  1
LEAF_MONTH_HIGHS            START + 3554            //  1 ||  1
LEAF_YEAR_LOWS              START + 3555            //  1 ||  1
LEAF_YEAR_HIGHS             START + 3556            //  1 ||  1

SOIL_HOUR                   START + 3557            // 24 ||  1
SOIL_DAY_LOWS               START + 3581            // 24 ||  1
SOIL_DAY_LOW_TIMES          START + 3605            // 24 ||  2
SOIL_DAY_HIGHS              START + 3653            // 24 ||  1
SOIL_DAY_HIGH_TIMES         START + 3677            // 24 ||  2
SOIL_MONTH_LOWS             START + 3725            //  1 ||  1
SOIL_MONTH_HIGHS            START + 3726            //  1 ||  1
SOIL_YEAR_LOWS              START + 3727            //  1 ||  1
SOIL_YEAR_HIGHS             START + 3728            //  1 ||  1
SOIL_YEAR_HIGHS_COMP        START + 3729            //  1 ||  1


RX_PERCENTAGE             START + 3730            //  24 ||  1

SAVE_MIN                  RX_PERCENTAGE+25
SAVE_HOUR                 SAVE_MIN+1
SAVE_DAY                  SAVE_HOUR+1
SAVE_MONTH                SAVE_HOUR+2
SAVE_YEAR                 SAVE_HOUR+3
SAVE_YEAR_COMP            SAVE_HOUR+4
BAUD_RATE                 SAVE_HOUR+5
DEFAULT_RATE_GRAPH        SAVE_HOUR+6
LCD_MODEL                 SAVE_HOUR+8
LCD_MODEL_COMP            SAVE_HOUR+9
LOG_AVERAGE_TEMPS         SAVE_HOUR+11        // MUST BE AT 4092
→
```