HydroLynx

5096
Data Transmitter

Operating and Programming Manual

A102747-12

Receiving and Unpacking

Carefully unpack all components and compare to the packing list. Notify HydroLynx Systems immediately concerning any discrepancy. Inspect equipment to detect any damage that may have occurred during shipment. In the event of damage, any claim for loss must be filed immediately with the carrier by the consignee. If the equipment was shipped via Parcel Post or UPS, contact HydroLynx Systems for instructions.

Returns

If equipment is to be returned to the factory for any reason, call HydroLynx between 8:00 a.m. and 4:00 p.m. Pacific Time to request a Return Authorization Number (RA#). Include with the returned equipment a description of the problem and the name, address, and daytime phone number of the sender. Carefully pack the equipment to prevent damage during the return shipment. Call HydroLynx for packing instructions in the case of delicate or sensitive items. If packing facilities are not available, take the equipment to the nearest Post Office, UPS, or other freight service and obtain assistance with packaging. Please write the RA# on the outside of the box.

Warranty

HydroLynx Systems warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment from the factory. HydroLynx Systems' obligations under this warranty are limited to, at HydroLynx's option: (I) replacing; or (ii) repairing; any product determined to be defective. In no case shall HydroLynx Systems' liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by HydroLynx Systems, or that has been subjected to misuse, negligence, or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

Address

HydroLynx Systems, Inc.
950 Riverside Pkwy., Suite 10
West Sacramento, CA 95605
Phone: (916) 374-1800
Fax: (916) 374-1877
E-mail: hydro@hydrolynx.com

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1 Introduction

1.1 Organization of the Manual

This manual describes the HydroLynx Systems ALERT Data Transmitter Model 5096. There are six sections of the manual containing information related to a specific function or aspect of the 5096 Data Transmitter:

Introduction

The Introduction describes the manual organization to help the reader in understanding how the information is presented. It also provides a general description of the 5096 Data Transmitter and the data transmitter specifications.

Set Up and Installation

This section contains the information needed for the initial set up of the system software and hardware installation. It provides instructions on how to set up the user's personal computer for use with the 5096 Data Transmitter. Also provided are instructions for the 5096 Data Transmitter software set up, hardware installation, wiring, and power connections.

Hardware Inputs and Outputs

This section describes the sensor inputs, the Data Transmitter board features and Communication outputs.

Programming

This section describes how to program the 5096 Data Transmitter. It also lists the 5096 Data Transmitter software commands and their parameters in detail.

Maintenance, Testing and Troubleshooting

This section provides information to help the user in locating and resolving problems often encountered during initial system start-up. It also provides the maintenance requirements for maximizing the life and operating cycle of the 5096 Data Transmitter.

Appendix

This section provides listings of programming commands, command functional groupings and command parameters. It also provides assembly and wiring diagrams, and reports to help in the installation, use, and repair of the 5096 Data Transmitter.

1.2 Description of the 5096 Data Transmitter

The 5096 Data Transmitter collects, processes, and transmits analog, digital and serial interface sensor data on events and timed intervals. The collection, processing and transmission of sensor data is controlled by parameters that are easily programmed using a terminal or computer with standard communications software. Communications with the 5096 is through an RS232 port with a programmable baud rate.

Real-time data is transmitted by radio using ALERT formats.

The 5096 Data Transmitter features on board data logging capabilities. Data can be down loaded using a portable computer during on-site visits.

1.2.1 Programmable Features

System Commands

- Set the system time and time mode (Elapsed or Real time)
- Set the clock tick interval
- Set the analog sensor warmup time
- Align sensor sample and transmit timers
- Initialize parameters
- Reset the transmitter

Communication Set Up Commands

- Set the serial port baud rate
- Set the RF warm, preamble, carrier detect wait and power state and power on times
- Set the transmitter hold-off time
- Select standard or enhanced ALERT transmission formats

Sensor Set Up Commands

- Set the sensor modes
- Set the sample and transmit time intervals
- Set the change required to transmit events and alarms
- Set the calibration coefficients
- Set the sensor ID
- Read and display raw and calibrated sensor values
- Set counter sensor values and reset times

Data Logging Commands

- Enable or disable data logging
- Select logging memory full action
- Display logged data
- Show logging memory usage
- Clear logging memory

Test and Maintenance Commands

- Test command to perform level 1 or 2 test
- Read sensor values
- Initiate RF transmission with and without tone
- Control analog power
- Display and clear Reset counter

1.2.2 Other Features

Low Power, Battery Operated

- Uses low power CMOS circuitry
- Power down mode for low power consumption during stand-by
- Optional solar panel or AC charger to maintain battery voltage

Real-time Data Transmission

- Real-time data is sent to the central site computer for immediate processing
- Transmission can be generated by an event or timed interval
- Alarm transmissions send double reports and override transmit hold-off timer
- ALERT ASCII, Binary, Enhanced ALERT and Enhanced IFLOWS formats supported
- Combined wind run and direction in ALERT wind format supported

Data Logging

- Sensor data reports are logged in battery-backed memory
- Logged data can be down loaded into a portable computer on site
- Allows for stand-alone data logging or as a backup for transmitted data
- Up to 4000 event data points or 12000 timed data points are logged

1.3 Specifications for the 9601 Board

The 9601 board is included in both the 5096 and the 5096N packages.

Environment:

Operating temperature:	-40 to 65 degrees Celsius
Storage temperature:	-60 to 75 degrees Celsius
Operating humidity:	0 to 100 RH, non-condensing

Circuit Board:

Memory size:	96 Kbytes CMOS EPROM - 64 Kbytes CMOS RAM - 32 Kbytes, Battery backed
Manual Controls:	Reset switch Test switch Station ID switches
Diagnostic LEDs:	Test Error LED Power Error LED Sensor Power LED TX-on LED Test LED Run LED
Current draw:	< 300 microAmps (120 typical)
Supply Voltage:	10.5 to 18.0 Vdc (12.2 to 14.5 Vdc Battery operated with Radio)
Baud rate: (Serial port)	300 default, 1200, 2400, 4800, 9600
Baud rate: (transmitter)	300
CPU type:	80C196 (5MHz)
Clock:	Real-Time software clock

Digital Inputs

4 digital channels with up to 100 event triggers/second

2 channels:	up/down accumulator
2 channels:	up only accumulator with pre-divide counter
Programmable:	Enable/disable event status
	ALERT wind format (up only) - wind run and direction
	Increment/decrement mode (up/down only)
	Pre-divide counter (up only)
	Transmit time interval (no change required to transmit)
	Change required to transmit an event
	Change required to transmit an alarm
	Calibration coefficients
	Accumulator reset time
	Sensor ID

1 digital channel with 8 status (binary inputs)

Programmable:	Sample time interval
	Transmit time interval (no change required to transmit)
	Enable transmission of zeros
	Status change (any or all) to transmit a sample
	Status change (any or all) to transmit an alarm
	Sensor ID

Analog Inputs

8 analog channels (10 bit resolution with +/- 0.24% non-linearity error)
7 channels (0-5 VDC)
1 channel (battery voltage)

4 Supply voltages:	Vbatt (12 VDC nominal)	non-switched
	+5 VDC	non-switched
	Vsw (12 VDC nominal)	switched
	Vref (+5 VDC)	switched

Programmable:	Event threshold (no sample transmission until threshold reached)
	Transmit time interval (no change required)
	Sample time interval
	Change required to transmit a sample
	Change required to transmit an alarm
	Calibration coefficients
	Sensor ID

Serial Inputs

8 serial channels to report data set by the WRITE-SERIAL command.

1.4 Specifications for the 5096

The 5096 is housed within an 8 inch diameter aluminum canister and is designed to fit inside HydroLynx Systems stand pipes used on most HydroLynx Systems weather stations. The 5096 is generally equipped with a radio and is primarily used in remote flood warning telemetry applications.

Enclosure:

Type:	Aluminum canister
Size:	8 inch diameter x 23 in high
Weight:	19 lbs (with battery)
Shipping weight:	12 lbs (Battery shipped separately)
Sensor inputs:	Keyed MS Male connectors

Sensor Inputs for Station Packages:

Package	Sensor Inputs
5096-54	1 Precipitation digital input
5096-88	1 Precipitation digital, 1 Water level digital input
5096-90	1 Precipitation digital, 1 Water level digital input, 2 Water level analog inputs
5096-81	1 Precipitation digital, 1 Water level digital, 1 Wind speed digital, 1 Counter digital, 7 Analog inputs
5096-82	1 Precipitation digital, 1 Water level digital, 1 Wind speed digital, 1 Counter digital, 7 Analog inputs with 3 second analog warm time.
5096-ST	8 Digital status inputs (10 pin MS Female connector)

Power:

Battery:	12 Vdc, 9.5 Amp-hour rechargeable gel cell battery, optionally maintained by an AC charger or solar panel.
External connector:	3 pin MS Male Connector

Signal Outputs:

Antenna:	BNC female bulkhead
Serial Console:	9 pin D-type RS232C Female mounted on circuit board
5096-RS232:	7 pin MS male bulkhead connector (optional)

1.5 Specifications for the 5096N

The 5096N is the 5096 circuit board mounted into a NEMA type 4X fiberglass enclosure. The 5096N is designed for outdoor mounting onto a panel or a mast. The 5096N can be equipped with a radio and used as part of a telemetry system, or it can be used as a data logger.

Enclosure:

Type:	NEMA type 4X fiberglass
Size:	15 ½" X 13 ½" X 6 ½" NEMA enclosure Type 4X
Weight:	16 lb (with battery)
Shipping weight:	12 lbs (Battery shipped separately)
Sensor inputs:	Case is provided with 7 cable strain reliefs.

Sensor Inputs for Station Package:

Connections: Screw Terminal Interconnect PCB.

Package	Sensor Inputs
5096-N	4 digital, 7 analog, and 8 digital status inputs.
5096-S	4 digital, 7 analog, and 8 digital status inputs, 8 serial inputs.

Power:

Battery:	12 Vdc, 7 Amp-hour rechargeable gel cell battery, optionally maintained by an AC charger or solar panel.
External connector:	3 pin MS Male Connector

Signal Outputs:

Antenna:	N-type female lightning arrester
Serial Console:	9 pin D-type RS232C Female mounted on circuit board
5096-RS232:	7 pin MS male bulkhead connector (optional)

2 Set Up and Installation

2.1 Introduction to Software Set Up

This section describes the initial steps to set up your 5096 Data Transmitter programmable features. This includes console set up and communication verification, station ID set up, system and sensor parameter set up, and data logging set up.

Also included in this section are the commands used after installation for testing and maintenance, and logged data retrieval.

2.1.1 Operator's Console Set Up

The operator's console is the primary means for communicating with the 5096 Data Transmitter. From the console, the operator can display, modify and log to disk all system parameters. Data stored in the 5096 Data Transmitter logging memory can be down loaded, displayed and logged to disk on the console.

The console can be a palmtop, notebook or desktop computer which uses HydroLynx Systems 5073PT Palmtop 5096 Programming Software, Microsoft Windows Terminal software, Microsoft HyperTerminal software, or any other terminal emulation software. A serial ASCII terminal can be used in place of a personal computer.

The console is connected to the 5096 Data Transmitter RS232 port, J5, with a custom serial cable such as HydroLynx Systems Model 5071C-5096. See the Console RS232 cable, 9 Pin to 9 Pin drawing AC104020 in Section 6.2.

The default baud rate used by the 5096 is 300 baud for all EPROM types except S. The default baud rate for EPROM type S is 9600 baud. The baud rate may be changed on the 5096 by command after communication with the 5096 has been established. The baud rate must then be changed on the console to match that of the 5096. See the command SET-BAUD in Section 4.7.

In addition to the baud rate the following RS-232 protocol settings must be used:

No Parity	Full duplex (FDX) for version 3 firmware
8 Data bits	Half duplex (HDX) for version 4 firmware
1 Stop bit	

To start communication with the 5096 Data Transmitter from your computer console:

1. Start the communication software on your console computer.

2. Connect your console computer to the 5096 Data Transmitter RS232 port, J5. If the 5096 Data Transmitter is powered up, the RUN LED will turn on.

3. Verify the proper communication baud rate for your communication software.

4A. 5096 Data Transmitter was off.

Power-up the 5096 Data Transmitter. The 5096 will follow its power up sequence checks, display the HydroLynx Systems copyright, the firmware part number, version number, release date and then display the > prompt.

4B. 5096 Data Transmitter was already on.
Press the [Enter] key and the 5096 should display the > prompt.

If you do not get the 5096 > prompt:

1. Check all connections.
Is your cable connected securely to both the 5096 Data Transmitter RS232 port, J5 and the console serial port?

2. Check for connection to proper console serial port.
Is you cable connected to the serial port set for your communication software (COM1, COM2, ...)?

3. Check serial communication parameters.
Is your communication software set to 300 baud, No parity, 8 Data bits, 1 Stop bit? It is it, try using another baud rate in case someone left the 5096 baud rate set to something other than the default, e.g. 9600.

4. Check your cable.
Are you using the correct type of cable? The HydroLynx Systems cable 5071C-5096 will cause the 5096 to turn on the RUN LED when it is connected to the 5096 RS232 port, J5 regardless of whether or not it is connected to the console correctly. Disconnect the cable from your console and check if the RUN LED comes on. If it does, replace your cable.

5. Check your power, Level 1 test.
When you power up the 5096 Data Transmitter it will perform its power up sequence checks which turn on and off LEDs (see Section 5.2.1). If this power up sequence does not occur, check your power.

6. Check your sensors.
Damaged or incorrect sensors or sensor connections can effect proper 5096 Data Transmitter performance. Disconnect all sensors and try again.

2.1.2 Station ID Switches

Check to see that the ID switches are set to the correct station ID number. The default ID numbers for sensors are based on the station ID number.

The station ID is set in the ID switches with the least significant digit (ones) in switch ID0 and the highest significant digit (thousands) in switch ID3.

For example, to set a station ID of 1930, set the ID switches to:

ID3	to	1
ID2	to	9
ID1	to	3
ID0	to	0

Note that the ALERT radio transmission format support sensor ID numbers from 0 - 8191. The ALERT ASCII format is used for sensor ID numbers 0 - 99 and the Binary format is used for sensor ID numbers 100 - 8191. The ALERT Binary format is recommended for the greatest sensor data range.

2.1.3 Initial Parameter Set Up

There are a number of commands that are used to set up the 5096 Data Transmitter parameters. The 5096 firmware versions 3.2 and later have default parameters set for the station package configuration (see Section 1.4 and 1.5). Only the station ID number must be set before the unit is installed. Sensor parameters can be changed for the sensors included in the station package. Commands effecting sensors not included in the station package are not available.

5096 firmware versions prior to 3.2 must have all command parameters checked to insure proper 5096 performance.

The programming sequence recommended to set up the 5069 parameters is provided below. Complete information on commands is provided in Command Descriptions, Section 4.7. Command Parameter Descriptions are provided in Section 4.8.

1. Initial Set Up	INIT	Initial Set Up - Sets all system and sensor parameters to their default values, sets sensor ID numbers based on the station ID number set in the switches and clears logging memory. If your 5096 transmitter firmware is version 3.3 or later, you can hold down the **TEST** switch and press the **RESET** switch to execute the INIT command.
2. Set baud rate	SET-BAUD	Setting a higher baud rate speeds up the 5096 display of system and sensor parameters making programming session go quicker.

3. System Set Up	SHOWALL	Display current system parameters.
	SET-HOLDOFF	Set the transmitter hold-off timer.
	SET-RFWARM	Set the RF tx warm, preamble, carrier detect wait time, wait radio power state, and power on time. You may have to increase the RF warm time for systems that use repeaters that are not the store and forward type. You will have to increase the RF power on time if you switch from a crystal to a synthesized radio without changing firmware.
	SET-ENH	Select the ALERT transmission format.
	SET-SPT	Set the clock time step.
	RESETINIT	Disable when reprogramming 5096 parameters.
4. Sensor Set Up	SET-AN	Program ANALOG sensors.
	SET-WARM	Set the ANALOG warm time.
	SET-BATT	Program the BATTERY sensor.
	SET-EV	Program EVENT sensors.
	SET-EVRESET	Program EVENT sensor reset time.
	SET-CTR	Program COUNTER sensors.
	SET-CTRRESET	Program COUNTER sensor reset time.
	SET-WI	Program WIND sensors.
	SET-PK	Program PEAK WIND sensors.
	SET-ST	Program the STATUS sensor.
	SET-SERIAL	Program SERIAL sensors.
	WRITE-EV	Write EVENT sensor values.
	WRITE-CTR	Write COUNTER sensor values.
	WRITE-SERIAL	Write SERIAL sensor values.
	ALIGN	Aligns all timers.
5. Logging Set Up	SET-MEM	Enable data logging and overwriting when full.
	TIME-MODE	Set the time mode.
	TIME=	Set the transmitter time.
	CLEAR-MEM	Clear data logging memory.

2.1.4 After Installation Testing and Maintenance

1. Check sensors	READ-AN	Read ANALOG sensor values.
	READ-EV	Read EVENT sensor accumulator values.
	READ-BATT	Read the BATTERY voltage.
	READ_IDSW	Read the Station ID switches.
2. Down load data	SET-BAUD	Set data transfer rate.
	TIME=	Check the transmitter time.
	GET-MEM	Down load data to console.
	CLEAR-MEM	Clear data logging memory.

2.1.5 Down Load Logged Data

When visiting the site for any reason, make entries in your notebook's Data Sheets describing the purpose of the visit and everything done. An example Maintenance Report is provided in Section 6.2.

Down load data from the 5096 Data Transmitter using the GET-MEM command before clearing the memory, or changing any parameters or replacing the battery (see Section 2.2.5). The READ command will show the current sensor values, not the logged data.

Connect the console to the 5096 and verify communication as described in Section 2.1.1.

1. Set baud rate	SET-BAUD	Setting a higher baud rate speeds up the 5096 display of logged data making the retrieval session go quicker.
2. Verify time	TIME-MODE	Verify the time mode, *Real* or *Elapsed Time*.
	TIME=	Verify the current transmitter time. You may want to adjust the logged data report times for any time error.
3. Verify readings	READ-...	Verify correct calibrated readings for sensors. You may want to adjust the logged data report values for any data reading errors.
4. Start logging		Start logging on the console using the command sequence required for your software.
HydroLynx 5073PT Palmtop software		On the *File* menu pull-down select *Capture Text...* and enter a file name.
Microsoft Windows Terminal software		On the *Transfer* menu pull-down select *Receive Text File...* and enter a file name.
Microsoft HyperTerminal software		On the *Transfer* menu pull-down, select *Capture Text...* and enter a file name.
		Enter a filename in which to store the logged data reports as they are displayed. Use a .txt file extension to simplify viewing the file later under Microsoft Windows. Enter filename that indicates the station and data retrieval time (month). For example at the Bigcreek gauge in April, create a file 'bigcreek-apr.txt'.

5A. Down load all	GET-MEM	Down load data from the 5096. All logged data reports are logged to the file as they are displayed. Logged data display starts with the oldest report logged.
5B. Down load ID	GET-MEM ***id***	Down load data for one sensor by entering the sensor ID number after the GET-MEM command.
5C. Down load period	GET-MEM ***,h1,..***	Down load data for a time period by entering the start and end time after the GET-MEM command. The start time is entered as: ***h1,m1,YYY1,M1,D1,*** and the end time is entered as: ***h2,m2,YYY2,M2,D2*** If no sensor ID is entered, all sensor data for the time period is down loaded.
6. Stop logging		Stop logging.
HydroLynx 5073PT Palmtop software		On the *File* menu pull-down select *Capture Text...* and when asked to *Cancel Capture Text?*, answer tap *Yes*.
Microsoft Windows Terminal software		On the *Transfer* menu pull-down select *Stop*.
Microsoft HyperTerminal software		On the *Transfer* menu pull-down, select *Capture Text...* and *Stop*.
7. Review file		Display the contents of the logging file to verify that data was down loaded correctly.
8. Clear memory	CLEAR-MEM	Clear the 5096 logging memory.
9. Change set up	SET-... WRITE-... ALIGN CLEAR-MEM	Change sensor parameters if necessary. Set accumulator values to new correct values if necessary. Align sensor timers if any changed. Clear the 5096 logging memory again after aligning parameters.

2.1.6 Sensor Set Up Examples

Version 3.2 and later have default sensor parameters set for standard data collection requirements. However, special data collection requirements or sensor configurations will require sensor parameter changes.

The 5096 Data Transmitter transmits data reports when an event occurs and/or on timed intervals. An event occurs when a digital sensor triggers a change in its accumulator value. A timed interval is a programmable timer which triggers a sensor reading and/or a data report transmission.

The 5096 Data Transmitter reads raw (**RAW**) sensor values, calibrates the values using sensor calibration coefficients and transmits the calculated (**CAL**) data to the central site. Sensor calibration coefficients can be used to calculate **CAL** data in engineering units. Both the **RAW** and **CAL** data values are integers (no decimal point).

The central site computer stores the transmitted **CAL** data in its database and converts the **CAL** data into engineering units (decimal points included).

An important consideration in calibrating sensor data on the 5096 Data Transmitter is that the ALERT transmission format limits data values to 11 bits. This limits the data reports to values of 0 to 2047. A number greater than 2047 only has its lower 11 bits transmitted. For example, 2049 is transmitted as 1. A number less than 0 is transmitted as 2048 plus the negative number. For example, -1 is transmitted as 2047.

Before changing station or sensor parameters, record the current parameters. Use the SHOWALL command to display all parameters and the console software to log to a disk file. Refer to Section 2.1.5 for information on logging to disk files.

Complete descriptions of commands and parameters is provided in Sections 4.7 and 4.8.

Sensor Set Up: EVENT Sensors

When an EVENT sensor triggers an event its **RAW** accumulator is incremented or decremented. **CAL** data is calculated from the **RAW** accumulator using sensor calibration coefficients when the **Event Detection** flag is **ENABLED** and change criteria is met. The change criteria is met when the difference between the newly calculated **CAL** data and the last transmitted **CAL** data is equal to or greater than the **Change for Alarm** or **Change to Txmit** parameters.

EVENT sensor data is transmitted on the time interval set in the **Transmit Intervl** parameter. The **Transmit Intervl** parameter units are in seconds. Timed reports are not transmitted when this parameter is zero.

5050P, 5050P-MS Tipping Bucket

The 5050P and 5050P-MS Tipping Bucket sensors are connected to the non-rotated 5 pin top plate connector labeled PRECIPITATION which is connected to EVENT 2 input. Type the command SET-EV **2** to display the current parameters for EVENT 2. The default parameters for EVENT 2 are:

```
> SET-EV 2[Enter]
EVENT 2 ID      : id
Event Detection : ENABLED
Event Mode      : 6
Transmit Intervl: 43200 sec(s)
Change to Txmit : 1
Change for Alarm: 2
Calibration  CAL= (RAW * 1)/1 + 0
```

The 5050P is calibrated to tip after it accumulates 1 millimeter (0.03937 inches) of rainfall. With the ***a***, ***b*** and ***c*** parameters set at **1**, **1**, and **0** respectively, the **CAL** data and **RAW** accumulator values are equal. Therefore the **CAL** data transmitted to the central site is an accumulated rainfall count in millimeters (mm). The central site computer software converts the data into engineering units (inches or millimeters).

The 5050P-MS is also calibrated to tip after it accumulates 1 millimeter (0.03937 inches) of rainfall. However, its read switch is rotated so the magnet does not stay over the switch after the bucket tips. This modification is done to eliminate the possibility of false counts due to static discharge on poorly grounded gauges. With the reed switch rotated, a 5050P-MS bucket tip sends a momentary pulse which causes two trigger line state changes in the 5096 Data Transmitter. **Event Mode** 6 instructs the 5096 Data Transmitter to only increment the accumulator once when two trigger line state changes are less than 200 milliseconds apart.

A **Change to Txmit** of **1** transmits the **CAL** data for each tip. A **Change for Alarm** of **2** transmits an alarm report If the bucket tips twice during the transmission hold-off period. A **Transmit Intervl** of **43200** transmits the tipping bucket **CAL** data every 12 hours.

For standard data collection applications the default settings need not be changed.

2500, 2501 Two Wire Precipitation Gage

The 2500 and 2501 are connected to the non-rotated 5 pin top plate connector labeled PRECIPITATION which is connected to EVENT 2 input.

For firmware versions older than 4.2, the **Event Mode** parameter, ***mode***, must be changed from the default parameter setting to mode **2** for the Two Wire Precipitation Gage to work properly with the 5096 Data Transmitter. Count the commas between ***sn*** and the ***mode*** parameter. There are 2 commas. Type the following command to set this parameter and

you will get the response:

```
> SET-EV 2,,2[Enter]
EVENT 2 ID      : id
Event Detection : ENABLED
Event Mode      : 2
Transmit Intervl: 43200 sec(s)
Change to Txmit : 1
Change for Alarm: 2
Calibration  CAL= (RAW * 1)/1 + 0
```

The 2500 and 2501 are calibrated to increment the EVENT 2 accumulator for each .01 inches or rainfall. The 2500M and 2501M are calibrated to increment the EVENT 2 accumulator for each millimeter of rainfall. For standard data collection applications no other parameter changes are required.

5096ELFT Float Type Sensor

The 5096ELFT Float Type Sensor is connected to the rotated 5 pin top plate connector labeled DIGITAL which is connected to EVENT 1 input. Type the command SET-EV **1** to display the current parameters for EVENT 1. The default parameters for EVENT 1 are:

	5096-81, 88, 90	5096N
`> SET-EV 1`**[Enter]**		
`EVENT 1 ID      :`	***id***	***id***
`Event Detection :`	`ENABLED`	`DISABLED`
`Event Mode      :`	`4`	`4`
`Transmit Intervl:`	`0 sec(s)`	`0 sec(s)`
`Change to Txmit :`	`1`	`1`
`Change for Alarm:`	`10`	`10`
`Calibration  CAL=`	`(RAW * 1)/1 + 0`	`(RAW * 1)/1 + 0`

Changes to the EVENT 1 parameters are made with the SET-EV command. First type the command SET-EV with a question mark to get the command parameter list:

```
> SET-EV ?[Enter]
SET-EV sn,{en_ev},{mode},{t_int},{cgt},{cga},{a},{b},{c},{id}
```

To enable **Event Detection** on the EVENT 1 sensor set the ***en_ev*** parameter to **1**. Type the following command to set this parameter and you will get the response:

```
> SET-EV 1,1[Enter]
EVENT 1 ID      : id
Event Detection : ENABLED
Event Mode      : 4
Transmit Intervl: 0 sec(s)
```

```
Change to Txmit : 1
Change for Alarm: 10
Calibration  CAL= (RAW * 1)/1 + 0
```

The standard 5096ELFT has 6 reed switches and a 375 millimeter (mm) pulley making each increment or decrement a 5mm (0.016405 feet) change in level. Each time a reed switch closes the **RAW** accumulator is incremented or decremented depending on the direction of wheel movement. With the ***a***, ***b*** and ***c*** parameters set at **1**, **1**, and **0** respectively, the **CAL** data and **RAW** accumulator values are equal. Therefore the **CAL** data transmitted to the central site is a level count in 5mm increments. The central site computer converts the data into engineering units (feet or meters) and adds a base value to adjust for the sensor datum. An observed level reading must be taken when the 5096 Data Transmitter is installed or the EVENT 1 sensor parameters are changed to allow programming of the base value in the central site computer software.

A **Change to Txmit** of **1** transmits the **CAL** data for each increment or decrement in level count. A **Change for Alarm** of **10** transmits an alarm report If the level changes by ten counts during the transmission hold-off. A **Transmit Intervl** of **0** disables timed reports.

For standard data collection applications the default settings need not be changed.

If wave action frequently causes the level to change by one or more counts, a **Change to Txmit** of **1** will transmit many meaningless reports. Decrease the sensitivity (therefore the number of reports transmitted) by increasing the **Change to Txmit** parameter. For example, set the **Change to Txmit** parameter, ***cgt***, to **5.** The sensor will still measure water level in 5mm increments. However, it only transmits reports when the **CAL** level data changes by 25mm since the last transmitted value.

Count the commas between ***sn*** and the ***cgt*** parameter. There are 4 commas. Type the following command to set this parameter and you will get the response:

```
> SET-EV 1,,,,5[Enter]
EVENT 1 ID      : id
Event Detection : ENABLED
Event Mode      : 4
Transmit Intervl: 0 sec(s)
Change to Txmit : 5
Change for Alarm: 10
Calibration  CAL= (RAW * 1)/1 + 0
```

The **CAL** data for a 5096ELFT is relative to the central site computer calibration. If the pulley on the 5096ELFT is rotated, as might happen during testing and maintenance, and not returned to its starting position, the **RAW** and **CAL** data values will change and the sensor is no longer in calibration with the central site computer.

There are two methods to recalibrate. One method is to take observed level reading and recalibrate the central site computer. The second method is to restore the **CAL** data to its

value prior to the station being serviced if there has been no change in water level.

To recalibrate using the second method, before servicing the station, read the **RAW** and **CAL** data values for EVENT 1. Type the following command and get the response:

```
> READ-EV 1[Enter]
EVENT 1 ID      : id
Raw Reading     : raw
Cal Reading     : cal
```

After servicing the station, reset the **RAW** and **CAL** data values for EVENT 1. For example, to restore a **RAW** value of **12** type the following command and get the response:

```
> WRITE-EV 1,12[Enter]
EVENT 1 ID      : id
Raw Reading     : 12
Cal Reading     : 12
```

Absolute Encoder Sensor

The Absolute Encoder Sensor is connected to the rotated 5 pin MS connector which is connected to the 5096 Data Transmitter RS232 port, J5 through a serial switch. Type the command SET-EV **1** to display the current parameters for EVENT 1.

Changes to the EVENT 1 parameters are made with the SET-EV command. First type the command SET-EV with a question mark to get the command parameter list:

```
> SET-EV ?[Enter]
SET-EV sn,{en_ev},{mode},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
```

To select the absolute encoder type to transmit every hour, sample the encoder signal every minute and transmit on changes of 5 calibrated counts set the ***en_ev*** parameter to **0** (disabled), the ***mode*** parameter to **12**, the ***t_int*** parameter to **3600**, the ***s_int*** parameter to **60** and the ***cgt*** parameter to **5**. Type the following command to set this parameter and you will get the response:

```
> SET-EV 1,0,12,3600,60,5[Enter]
EVENT 1 ID      : id
Event Detection : DISABLED
Event Mode      : 12
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 5
Change for Alarm: 10
Calibration  CAL= (RAW * 1)/1 + 0
```

Sensor Set Up: ANALOG Sensors

Relative humidity, temperature, pressure transducers, barometric pressure, wind direction and battery voltages are ANALOG sensors.

Standard ANALOG sensors are calibrated at the factory for a 0 to 5 Vdc analog output over the measured range. The relationship between the sensor's range and 0 to 5 Vdc analog signal is linear.

The 5096 Data Transmitter has a 10 bit (0-1023) resolution analog to digital converter (ADC). This means that there are 1024 possible values when converting an analog signal into a digital value. The relationship between the analog signal (0 - 5Vdc) and the digital value (0 - 1023) is linear.

Since the sensor's measured range is linear to the analog output and the analog output is linear to the ADC converted digital value, any point along the sensor's measured range can be expressed as a digital value. For example, if a Relative Humidity (RH) Sensor with a measured range of 0 to 100%RH measures 80%RH, the analog signal would be 4.0Vdc. The ADC converts the 4.0Vdc to a digital value of 818.

On the time intervals set in the **Sample Interval** and **Transmit Intervl** parameters the 5096 Data Transmitter reads an ANALOG sensor analog signal, converts the signal with the ADC, computes a **RAW** digital value and calculates the **CAL** data using sensor calibration coefficients. Negative **CAL** data values are not valid and will be set to zero. The **Sample Interval** and **Transmit Intervl** parameter units are in seconds. To disable an ANALOG sensor, set both the **Transmit Intervl** and **Sample Interval** to **0.**

On sample intervals, if the **CAL** data is equal to or greater than the **Event Threshold** and the difference between the newly calculated **CAL** data and the last transmitted **CAL** data is equal to or greater than the **Change for Alarm** or **Change to Txmit** parameters the sensor **CAL** data is transmitted. On transmit intervals, the **CAL** data is transmitted regardless of the **CAL** data value or any change in the **CAL** data value.

2048RH/T Relative Humidity and Temperature

The 2048RH/T Relative Humidity and Temperature sensors are connected to the rotated 6 pin top plate connector labeled TEMPERATURE & HUMIDITY. The relative humidity sensor is connected to ANALOG 1 and the temperature sensor is connected to ANALOG 2. The standard range for the relative humidity sensor is 0 to 100%RH. The standard range for the temperature sensor is -40 to 140 degrees Fahrenheit (˚F).

Type the command SET-AN **1** to display the current parameters for ANALOG 1. The default parameters for ANALOG 1 are:

	5096-81	**5096N**
> SET-AN 1[Enter]		
ANALOG 1 ID :	***id***	***id***
Event Threshold :	**0**	**0**
Transmit Intervl:	**10800 sec(s)**	**0 sec(s)**
Sample Interval :	**300 sec(s)**	**0 sec(s)**
Change to Txmit :	**13**	**1**
Change for Alarm:	**52**	**50**
Calibration CAL =	**(RAW * 1)/4 + 0**	**(RAW * 1)/4 + 0**

Type the command SET-AN **2** to display the current parameters for ANALOG 2. The default parameters for ANALOG 2 are:

	5096-81	**5096N**
> SET-AN 2[Enter]		
ANALOG 2 ID :	***id***	***id***
Event Threshold :	**0**	**0**
Transmit Intervl:	**10800 sec(s)**	**0 sec(s)**
Sample Interval :	**300 sec(s)**	**0 sec(s)**
Change to Txmit :	**3**	**1**
Change for Alarm:	**12**	**50**
Calibration CAL =	**(RAW * 1)/4 + 0**	**(RAW * 1)/4 + 0**

An **Event Threshold** of **0** allows all sample **CAL** data to be transmitted if the change criteria is met. A **Transmit Intervl** of **10800** transmits the **CAL** data every 3 hours regardless of value or change. The ANALOG sensors are read and the **CAL** data is calculated on a **Sample Interval** of **300** (5 minutes). The ***a***, ***b*** and ***c*** parameters of **1**, **4**, and **0** calculate **CAL** data for a range of 0 to 255.

The relative humidity sensor **CAL** data transmitted to the central site has an increment size of 100%RH divided by 255 equals 0.39%RH. A **Change to Txmit** of **13** transmits the **CAL** data if it has changed by approximately 5%RH since the last **CAL** data transmitted (13 × 0.39%RH = 5.1%RH). A **Change for Alarm** of **52** transmits the **CAL** data if it has changed by approximately 20%RH since the last **CAL** data transmitted (52 × 0.39%RH = 20.4%RH).

The temperature sensor **CAL** data transmitted to the central site has an increment size of 180˚F (140˚F - -40˚F) divided by 255 equals 0.7˚F. A **Change to Txmit** of **3** transmits the **CAL** data if it has changed by 2.1˚F since the last **CAL** data transmitted (3 × 0.7˚F = 2.1˚F). A **Change for Alarm** of **12** transmits the **CAL** data if it has changed by 8.4˚F since the last **CAL** data transmitted (12 × 0.7˚F = 8.4˚F).

For standard data collection applications the default settings need not be changed.

Changes to the ANALOG sensor parameters are made with the SET-AN command. First type the command SET-AN with a question mark to get the command parameter list:

```
> SET-AN ?[Enter]
SET-AN sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
```

To program the 5096 Data Transmitter to read the relative humidity sensor and calculate the **CAL** data every 15 minutes, set the **Sample Interval** parameter to **900**. To transmit the sensor data value every day regardless of any **CAL** data change, set the **Transmit Intervl**, ***t_int***, parameter to **86400** (24 hours). Count the commas between ***sn*** and the ***t_int*** parameter. There are 2 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 1,,86400,900[Enter]
ANALOG 1 ID     : id
Event Threshold : 0
Transmit Intervl: 86400 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 13
Change for Alarm: 52
Calibration CAL = (RAW * 1)/4 + 0
```

To increase the sensitivity of the sample time reporting criteria, decrease the **Change to Txmit**, ***cgt***, parameter. For example, to transmit changes in relative humidity of 1%RH set this parameter to **3** (3 × 0.39%RH = 1.2%RH). Count the commas between ***sn*** and the ***cgt*** parameter. There are 4 commas. Type the following command to set this parameter and you will get the response:

```
> SET-AN 1,,,,3[Enter]
ANALOG 1 ID     : id
Event Threshold : 0
Transmit Intervl: 86400 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 3
Change for Alarm: 52
Calibration CAL = (RAW * 1)/4 + 0
```

The calibration coefficients of an ANALOG sensor can be changed to display and transmit **CAL** data in engineering units. The formula for computing calibration coefficients is to set the ***a*** parameter to the calculated **CAL** data range and set the ***b*** parameter to the **RAW** digital value range. Set the ***c*** parameter to the **CAL** data value to display when the **RAW** digital value is 0. Positive and negative numbers can be used for the ***a***, ***b*** and ***c*** parameters but the resulting **CAL** data value cannot be greater than 2047 or less than zero. Only integer (no decimal points) **CAL** data is saved. Multiply the ***a*** and ***c*** parameters by factors of ten to change data precision.

For example, to display relative humidity sensor **CAL** data in tenths of %RH set the ***a***

parameter to the desired **CAL** data range (100%RH - 0%RH = 100). Set the ***b*** parameter to the **RAW** digital value range (1023 - 0 = 1023). The ***c*** parameter is 0 since **CAL** data is 0%RH when the **RAW** digital value is 0. Adjust the ***a*** and ***c*** parameters by a factor of ten to make the data precision 0.1%RH (100 × 10 = 1000 and 0 × 10 = 0).

Test the calibration coefficient accuracy using the previous example of relative humidity at 80% and an **RAW** digital of 818. The **CAL** data is calculated as:

CAL = (818 × 1000) ÷ 1023 + 0 = 799.6
CAL = 799 with a remainder of 6

Round up the calculated **CAL** data by increasing the ***c*** parameter by 1.

CAL = (818 × 1000) ÷ 1023 + 1 = 800.6
CAL = 800 with a remainder of 6

A **CAL** data value of 800 is transmitted to the central site.

Reprogram the **Change to Txmit**, ***cgt***, and **Change for Alarm**, ***cga***, parameters when the **CAL** data is changed to display engineering units. For example, to compute the ***cgt*** parameter to transmit when the **CAL** data changes by 5%RH, divide this change by the **CAL** data precision (5%RH ÷ 0.1%RH = 50). Likewise, to compute the ***cga*** parameter to transmit when the **CAL** data changes by 20%RH, divide this change by the **CAL** data precision (20%RH ÷ 0.1%RH = 200). Count the commas between ***sn*** and the ***cgt*** parameter. There are 4 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 1,,,,50,200,1000,1023,1[Enter]
ANALOG 1 ID     : id
Event Threshold : 0
Transmit Intervl: 86400 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 50
Change for Alarm: 200
Calibration CAL = (RAW * 1000)/1023 + 1
```

Remember to adjust the central site computer calibration when you change the calibration in the 5096 Data Transmitter.

5050LLPTK Pressure Transducer

The 5050LLPTK sensor is connected to the rotated 4 pin rotated top plate connector labeled ANALOG. The pressure transducer sensor is connected to ANALOG 3. The pressure transducer calibrated range can be ordered from the factory. A standard calibrated range for pressure transducers is 25.5 feet(ft).

Type the command SET-AN **3** to display the current parameters for ANALOG 3. The default parameters for ANALOG 3 are:

	5096-81, 90	**5096N**
> SET-AN 3[Enter]		
ANALOG 3 ID :	***id***	***id***
Event Threshold :	**0**	**0**
Transmit Intervl:	**10800 sec(s)**	**0 sec(s)**
Sample Interval :	**300 sec(s)**	**0 sec(s)**
Change to Txmit :	**3**	**1**
Change for Alarm:	**30**	**50**
Calibration CAL =	**(RAW * 1)/4 + 0**	**(RAW * 1)/4 + 0**

An **Event Threshold** of **0** allows all sample **CAL** data to be transmitted if the change criteria is met. A **Transmit Intervl** of **10800** transmits the **CAL** data every 3 hours regardless of value or change. The ANALOG sensor is read and the **CAL** data is calculated on a **Sample Interval** of **300** (5 minutes). The ***a***, ***b*** and ***c*** parameters of **1**, **4**, and **0** calculate **CAL** data for a range of 0 to 255.

The pressure transducer sensor **CAL** data transmitted to the central site has an increment size of 25.5ft divided by 255 which equals 0.1ft. A **Change to Txmit** of **3** transmits the **CAL** data if it has changed by 0.3ft since the last **CAL** data transmitted (3 × 0.1ft = 0.3ft). A **Change for Alarm** of **30** transmits the **CAL** data if it has changed by 3ft since the last **CAL** data transmitted (30 × 0.1ft = 3ft).

For standard data collection applications the default settings need not be changed.

Changes to the ANALOG sensor parameters are made with the SET-AN command. First type the command SET-AN with a question mark to get the command parameter list:

> SET-AN ?[Enter]
SET-AN *sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}*

To program the 5096 Data Transmitter to read the pressure transducer sensor and calculate the **CAL** data every minute, set the **Sample Interval**, ***s_int***, parameter to **60**. To transmit the sensor data value every hour regardless of any **CAL** data change, set the **Transmit Intervl**, ***t_int***, parameter to **3600** (1 hour). Count the commas between ***sn*** and the ***t_int*** parameter. There are 2 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 3,,3600,60[Enter]
ANALOG 3 ID      : id
Event Threshold : 0
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 3
Change for Alarm: 30
Calibration CAL = (RAW * 1)/4 + 0
```

The calibration coefficients for an ANALOG sensor can be changed to display and transmit **CAL** data in engineering units. The formula for computing calibration coefficients is to set the ***a*** parameter to the calculated **CAL** data range and set the ***b*** parameter to the **RAW** digital value range. Set the ***c*** parameter to adjust the **CAL** data value for the pressure transducer zero offset. Positive and negative numbers can be used for the ***a***, ***b*** and ***c*** parameters but the resulting **CAL** data value cannot be greater than 2047 or less than zero. Only integer (no decimal points) **CAL** data is saved. Multiply the ***a*** and ***c*** parameters by factors of ten to change data precision.

For example, if a pressure transducer has a calibrated range of 10ft and a measurement precision of 0.01ft is desired set the ***a*** parameter to the **CAL** data range (10ft - 0ft = 10). Set the ***b*** parameter to the **RAW** digital value range (1023 - 0 = 1023). Adjust the ***a*** parameter by a factor of one hundred to make the data precision 0.01ft (10 × 100 = 1000).

Count the commas between ***sn*** and the ***a*** parameter. There are 6 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 3,,,,,,1000,1023[Enter]
ANALOG 3 ID      : id
Event Threshold : 0
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 3
Change for Alarm: 30
Calibration CAL = (RAW * 1000)/1023 + 0
```

Due to calibration and sealing procedures at the factory, a pressure transducer **RAW** digital value may not read 0 when the pressure transducer is not submerged. This zero offset can be eliminated by setting the ***c*** parameter to a negative number adjusting the **CAL** data to zero.

To compute the ***c*** parameter after setting the ***a*** and ***b*** parameters, take a reading for the pressure transducer when it is not submerged. Type the following command to read the pressure transducer on ANALOG 3 and you will get the response:

```
> READ-AN 3[Enter]
ANALOG 3 ID      : id
Raw Reading      : 3
```

```
Cal Reading      : 2
```

Set the ***c*** parameter to the negative **Cal Reading** displayed, **-2**. Count the commas between ***sn*** and the ***c*** parameter. There are 8 commas. Type the following command to set this parameter and you will get the response:

```
> SET-AN 3,,,,,,,,-2[Enter]
ANALOG 3 ID      : id
Event Threshold : 0
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 3
Change for Alarm: 30
Calibration CAL = (RAW * 1000)/1023 + -2
```

If wave action frequently causes the level to change by three or more counts, a **Change to Txmit** of **3** will transmit many meaningless reports. To decrease the sensitivity (therefore the number of reports transmitted) increase the **Change to Txmit** parameter. For example, set the **Change to Txmit** parameter, ***cgt***, to **5** to transmit when the **CAL** data changes be 0.05ft (5 × 0.01ft = 0.05ft). Likewise set the **Change for Alarm** parameter, ***cga***, to **50** to transmit an alarm when the **CAL** data changes by 0.50ft (50 × 0.01ft = 0.50ft). Count the commas between ***sn*** and the ***cgt*** parameter. There are 4 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 3,,,,5,50[Enter]
ANALOG 3 ID      : id
Event Threshold : 0
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 5
Change for Alarm: 50
Calibration CAL = (RAW * 1000)/1023 + -2
```

Remember to adjust the central site computer calibration when you change the calibration in the 5096 Data Transmitter.

To prevent meaningless reports from being transmitted due to temperature fluctuations when the sensor is not submerged, set the **Event Threshold** parameter, ***ev_th***, to the calibrated value which is reached when water covers the sensor. For example, to prevent sample readings from transmitting for a 10 foot range pressure transducer when the water value drops below 0.05ft, divide this level by the **CAL** data precision (0.05ft ÷ 0.01ft = 5). Count the commas between ***sn*** and the ***ev_th*** parameter. There is 1 comma.

Type the following command to set this parameter and you will get the response:

```
> SET-AN 3,5[Enter]
ANALOG 3 ID      : id
Event Threshold : 5
Transmit Intervl: 3600 sec(s)
Sample Interval : 60 sec(s)
Change to Txmit : 2
Change for Alarm: 10
Calibration CAL = (RAW * 1000)/1023 + -2
```

1522 Barometric Pressure

The 1522 Barometric Pressure sensor is connected to the rotated 4 pin top plate connector labeled BAROMETRIC PRESSURE. The barometric pressure sensor is connected to ANALOG 4. A standard calibrated range for barometric pressure sensors is 100 millibars (mb) offset according to the station elevation.

Type the command SET-AN **4** to display the current parameters for ANALOG 4. The default parameters for ANALOG 4 are:

```
                          5096-81                5096N
> SET-AN 4[Enter]
ANALOG 4 ID      : id                    id
Event Threshold : 0                     0
Transmit Intervl: 10800 sec(s)          0 sec(s)
Sample Interval : 300 sec(s)            0 sec(s)
Change to Txmit : 8                     1
Change for Alarm: 32                    50
Calibration CAL = (RAW * 1)/4 + 0       (RAW * 1)/4 + 0
```

An **Event Threshold** of **0** allows all sample **CAL** data to be transmitted if the change criteria is met. A **Transmit Intervl** of **10800** transmits the **CAL** data every 3 hours regardless of value or change. The ANALOG sensor is read and the **CAL** data is calculated on a **Sample Interval** of **300** (5 minutes). The ***a***, ***b*** and ***c*** parameters of **1**, **4**, and **0** calculate **CAL** data for a range of 0 to 255.

The barometer pressure sensor **CAL** data transmitted to the central site has an increment size of 100mb divided by 255 which equals 0.39mb. A **Change to Txmit** of **8** transmits the **CAL** data if it has changed by approximately 3mb since the last **CAL** data transmitted (8 × 0.39mb = 3.1mb). A **Change for Alarm** of **32** transmits the **CAL** data if it has changed by approximately 12mb since the last **CAL** data transmitted (32 × 0.39mb = 12.5mb).

For standard data collection applications the default settings need not be changed.

Changes to the ANALOG sensor parameters are made with the SET-AN command. First type the command SET-AN with a question mark to get the command parameter list:

```
> SET-AN ?[Enter]
SET-AN sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
```

To program the 5096 Data Transmitter to read the barometric pressure sensor and calculate the **CAL** data every 15 minutes, set the **Sample Interval**, ***s_int***, parameter to **900**. To transmit the sensor data value every 6 hours regardless of any **CAL** data change, set the **Transmit Intervl**, ***t_int***, parameter to **21600**. Count the commas between ***sn*** and the ***t_int*** parameter. There are 2 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 4,,21600,900[Enter]
ANALOG 4 ID     : id
Event Threshold : 0
Transmit Intervl: 21600 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 8
Change for Alarm: 32
Calibration CAL = (RAW * 1)/4 + 0
```

The calibration coefficients of an ANALOG sensor can be changed to display and transmit **CAL** data in engineering units. The formula for computing calibration coefficients is to set the ***a*** parameter to the calculated **CAL** data range and set the ***b*** parameter to the **RAW** digital value range. Set the ***c*** parameter to the **CAL** data value to display when the **RAW** digital value is 0. Adjust the ***c*** parameter by 1 to correct for ADC conversion and calibration equation truncation of decimal digits. Positive and negative numbers can be used for the ***a***, ***b*** and ***c*** parameters but the resulting **CAL** data value cannot be greater than 2047 or less than zero. Only integer (no decimal points) **CAL** data is saved. Multiply the ***a*** and ***c*** parameters by factors of ten to change data precision.

For example, if a barometric pressure sensor has a measured range of 930mb to 1030mb set the ***a*** parameter to the **CAL** data range (1030mb - 930mb = 100). Set the ***b*** parameter to the **RAW** digital value range (1023 - 0 = 1023). Set the ***c*** parameter to 931 since the measured barometric pressure is 930 mb when the **RAW** digital value is 0 and 1 additional count adjusts for ADC conversion and calibration equation truncation. The ***a*** and ***c*** parameters do not need to be adjusted since the **CAL** data precision is in millibars.

Count the commas between ***sn*** and the ***a*** parameter. There are 6 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 4,,,,,,100,1023,931[Enter]
ANALOG 4 ID     : id
Event Threshold : 0
Transmit Intervl: 21600 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 8
Change for Alarm: 32
Calibration CAL = (RAW * 100)/1023 + 931
```

Reprogram the **Change to Txmit**, ***cgt***, and **Change for Alarm**, ***cga***, parameters when the **CAL** data is changed to display engineering units. For example, to compute the ***cgt*** parameter to transmit when the **CAL** data changes by 2mb, divide this change by the **CAL** data precision (2mb ÷ 1mb = 2). Likewise, to compute the ***cga*** parameter to transmit when the **CAL** data changes by 10mb, divide this change by the **CAL** data precision (10mb ÷ 1mb = 10). Count the commas between ***sn*** and the ***cgt*** parameter. There are 4 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 4,,,,2,10[Enter]
ANALOG 4 ID     : id
Event Threshold : 0
Transmit Intervl: 21600 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 2
Change for Alarm: 10
Calibration CAL = (RAW * 100)/1023 + 931
```

Remember to adjust the central site computer software calibration when you change the calibration in the 5096 Data Transmitter.

Battery Sensor

The 5096 Data Transmitter has an internal BATTERY sensor that measures the internal battery voltage in hundredths of volts (Vdc). Type the command SET-BATT to display the current parameters for the BATTERY sensor. The default parameters for the BATTERY sensor are:

All types

```
> SET-BATT[Enter]
BATTERY 8 ID    : id
Transmit Intervl: 0 sec(s)
Sample Interval : 0 sec(s)
Change to Txmit : 25
Change for Alarm: 50
```

The BATTERY sensor is disabled by default. The calibration coefficients cannot be changed. They are factory set to display battery voltage in hundredths of volts (Vdc).

Changes to the BATTERY sensor parameters are made with the SET-BATT command. First type the command SET-BATT with a question mark to get the command parameter list:

```
> SET-BATT ?[Enter]
SET-BATT {t_int},{s_int},{cgt},{cga},{id}
```

To program the 5096 Data Transmitter to read the BATTERY sensor and calculate the **CAL** data every 5 minutes, set the **Sample Interval**, ***s_int***, parameter to **300**. A **Change to Txmit** of **25** transmits the **CAL** data when it has changed by 0.25Vdc since the last **CAL** data transmitted (25 × 0.01Vdc = 0.25Vdc). A **Change for Alarm** of **50** transmits the **CAL** data when it has changed by 0.50Vdc since the last **CAL** data transmitted (50 × 0.01Vdc = 0.50Vdc). To transmit the sensor data value every 3 hours regardless of any **CAL** data change, set the **Transmit Intervl**, ***t_int***, parameter to **10800**. Type the following command to set these parameters and you will get the response:

```
> SET-BATT 10800,300[Enter]
BATTERY 8 ID    : id
Transmit Intervl: 10800 sec(s)
Sample Interval : 300 sec(s)
Change to Txmit : 25
Change for Alarm: 50
```

Sensor Set Up: WIND Sensors

WIND sensors work on an event basis just like EVENT sensors; however, they provide high speed signal input. To prevent the 5096 Data Transmitter from being triggered on each pulse, a pre-divide counter is used. The pre-divide counter requires a programmed number of pulses before it increments the WIND sensor **RAW** accumulator. **CAL** data is calculated from the **RAW** accumulator using sensor calibration coefficients. **CAL** data is transmitted when the **Event Detection** flag is **ENABLED** and change criteria is met. The change criteria is met when the difference between the newly calculated **CAL** data and the last transmitted **CAL** data is equal to or greater than the **Change for Alarm** or **Change to Txmit** parameters.

WIND sensor **CAL** data measures wind travel or wind run in miles or kilometers depending on the pre-divide counter. The central site computer calculates wind speed from WIND **CAL** data by dividing the difference between two **CAL** data report values by the time between reports.

WIND sensor data is transmitted on the time interval set in the **Transmit Intervl** parameter. The **Transmit Intervl** parameter units are in seconds. Timed reports are not transmitted when this parameter is zero.

The **Wind Enable Flag** parameter is used to select between ALERT Wind or standard format data reporting. When this flag is enabled, the 5096 Data Transmitter reads and combines the high 6 bits of the wind direction sensor **CAL** data with the lower 5 bits of the WIND sensor **CAL** data in the ALERT Wind format and transmits the combined data report. The sensor input is called a WIND sensor when this parameter is enabled and is called a COUNTER sensor when this parameter is disabled. A COUNTER sensor only transmits the sensor **CAL** data. The wind direction sensor must be set up to transmit independently of the COUNTER sensor. The wind direction sensor data used in the ALERT Wind format is read from ANALOG 7.

5096-81 and 5096N station packages have WIND sensor 1 set up as a WIND sensor (WI1) and WIND sensor 2 set up as a COUNTER (CTR2).

5050WS/WD Wind Speed and Direction

The 5050WS/WD Wind Speed and Direction sensors are connected to the 6 pin top plate connector labeled WIND. The wind speed sensor is connected to WIND 1 and the wind direction sensor is connected to ANALOG 7. The wind speed sensor pulses 1308 times for each kilometer or 2094 times for each mile of wind run. The calibrated range for the wind direction sensor is 360 degrees with north usually set to 0 degrees.

Type the command SET-WI **1** to display the current parameters for WIND 1. The default parameters for WIND 1 are:

	5096-81	**5096N**
> SET-WI 1[Enter]		
WIND 1 ID	***id***	***id***
Event Detection	**ENABLED**	**DISABLED**
Pre-divide Ctr	**3924**	**3924**
Transmit Intervl	**0 sec(s)**	**0 sec(s)**
Change to Txmit	**1**	**1**
Change for Alarm	**10**	**10**
Calibration CAL =	**(RAW * 1)/1 + 0**	**(RAW * 1)/1 + 0**

Type the command SET-AN **7** to display the current parameters for ANALOG 7. The default parameters for ANALOG 7 are:

	5096-81	**5096N**
> SET-AN 7[Enter]		
ANALOG 7 ID	***id***	***id***
Event Threshold	**0**	**0**
Transmit Intervl	**0 sec(s)**	**0 sec(s)**
Sample Interval	**0 sec(s)**	**0 sec(s)**
Change to Txmit	**1**	**1**
Change for Alarm	**50**	**50**
Calibration CAL =	**(RAW * 1)/4 + 0**	**(RAW * 1)/4 + 0**

A **Pre-divide Ctr** of **3924** for WIND 1 increments the **RAW** accumulator every 3 kilometers (3 × 1308 = 3924) of wind travel. With the ***a***, ***b*** and ***c*** parameters set at **1**, **1**, and **0** respectively, the **CAL** data and **RAW** accumulator values are equal. Therefore the **CAL** data transmitted to the central site is wind run in 3 kilometer(km) increments. The central site computer converts the data into engineering units (miles or kilometers).

An **Event Detection** flag **ENABLED** and a **Change to Txmit** of **1** transmits a report for each wind run increment. The WIND sensor set up transmits the wind direction sensor **CAL** data along with the wind run **CAL** data in the ALERT Wind format. A **Change for Alarm** of **10** transmits an alarm report If the **CAL** data changes by 10 counts during the transmission hold-off period. A **Transmit Intervl** of **0** disables timed report transmissions.

WARNING: No Transmit Interval is defined. Do NOT set a transmit interval for WIND sensors! Non-incremental reports will confuse the central site computer computation of wind speed.

The wind direction ANALOG sensor is read and the **CAL** data is calculated only when a WIND sensor transmission is made. The **Sample Interval** and **Transmit Intervl** of **0** disable all other transmissions. The ***a***, ***b*** and ***c*** parameters of **1**, **4**, and **0** calculate **CAL** data for a range of 0 to 255. However, only the upper 6 bits of the **CAL** data are used in the ALERT Wind format limiting the range to 0 to 63.

For standard data collection applications the default settings need not be changed.

Changes to the WIND sensor parameters are made with the SET-WI command. First type the command SET-WI with a question mark to get the command parameter list:

```
> SET-WI ?
SET-WI sn,{en_ev},{pdc},{t_int},{cgt},{cga},{a},{b},{c},{we},{id}
```

To change the wind run increment to 1 mile(mi) instead of 3 kilometers(km), change the **Pre-divide Ctr** parameter, ***pdc***, to 2094. Count the commas between ***sn*** and the ***pdc*** parameter. There are 2 commas. Type the following command to set the parameter and you will get the response:

```
> SET-WI 1,,2094[Enter]
WIND 1 ID       : id
Event Detection : ENABLED
Pre-divide Ctr  : 2094
Transmit Intervl: 0 sec(s)
Change to Txmit : 1
Change for Alarm: 10
Calibration CAL = (RAW * 1)/1 + 0
```

The R.M. Young Wind Sensor, HydroLynx Systems Model 200-05103, should have its **Pre-divide Ctr** parameter, ***pdc***, set to **30612** for 3 km or **16327** for 1 mi wind run increments.

WIND sensor reporting can be changed from event to average wind reporting over a time period. Change the **Event Detection** parameter, ***en_ev***, to **0** to disable prevent event reporting. Set the **Transmit Intervl** parameter, ***t_int***, to **3600** to transmit every hour regardless of change (the **Change to Txmit** and **Change for Alarm** parameters have no effect on transmit intervals). Change the **Wind Enable Flag** parameter, ***we***, to **0** to disable ALERT Wind format reporting. WIND sensor **CAL** data will range from 0 to 2047 and if the **Pre-divide Ctr** parameter, ***pdc***, is set to **2094**, each **CAL** data increment is 1 mile of wind run. Change the central site computer sensor set up to use a raw range to 2048 counts.

Care should be taken is selecting the transmit interval so that the WIND sensor **RAW** accumulator does not increment more than 2047 times during the interval. Otherwise the central site computer will not be able to calculate the average wind speed correctly.

Count the commas between ***sn*** and the ***en_ev*** parameter. There is 1 comma. Count the commas between ***t_int*** and the ***we*** parameter. There are 6 commas. Type the following command to set the parameter and you will get the response:

```
> SET-WI 1,0,2094,3600,,,,,,0[Enter]
COUNTER 1 ID    : id
Event Detection : DISABLED
Pre-divide Ctr  : 2094
Transmit Intervl: 3600 sec(s)
Change to Txmit : 1
Change for Alarm: 10
Calibration CAL = (RAW * 1)/1 + 0
```

The parameter display will now label the sensor as a COUNTER since the **Wind Enable Flag** parameter is disabled.

Set up the wind direction sensor on ANALOG 7 to also transmit wind direction every hour. Changes to the ANALOG sensor parameters are made with the SET-AN command. First type the command SET-AN with a question mark to get the command parameter list:

```
> SET-AN ?[Enter]
SET-AN sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
```

Program the 5096 Data Transmitter to read the wind direction sensor, calculate the **CAL** data for a range of 0 to 360 degrees and transmit the **CAL** data every hour. Set the **Transmit Intervl** parameter, ***t_int***, to **3600** to transmit every hour. Set the ***a*** parameter to the calculated **CAL** data range (360 - 0 = 360), set the ***b*** parameter to the **RAW** digital value range (1023 - 0 = 0) and set the ***c*** parameter to the **CAL** data value to display when the **RAW** digital value is **0** (0 degrees). Count the commas between ***sn*** and the ***t_int*** parameters. There are 2 commas. Count the commas between ***t_int*** and the ***a*** parameter. There are 4 commas. Type the following command to set these parameters and you will get the response:

```
> SET-AN 7,,3600,,,,360,1023[Enter]
ANALOG 7 ID     : id
Event Threshold : 0
Transmit Intervl: 3600 sec(s)
Sample Interval : 0 sec(s)
Change to Txmit : 1
Change for Alarm: 50
Calibration CAL = (RAW * 360)/1023 + 0
```

Sensor Set Up: PEAK WIND Sensors

A PEAK WIND sensor is a virtual input that counts the number of WIND sensor pulses over the time interval set in the **Sample Interval** parameter. The maximum count is saved and the corresponding **CAL** data is calculated using sensor calibration coefficients. PEAK WIND sensor 1 counts pulses from the WIND sensor 1 and PEAK WIND sensor 2 counts pulses from WIND sensor 2.

The PEAK WIND **CAL** data value is transmitted on the time interval set in the **Transmit Intervl** parameter when the value criteria is met. The value criteria is met when the PEAK WIND **CAL** data is equal to or greater than the **Value for Alarm** or **Value to Txmit** parameters. To disable a PEAK WIND sensor, set both the **Transmit Intervl** and **Sample Interval** to **0**.

Type the command SET-PK **1** to display the current parameters for PEAK WIND 1. The default parameters for PEAK WIND 1 are:

5096-81, N

```
> SET-PK 1[Enter]
PEAK WIND 1 ID  : id
Sample Interval : 0 sec(s)
Transmit Intervl: 0 sec(s)
Value to Txmit  : 0
Value for Alarm : 70
Calibration CAL = (RAW * 360)/1308 + 0
```

Changes to the PEAK WIND sensor parameters are made with the SET-PK command. First type the command SET-PK with a question mark to get the command parameter list:

```
> SET-PK ?
SET-PK sn,{s_int},{tx_int},{vgt},{vga},{a},{b},{c},{id}
```

PEAK WIND sensor **RAW** value units are in WIND sensor pulses. Set the calibration coefficients to calculate the peak wind speed by converting the pulse counts into wind run and adjust for the sample time interval. Set the ***a*** parameter to the number of seconds in engineering units divided by the number of seconds in the **Sample Interval** parameter. Set the ***b*** parameter to the number of pulses per wind run engineering units. The ***c*** parameter is not used.

For example, to count the WIND sensor pulses for a 10 second interval and transmit the PEAK WIND every hour, set the **Sample Interval** parameter, ***s_int***, to **10** and set the **Transmit Intervl** parameter, ***tx_int***, to **3600**. If the engineering units are kilometers per hour (kph), set the **a** parameter to **360** (3600 seconds per hour ÷ 10 seconds per sample interval = 360). Set the ***b*** parameter to **1308** (1308 pulses per kilometer of wind run).

Count the commas between ***sn*** and the ***s_int*** parameter. There is 1 comma. Count the commas between ***tx_int*** and the ***a*** parameter. There are 3 commas. Type the following command to set the parameters and you will get the response:

```
> SET-PK 1,10,3600,,,360,1308[Enter]
PEAK WIND 1 ID  : id
Sample Interval : 10 sec(s)
Transmit Intervl: 3600 sec(s)
Value to Txmit  : 0
Value for Alarm : 70
Calibration CAL = (RAW * 360)/1308 + 0
```

Set the **Value to Txmit** parameter to eliminate PEAK WIND reports when wind gusts are below a value of interest. For example, if wind gusts below 10kph are not of interest, set the **Value to Txmit** parameter, ***vgt***, to **10**. Count the commas between ***sn*** and the ***vgt*** parameter. There are 3 commas. Type the following command to set the parameter and you will get the response:

```
> SET-PK 1,,,10[Enter]
PEAK WIND 1 ID  : id
Sample Interval : 10 sec(s)
Transmit Intervl: 3600 sec(s)
Value to Txmit  : 10
Value for Alarm : 70
Calibration CAL = (RAW * 360)/1308 + 0
```

Sensor Set Up: STATUS Sensor

The STATUS sensor can monitor up to 8 digital status inputs. The status line states can be either open (1) or closed (0). When a status line changes state a data report can be transmitted.

The STATUS sensor must be read at regular time intervals to check for changes in state since status line state changes do not trigger events. On the time intervals set in the **Sample Interval** and **Transmit Intervl** parameters the 5096 Data Transmitter reads the status line states and saves the **RAW** binary data. Calibration coefficient parameters are not available for the STATUS sensor so the **CAL** data is set to the **RAW** binary data.

The STATUS sensor **CAL** data is transmitted on the time interval set in the **Sample Interval** parameter when the **Txmt Zero Status** flag criteria and the **Alarm Flag** or **Change Flag** criteria are met. The **CAL** data is transmitted on the time interval set in the **Transmit Intervl** parameter regardless of any status line state change or flag criteria. To disable the STATUS sensor set both the **Transmit Intervl** and **Sample Interval** to **0**.

The **Txmt Zero Status** flag criteria is met when the parameter is **ENABLED** or the STATUS sensor **CAL** data is not **00000000** or when all status line states return to closed (0) after transmitting a non-zero value.

The **Alarm Flag** and **Change Flag** parameters mark which status lines are monitored for changes in state. The flag parameters can be set to monitor changes in state for **ANY** or **ALL** marked status lines. The flag criteria is met for **ANY** when any marked status line changes state; the flag criteria is met for **ALL** when all marked status lines change state. The flag criteria is met regardless of any status line state change when either parameter is set to **00000000** (the **Txmt Zero Status** flag criteria must still be met to transmit).

5096ES Emergency Status Sensor

The Emergency Status Sensor is connected to the 5096 Data Transmitter STATUS sensor to transmit data reports when critical water levels are reached. This sensor is set up as a normally closed switch. When the water rises to the critical level, a float opens the switch and the 5096 transmits a report to the central site. If the sensor is washed away and the cable breaks, an open switch condition also occurs and is detected by the 5096.

The Emergency Status Sensor is connected to the optional 10 pin top plate connector labeled STATUS which is connected to the STATUS input. Pins A - H connect to status lines 1 - 8 and pins I and J are ground.

Type the command SET-ST to display the current parameters for the STATUS sensor. The default parameters for STATUS sensor are:

5096-ST, N

```
> SET-ST[Enter]
STATUS 1 ID     : id
Txmt Zero Status: DISABLED
Transmit Intervl: 0 sec(s)
Sample Interval : 0 sec(s)
Change Flag     : ANY 00000000
Alarm Flag      : ALL 11111111
```

The default parameters disable the STATUS sensor.

Changes to the STATUS sensor parameters are made with the SET-ST command. First type the command SET-ST with a question mark to get the command parameter list:

```
> SET-ST ?
SET-ST {tx0},{t_int},{s_int},{{-}tf},{{-}af},{id}
```

Set the **Txmt Zero Status** parameter, ***tx0***, to **0** to **DISABLE** or **1** to **ENABLE** transmissions on sample intervals when all status line states are closed (0).

Set the **Change Flag**, ***tf***, and **Alarm Flag**, ***af***, parameters to monitor changes to status line states. These flag parameters are signed 8 digit binary numbers. Each digit is used to mark whether or not a status line is monitored for changes in state. The rightmost digit marks status line 1 and the leftmost digit marks status line 8. If the digit is **1** the status line is monitor; If the digit is **0** the status line is ignored. When a minus sign (**-**) is entered before the binary number, **ALL** status lines marked must change in state to cause a transmission. When a plus sign (**+**) or no sign is entered **ANY** status line marked can change in state to cause a transmission.

For example, to program the 5096 Data Transmitter to transmit STATUS sensor data every minute when a status line state becomes open (1) set the **Sample Interval** parameter, ***s_int***, to **60**. The **Txmt Zero Status** parameter set to **DISABLED** and the **Change Flag** set to **ANY 00000000** will transmit every sample interval as long as the STATUS sensor **CAL** data is not **00000000**. All unused status lines must be grounded so their states are closed (0). The status line connected to the Emergency Status Sensor will be normally closed (0). When the sensor switch opens the status line state becomes open (1) and transmissions begin. When the sensor switch becomes closed (0), one last transmission is made. Count the commas between ***tx0*** and the ***s_int*** parameter. There are 2 commas.

Type the following command to set the parameters and you will get the response (be sure to include the space after the command):

```
> SET-ST ,,60[Enter]
STATUS 1 ID      : id
Txmt Zero Status: DISABLED
Transmit Intervl: 0 sec(s)
Sample Interval : 60 sec(s)
Change Flag      : ANY 00000000
Alarm Flag       : ALL 11111111
```

To program the 5096 Data Transmitter to read the STATUS sensor every minute and check for state changes on status lines 1 and 2 but ignore all other unused status lines, set the **Change Flag** parameter, ***tf***, to **00000011** marking status line 1 and 2. To transmit an alarm if both status lines 1 and 2 change, set the **Alarm Flag** parameter, ***af***, to **-00000011**. Set the **Txmt Zero Status** parameter, ***tx0***, to **1** to **ENABLE** transmission on the sample interval even if all status line states are closed (0). Set the **Transmit Intervl** parameter, ***t_int***, to **86400** to transmit every day regardless of status line state changes. Type the following command to set the parameters and you will get the response:

```
> SET-ST 1,86400,,00000011,-00000011[Enter]
STATUS 1 ID      : id
Txmt Zero Status: ENABLED
Transmit Intervl: 86400 sec(s)
Sample Interval : 60 sec(s)
Change Flag      : ANY 00000011
Alarm Flag       : ALL 00000011
```

Sensor Set Up: SERIAL Sensor

A SERIAL sensor can store data in one of the 8 analog input channels. Type the command SET-SERIAL ***sn*** with parameters to replace the storage of analog channel ***sn*** with a serial sensor. The analog input will no longer be read for this channel. Instead data will be stored when the WRITE-SERIAL command is received on the console port. The WRITE-SERIAL commands saves a RAW data value and computes the CAL data value using the sensor calibration coefficients.

The console baud rate must match the baud rate of the equipment that will issue the WRITE-SERIAL command. The default baud rate of the EPROM type S is 9600 baud. See the command SET-BAUD in Section 4.7 to change the console baud rate.

Changes to the SERIAL sensor parameters are made with the SET-SERIAL command. First type the command SET-SERIAL with a question mark to get the command parameter list:

```
> SET-SERIAL ?[Enter]
SET-SERIAL sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
```

To program the 5096 Data Transmitter to check for a change of 5 in the serial input 5 **CAL** data every 15 minutes, set the **Change to Txmit, *cgt*,** parameter to **5** and the **Sample Interval, *s_int*,** parameter to **900**. To transmit the sensor data value every day regardless of any **CAL** data change, set the **Transmit Intervl**, ***t_int***, parameter to **86400** (24 hours). To transmit alarms on a change of 50 set the **Change for Alarm**, ***cga***, parameter to **50**. Set the calibration coefficients ***a***, ***b*** and ***c*** parameters to **1**, **1** and **0** to set the **CAL** data value to the same value as the **RAW** data value. Count the commas between ***sn*** and the ***t_int*** parameter. There are 2 commas. Type the following command to set these parameters and you will get the response:

```
> SET-SERIAL 5,,86400,900,5,50,1,1,0[Enter]
SERIAL 5 ID     : id
Event Threshold : 0
Transmit Intervl: 86400 sec(s)
Sample Interval : 900 sec(s)
Change to Txmit : 5
Change for Alarm: 50
Calibration CAL = (RAW * 1)/1 + 0
```

2.2 Hardware Installation

After unpacking the 5096 Data Transmitter check that it has not been damaged in shipment. Set it up on a work bench and identify the different components. This gives you the opportunity to familiarize yourself with the 5096 and to check that it is functioning properly. Changes to any of the default parameter settings can also be done at this time. A terminal or computer with terminal emulation software is used as the console to program and test the 5096.

Check that a central site computer or 5062 Remote Station Tester is set up to receive and verify radio transmitter signals from the 5096 Data Transmitter.

The hardware installation may vary depending on the type of transmitter enclosure. Differences in installation are noted by the transmitter enclosure type. For example:

5096 The 5096 Data Transmitter is enclosed in an 8 inch diameter aluminum canister.

5096N The 5096N Data Transmitter is enclosed in a NEMA 4X fiberglass enclosure.

2.2.1 Console Cable Connection

Connect the console to the 5096 using the 5071C-5096 cable as described in Section 2.1.1. The cable connects to the board at J5, the 9 pin female 'D' connector on the upper right side.

2.2.2 5050LLFT and 5050TS Modifications

If a 5050LLFT or a 5050TS is to be connected to the 5096 the following modification must be made. This modification will not affect the operation of these devices on either a 5050 or a 5096. If you need assistance contact the Customer Service Department.

Open the female MS connector and cut the wire at pin B. Reassemble the connector.

WARNING: Failure to implement this modification will cause DAMAGE to the 5096.

2.2.3 Radio Transmitter Check

Radio transmitter **Frequency error**, **Deviation** and **Power output** are factory tested and recorded on the Test Result Report (see Section 6.2, Document Number A101018-4) provided with each 5096 Data Transmitter. The FCC requires that these tests be performed at time of installation and every year thereafter. Should any adjustments be necessary, they should be performed by a qualified technician using the proper test equipment.

For optional dual frequency radios check that the switch on the 5096 Data Transmitter chassis is set to the proper frequency.

2.2.4 Antenna Connection

5096 The antenna is connected to the female BNC connector on the top plate.

5096N The antenna is connected to the female N-type connector on the enclosure.

2.2.5 Battery Connection

5096 To connect the battery place the battery bracket over the battery with the red and black tapes aligned. Connect the red wire to the positive terminal then connect the black wire to the negative terminal.

Carefully lower the battery on end into the canister. Check that there is a silica gel absorbent pack (Desiccant bag) in the canister. Place the 5096 Data Transmitter into the canister and rotate to align the two holes over the latch screws and put the knobs on.

5096N Turn off the **POWER** switch on the Screw Terminal Panel. Install the battery with the terminals on the top left and screw the battery bracket into place. Connect the red wire to the positive terminal, marked with red tape and connect the black wire to the negative terminal marked with black tape.

WARNING: Failure to correctly connect the battery can cause extensive DAMAGE to the 5096 Data Transmitter.

2.2.6 Solar Panel or AC Charger Connection

5096 Connect the solar panel or AC charger to the 3 pin MS male connector labeled **12 VDC IN**.

5096N Connect the solar panel or AC charger to the 3 pin MS male connector. Turn on the **POWER** switch on the Screw Terminal Panel.

WARNING: Connect the battery before connecting the solar panel or AC charger. Never operate the 5096 Data Transmitter without a battery connected.

2.2.7 Sensor Connectors

5096 Sensors are connected to the MS bulkhead connectors on the top plate. The number of pins and rotation of each connector is unique for each sensor input which prevents incorrect installation. See Section 6.2 Drawing AC104180.

5096N Sensors are connected to the Screw Terminal Panel. Sensor cables enter the enclosure through the cable strain reliefs. A wiring diagram for typical sensors to the 5096N is provided in Section 6.2 Drawing AC107911.

Warning: Label sensor cables to prevent damage to the sensors or the 9601 board due to incorrect wiring on the Screw Terminal Panel.

2.2.8 Data Transmitter Installation

5096 The design of the 5096 Data Transmitter allows it to be installed in a standpipe by lowering it from the top of the standpipe or through an optional door. When lowering from the top of the standpipe, attach a 'lifting rope' to the top plate handle and tie off the other end of the rope to the bracket near the top of the standpipe. The cables for the antenna, solar panel and sensor inputs are connected before lowering the transmitter into the standpipe. Carefully lower the transmitter to the bottom of the standpipe.

5096N The 5096N in the NEMA type 4X enclosure is designed to be mounted either on a pole or on a backboard. If the unit is exposed to direct sunlight, a sun shield should be used to protect the unit from excessive heat. After the enclosure is mounted, cut excessively long cables (cable that needs to be coiled is excessive) before connecting the antenna, solar panel and sensor inputs to the transmitter. Check that there is a silica gel absorbent pack (desiccant bag) in the enclosure.

3 Hardware Inputs and Outputs

3.1 Hardware Introduction

The 5096 Data Transmitter has the following inputs, outputs and board features:

Sensor Inputs

- Digital inputs
  2 EVENT inputs
  2 COUNTER/WIND inputs
  1 8-bit STATUS input

- Analog inputs
  7 external ANALOG inputs
  1 internal BATTERY voltage input

- Virtual inputs
  2 virtual PEAK WIND inputs computed from WIND input values

- Serial Sensor Interface
  1 Absolute encoder input connected to the serial sensor interface or
  8 serial sensors written to with the WRITE-SERIAL command.

Board Features

- Switches
  RESET, TEST and Station ID number

- LEDs for monitoring board activity and test results
  RUN, TEST ERR, SENS PWR, PWR ERR, TX ON and TEST

- Test points for board level testing and troubleshooting
  TP1(TxData), TP2(Battery), +5V SENS(VREF), CLOCK, GND, +5V(Vcc)

- On board battery with disconnect jumper to reset battery-backed parameters

Communication Outputs

- Radio telemetry interface for data reporting

- Console interface for programming and monitoring the 5096 Data Transmitter

3.2 Sensor Inputs

The 5096 Data Transmitter design supports connections to a variety of digital and analog inputs. Some of the standard sensor configurations used with the 5096 Data Transmitter are covered in Section 2.1.6. See Drawings AC104180 and AC107911 in Section 6.2.

3.2.1 Digital Inputs

The 5096 Data Transmitter supports three types of digital inputs: EVENT, COUNTER/WIND, and STATUS. Each digital input type has a unique characteristic suited to a particular application as defined below.

EVENT inputs: (2 provided)

- Each digital input has two input trigger lines and a status line that can increment or decrement the input's accumulator value, depending on the mode selected by programming. When the count is incremented beyond the accumulator's maximum value, the accumulator is reset to zero. When the count is decremented below zero, the accumulator is set to its maximum value, 65535.

- The input is capable of continuous counting rates of 60Hz and burst counting rates of as high as 100Hz for several seconds.

- Transmissions can be initiated when an event occurs or on a programmable time interval or both.

COUNTER / WIND inputs: (2 provided)

- Each input has a single trigger line that will increment the input's accumulator value when its counter reaches the programmed pre-divide value. For example, if the pre-divide value is 12, the accumulator will increment by one, each time that 12 signals are counted on the trigger line. When the count is incremented beyond the accumulator's maximum value, the accumulator is reset to zero.

- The pre-divide counter allows continuous input frequencies of up to 600 KHz and burst rates of up to 3 MHz for several seconds.

- Transmissions can be initiated when an event occurs or on a programmable time interval or both.

- The standard configuration for WIND 1 is set up for the Model 5050WS wind speed sensor's signal (AC sine wave). However, it can be reprogrammed as a general purpose up-counter COUNTER 1.

- The standard configuration for COUNTER 2 is set up as a general purpose up-counter. COUNTER 2 accepts momentary contact closures as its signals. This counter can also be programmed as WIND 2

STATUS inputs: (8 provided)

- Each bit in the 8-bit status value represents the status of a single contact closure input line.

- All 8 inputs are processed and transmitted together as a single STATUS sensor value.

- The STATUS inputs generate transmissions on a timed interval. A sample interval is defined to check for changes in the status line states. Transmissions can be sent for any or all status line changes. A transmit interval is defined to transmit the STATUS value regularly regardless of any status line state changes.

3.2.2 Analog Inputs

ANALOG inputs: (7 provided)

- Each ANALOG input has an input range of 0 to 5 volts.

- The 5096 Data Transmitter has a 10 bit A/D converter, which provides an accuracy of ± 0.2% (± 10 millivolts).

- Transmissions can be initiated on a specified change in the input voltage level (defined as an event) or on a programmable time interval or both.

BATTERY Sensor input: (1 provided)

- The BATTERY sensor input is part of the 5096 Data Transmitter's internal design, no external connector is required.

- The BATTERY sensor input reports the battery voltage within ± .02 volt.

- Transmissions can be initiated on a specified change in battery voltage or on a programmable time interval or both.

3.2.3 Virtual Inputs

PEAK WIND inputs: (2 provided)

- On every sample interval, the wind sensor input count is compared to the current count for the PEAK WIND sensor and the maximum count is saved. The count from WIND 1 is used for PEAK WIND 1 and the count from WIND 2 is used for PEAK WIND 2.

- Transmissions of the maximum value are sent on a programmable time interval.

3.2.4 Serial Sensor Interface

Absolute encoder input: (1 provided)

- The EVENT 1 input can be switched from a digital input to an absolute encoder sensor connected to the serial sensor interface. This is done by selecting event ***mode*** 12 using the SET-EV command (See Section 4.7 and 4.8).

- The absolute encoder is not an event sensor. It is read on a programmed sample interval.

- Transmission are made on a specified change for the sample interval or regardless of change for a programmable transmit interval.

Serial data input: (8 provided)

- Serial data can be written to the 5096 Data Transmitter using the WRITE-SERIAL command.

3.3 Board Features

The 9601 board features switches for transmitter RESET, TEST and Station ID select, LEDs for monitoring board activity and testing, test points for board level testing and troubleshooting, and an internal battery jumper to allow battery-backed parameters to be reset to default values and erase data logging memory.

3.3.1 Switches

No.	Name	Type	Function
1	RESET	Momentary Push Button	Performs a system reset. The system reset is functionally equivalent to a power-up reset.
2	TEST	Momentary Push Button	Starts a test transmission followed by a series of internal functionality tests.
3-6	ID Select	10 Pos. Rotary Switch	Set the Station ID number. Default Sensor ID numbers are offset from the Station ID number.

To locate the switches, refer to the M9601 PCB assembly diagram in Section 6.2.

RESET Switch (SW1)

RESET is a push button switch located on the right hand edge of the 9601 board and is marked **RESET**.

When the RESET switch is pressed and released, the 5096 Data Transmitter restarts its program, and displays on the console:

```
HydroLynx Systems, Inc. - 5096 ALERT Data Transmitter
Copyright Year. All Rights Reserved.
P9601-01-pn Ver verR Month Day, Year
Station ID      : staid
```

where ***pn*** is the firmware part number suffix, ***ver*** is the firmware version number, ***R*** is the radio type, ***Month Day, Year*** is the month, day, and year of version release date and ***staid*** is the Station ID read from the ID switches.

If the **TEST** switch is held down and the **RESET** switch is pressed when the RESETINIT feature is enabled, the 5096 Data Transmitter will execute the command to reset all battery-backed-up parameters to default values and clear logging memory. The 5096 will

display on the console:

```
Parameters reset
Logging memory cleared
```

When the 5096 Data Transmitter program starts, it compares the contents of a RAM memory location with a number stored in the EPROM program. If the two numbers do not match, the 5096 assumes the EPROM program has been changed or that RAM corruption has occurred. In either case, the 5096 executes an INIT command to reset all battery-backed parameters to their default values and displays on the console:

```
Battery backed up memory lost: resetting all parameters
Logging memory cleared
```

TEST Switch (SW2)

TEST is a push button switch located at the bottom left corner of the 9601 board and is marked **TEST**.

When the TEST switch is pressed, the current data values of all active sensors are transmitted and a Level 1 test is executed. See Section 5.2.2 and 5.2.3 for the actions performed by the TEST switch.

Pressing the TEST switch usually has no effect on either the battery-backed parameters or the data logging memory. The one exception is when the 5096 Data Transmitter is reset while the TEST switch is pressed and held down. In this case the 5096 Data Transmitter will execute the INIT command to reset all battery-backed-up parameters to default values and clear logging memory.

ID Switches

The 9601 board has a set of four rotary switches, each with ten numbered positions. These switches are used to set the Station ID number. The default Sensor ID numbers are offset from the Station ID number.

When a 5096 Data Transmitter transmits sensor data values, it also sends the sensor ID number. This Sensor ID number is used by the base station computer software for data storage in its database.

The ID switches (SW3 through SW6 on the schematic drawing) are located on the left hand edge of the board and are labeled ID0, ID1, ID2, ID3.

The number set by ID3 is the thousands digit. ID2 is the hundreds digit. ID1 is the tens digit, and ID 0 is the ones digit. For example, a Station ID of 1930 would be set by placing the switches into the following positions:

ID3 = 1
ID2 = 9
ID1 = 3
ID0 = 0

Default Sensor ID offsets and example ID numbers for Station ID#, 1930 are:

Sensor	Sensor type	Class	ID offset	Example
PK1	Peak wind	D	ID# - 6	1924
PK2	Peak wind	D	ID# - 5	1925
ST	Status	D	ID# - 4	1926
WI1 (CTR1)	Wind Speed	D	ID# - 3	1927
CTR2 (WI2)	_____	D	ID# - 2	1928
EV1	Float	D	ID# - 1	1929
EV2	Precipitation	D	ID#	1930
AN1	Rel. Humidity	A	ID# + 1	1931
AN2	Temperature	A	ID# + 2	1932
AN3	Pres. Transducer	A	ID# + 3	1933
AN4	Barometric Pres.	A	ID# + 4	1934
AN5	_____	A	ID# + 5	1935
AN6	_____	A	ID# + 6	1936
AN7	Wind Direction	A	ID# + 7	1937
BATT	Battery Voltage	A	ID# + 8	1938

3.3.2 LEDS

6 LEDs are provided on the 9601 board to aid in monitoring Data Transmitter activity and to help in testing and troubleshooting.

To conserve power, the LEDs are normally all off. When a 5071C-5096 cable is connected to the console port the RUN LED stays on.

The LED numbers, their color, names and functions are:

No.	Color	Name	Function
1	Green	RUN	On while microprocessor is active or the console is plugged in. Flashes each clock tick (default=10 sec.) when in power saving mode.
2	Red	ERR	Flashes 4 times when a Level 1 Test detects errors.
3	Yellow	SENS PWR	On when switched ANALOG power is on.
4	Red	PWR ERR	On for errors in the 5 volt Reference power supply (VREF).
5	Red	Tx ON	On when the radio is powered.
6	Yellow	TEST	On during a test sequence.

3.3.3 Test Points

Test points are provided on the 9601 board to aid in testing and troubleshooting Data Transmitter performance.

The test point numbers, names, labels and descriptions are:

No.	Name	Label	Description
1	Tx Data	TP1	RF transmit data stream (audio to the radio); requires a frequency counter or an oscilloscope.
2	Battery	TP2	Battery voltage should be 12.5 - 14.0 Vdc
3	VREF	+5V SENS	Switched reference voltage should read 5.000 ± 0.005 Vdc when an analog sensor is being read or the analog power has been turned on.
4	Clock	CLOCK	Internal system clock; requires a frequency counter or an oscilloscope.
5	Ground	GND	Ground reference point.
6	Vcc	+5V	+5 Vdc power for the logic circuits; should read 5.00 ± 0.25 Vdc at all times.

3.3.4 Internal Battery Jumper

A shorting-block connector for disconnecting the internal back-up battery is located at JB2 on the right side of the board. To reset all battery-backed parameters to their default values and clear data logging memory, disconnect the external main battery and remove the internal battery jumper at JB2.

WARNING: **Removing the internal battery jumper and disconnecting the external battery will reset all battery-backed parameters to default values and erase all data stored in logging memory.**

Disconnect the internal battery jumper, JB2, and the main battery, then wait approximately 60 seconds. Reconnect the battery jumper and connect the main battery. When the 5096 Data Transmitter program starts it compares a RAM memory value to a value stored in the EPROM program. If the two values do not match, the program will execute the INIT command. On the console, the 5096 will display its power up message followed by:

```
Battery backed up memory lost: resetting all parameters
Logging memory cleared
```

3.4 Communications

The 5096 Data Transmitter provides a radio telemetry interface that allows it to report sensor data values to the base station software system. It also provides a console interface that allows a console terminal to program and monitor Data Transmitter activity.

3.4.1 Telemetry Interface

The 5096 telemetry interface allows the 5096 Data Transmitter to be connected to a variety of radio transmitters for the transmission of sensor data. The data is transmitted using the selected ALERT format and standard ALERT tones.

The supported ALERT formats are ASCII, Binary, ALERT wind, Enhanced ALERT and Enhanced IFLOWS (both with CRC). The transmission formats are described in drawing AC107484 in Section 6.2.

The standard ALERT transmission tones are 2140Hz (one) and 1920HZ (zero).

Radio transmitter frequencies vary depending on system needs.

The telemetry interface connection is J4 on the 9601 board. The pin-out is:

Pin	Name	Description
1	TX	Audio out
2	PTT	Key transmission
3	TX-PWR	Transmitter power
4	RX-PWR	Receiver power (Not used)
5	RX	Audio in (Not used)
6	GND	Ground

3.4.2 Console Interface

The console interface is used to connect the 5096 Data Transmitter to a console for programming and monitoring purposes.

The console interface is an RS232 serial port configured as a DTE. The RS232 serial port is a 9 pin female 'D' connector located on the upper right corner of the 9601 board at J5.

The fact that this interface port is configured as a DTE means that you must use a NULL Modem cable to communicate with the 5096 Data Transmitter from a computer serial port.

An additional feature of the 5096 Data Transmitter is that it enters a power-down mode 20 seconds after the last command entered. After the 5096 enters power-down mode, it takes one keystroke to wake it up. Unfortunately, the keystroke is lost.

To prevent the 5096 Data Transmitter from entering power-down mode, connect DTR and DSR pins (4 and 6) on the console serial port. As long as these pins are connected, the 5096 will stay in RUN mode and never enter power-down mode.

Version 4.0 firmware switches the serial port from the console to the serial sensor interface by dropping the CTS signal. To prevent console commands from interfering with serial sensor interrogations, set up the console terminal software to use hardware flow control (RTS/CTS).

The pin-out for the serial port is:

Pin	Name	Description
1	CD	Carrier Detect (Not used)
2	RXD	Receive Data, serial in
3	TXD	Transmit Data, serial out
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send (Not used)
8	CTS	Clear to Send
9	RI	Ring Indicator (Not used)

4 Programming

4.1 Introduction

This section describes the commands used to program the 5096 Data Transmitter. An IBM compatible personal computer is typically used as the operator's programming console. The personal computer may be a notebook or portable style for use at the remote station. The personal computer is connected into the 5096 through the RS232 port with a 5071C-5096 cable. The software used to program and operate the 5096 can be HydroLynx Systems 5073PT Palmtop 5096 Programming Software, Microsoft Windows Terminal software, Microsoft HyperTerminal software, or any other terminal emulation software.

4.2 Firmware Version

9601-01 version 4.4 is the current version of HydroLynx Systems firmware release for the 5096 Data Transmitter. Descriptions of both the system commands and the default parameters for version 4.4 are provided within this manual. The version section in the command description shows versions which added the command or made changes to command parameters or defaults.

HydroLynx Systems invites customer comments and suggestions for future firmware improvements and features. Whenever new firmware versions are released, updates to this manual will also be released. Version 4.4 commands and default parameters will remain in effect unless specifically changed by an addendum to the manual. Always check for the latest firmware version and related documentation whenever the 5096 Data Transmitter is to be programmed.

See Section 6.3 for a list of 5096 Firmware Enhancements.

4.3 Rules for Entering Commands

Most of the 5096 Data Transmitter commands have one or more associated parameters. Some of the commands require specific parameters, while other commands may have parameters that are optional. The rules for entering commands and parameters are:

- Commands may be typed in either upper or lower case after the 5096 Data Transmitter command prompt, **>**. Commands are executed when **[Enter]** is pressed.
- When a command has parameters associated with it, the first parameter must be separated from the command by one or more spaces.
- When two or more parameters are specified, the parameters must be separated by a field delimiter. A field delimiters can be a space, comma (**,**), colon (**:**), or forward slash (*/*).
- Parameters shown enclosed in braces ***{}*** are optional and may be omitted. An omitted parameter retains the same value it had before the command was executed (unless otherwise specified).
- If one or more parameters are omitted between two that are specified, non-space field delimiters must still be typed to mark the omitted parameters.
- If all parameters are omitted after a given point, then the field delimiter for those parameters need not be typed.
- All parameters must be typed in the range and format specified in the command description.
- A period (**.**) will repeat the last command.
- ^C (**[Ctrl]C**) will break out of the last command.
- ^S (**[Ctrl]S**) will pause the display during command execution.

NOTE: To simplify the command descriptions that follow, the field delimiter is shown as a comma. A space, colon, or forward slash can be substituted for the comma.

4.4 Battery Protected Parameters

The main battery powers the 9601 board, radio, and ANALOG sensors. Additionally, the 5096 Data Transmitter has an independent, small, long-life battery that maintains the values stored in the system's memory. These values are referred to as "battery-backed-up" or battery protected parameters. Battery protected values are maintained in the 5096 memory independent of whether or not the main battery is connected or the condition of the battery's state of charge.

The parameters may be changed by command. The new values are retained until both batteries are disconnected or until the INIT command is given.

4.5 Command Help Facilities

The 5096 Data Transmitter can help the operator to enter commands correctly. Each command has zero or more parameters which can be listed on the console either by typing the command followed by a space and a question mark (**?**) or by typing the word HELP followed by a space and the command. For example type either of these commands and you will get the response:

> SET-AN ?[Enter] or **> HELP SET-AN[Enter]**
SET-AN ***sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}***

HELP, entered by itself, lists all commands, and HELP followed by a partial command will list all commands that are similar or close to that entry.

If a command cannot be interpreted, an error message will be displayed. Refer to Section 4.9 for a complete list of error messages.

4.6 Command Examples

The following examples show how the SET-AN command can be used to set and view the parameters associated with it. The rules demonstrated in this example apply to all commands. To set the following parameters:

sn	*ev_th*	*t_int*	*s_int*	*cgt*	*cga*	*a*	*b*	*c*	*id*
1	0	3600	50	5	20	1	5	10	1931

type the following command after the **>** prompt:

> SET-AN 1,0,3600,50,5,20,1,5,10,1931[Enter]

or

> SET-AN 1 0 3600 50 5 20 1 5 10 1931[Enter]

If a parameter is not going to be changed, it may be omitted by using consecutive non-space delimiters: comma, slash, colon (**,** */* **:**). For example, to change only ***ev_th***, ***cgt***, ***a***, and ***b*** (but NOT change ***t_int***, ***s_int***, ***cga***, ***c***, and ***id***):

sn	*ev_th*	*t_int*	*s_int*	*cgt*	*cga*	*a*	*b*	*c*	*id*
1	2	----	--	6	--	2	11	--	----

type the following command after the **>** prompt:

> SET-AN 1,2,,,6,,2,11[Enter]

Note that spaces will NOT serve to delimit an omitted parameter.

To display the current parameters values for ANALOG 1 type the command after the **>** prompt and you will get the response:

> SET-AN 1[Enter]
ANALOG *sn* ID : *id*
Event Threshold : *ev_th*
Transmit Intervl: *t_int* sec(s)
Sample Interval : *s_int* sec(s)
Change to Txmit : *cgt*
Change for Alarm: *cga*
Calibration CAL=: (RAW * *a*)/*b* + *c*

4.7 Command Descriptions

A description of all 5096 Data Transmitter commands follows, in alphabetical order. The formats for input and output, as well as the command's parameters are shown. Braces indicate ***{optional}*** parameters.

The **HEADING** section shows the command's name and function.

The **FORMAT** section shows the command name in **`CAPITAL`** letters followed by the parameter list in ***italics***. Optional parameters are enclosed in braces, ***{s_int}***. Optional parameters that are not included in a command line are replaced by default values. Choices in optional parameters are separated by a bar, ***{choice1 | choice 2}***.

The **OUTPUT** section shows the **`console display`** after the command has been entered. Parameter names that are replaced by values are displayed in ***italics***. The output parameter names are described in tables with ranges and default values.

The **PARAMETER** section shows each parameter's name, description, range, and default values for 5096N version 4.4 (See Section 2.1.6 for other package default parameters). All command parameters are described in section 4.8.

The **DESCRIPTION** section describes the actions performed by the command and includes examples. In the examples, commands are typed after the command prompt **>** and are followed on the next line by the command output. For example:

```
> AD-ON[Enter]
Analog Power ON
```

Warnings associated with a command are highlighted with bars. For example:

WARNING: **This command will reset all parameters to their default values.**

The **SEE** section lists the names of related commands.

AD-OFF

Turn off the switched analog power.

FORMAT: **AD-OFF**

OUTPUT:
```
Analog Power OFF
      or
Analog Power Remaining On
```

PARAMETERS: None

DESCRIPTION: The AD-OFF command is used to turn off the switched analog power after it has been turned on by the AD-ON command. The AD-ON and AD-OFF commands must be entered in pairs. For example the sequence:

```
> AD-ON[Enter]
Analog Power ON
> AD-OFF[Enter]
Analog Power OFF
```

turns the analog power on and then off. The sequence:

```
> AD-ON[Enter]
Analog Power ON
> AD-ON[Enter]
Analog Power Already On
> AD-OFF[Enter]
Analog Power Remaining On
```

would leave the analog power on. The single AD-OFF command canceled only one of the two AD-ON commands.

VERSION: 1.4 Original command set.

SEE: AD-ON, READ-AN, READ-BATT

AD-ON

Turn on the switched analog power.

FORMAT: `AD-ON`

OUTPUT:
```
Analog Power ON
     or
Analog Power Already On
```

PARAMETERS: None

DESCRIPTION: The AD-ON command is used to turn on the switched analog power. It can be turned on to allow the testing of the analog circuitry and the sensor connected to it. The AD-ON and AD-OFF commands must be entered in pairs. For example the sequence:

```
> AD-ON[Enter]
Analog Power ON
> AD-OFF[Enter]
Analog Power OFF
```

turns the analog power on and then off. The sequence:

```
> AD-ON[Enter]
Analog Power ON
> AD-ON[Enter]
Analog Power Already On
> AD-OFF[Enter]
Analog Power Remaining On
```

would leave the analog power on. The single AD-OFF command canceled only one of the two AD-ON commands.

VERSION: 1.4 Original command set.

SEE: AD-OFF, READ-AN, READ-BATT

ALIGN

Align all system timers to the same starting point.

FORMAT: `ALIGN`

OUTPUT: `All timers aligned`

PARAMETERS: None

DESCRIPTION: After timing intervals have been entered using the sensor SET commands, it may be desirable to align all of the timers so that they start at the same time. This can be done in any of two ways:

1 - The ALIGN command can be entered from the console.

2 - The SET-SPT command can be entered from the console to change the clock-tick which re-aligns the timing intervals.

When the ALIGN command is typed, the 5096 Data Transmitter timers all start at the same time. For example, if there are two sensors, and one is set to take a measurement every 15 minutes and the other one every two hours, when the ALIGN command is entered at 9:17, the starting time for the sensors is 9:17. The first sensor will sample at 9:32, 9:47, 10:02, 10:17, etc. The second sensor will sample at 11:17, 13:17, etc. For example, to align sensor timers type the command:

```
> ALIGN[Enter]
All timers aligned
```

WARNING: **ALIGN commands close open data logging tables. New tables are opened for all defined sensors. The 5096 Data Transmitter has a limit of 16 tables for timed report logging. These tables allow timed reports to take only 2 bytes of logging memory. Once all tables have been closed, each report logged (timed and event) will take 8 bytes. Type the** CLEAR-MEM **command to clear logged memory and free all data logging tables.**

VERSION: 1.4 Original command set.
3.2 Reset no longer aligns system timers .

SEE: INIT, SET-SPT

CHK-MEM

Display the data logging memory available, memory used, and percentage of memory used.

FORMAT: `CHK-MEM`

OUTPUT:

```
Total Mem Avail : ma bytes
Total Mem Used  : mu bytes
Percent Used    : pct %
```

Name	Description	Range	Initial value
ma	Total Memory	0 to 24576	24576
mu	Used Memory	0 to *ma*	0
pct	Percent Used	*mu/ma* * 100	0

PARAMETERS: None

DESCRIPTION: This command displays the amount of memory available, the amount of memory used, and the percentage of memory used.

Sensor data reports logged use 2 bytes for timed reports, 6 bytes for event reports and 8 bytes for non-aligned timed or event reports.

For example, if the station was logging timed reports every hour for 1 month for 3 sensors (24hours * 31days * 3sensor * 2bytes) and 25 event reports were logged (25event * 6bytes), the CHK-MEM command would display:

```
> CHK-MEM[Enter]
Total Mem Avail : 24576 bytes
Total Mem Used  : 4614 bytes
Percent Used    : 18.77 %
```

VERSION: 1.4 Original command set.

SEE: CLEAR-MEM, GET-MEM, SET-MEM

CLEAR-MEM

Clear all data from the data logging memory.

FORMAT: `CLEAR-MEM`

OUTPUT: `Data Logging Memory Cleared`

PARAMETERS: None

DESCRIPTION: With this command you can clear the data-logging memory after retrieving logged data. All data logging tables are freed.

For example:

```
> GET-MEM[Enter]
(Sensor data reports are printed and logged by
the portable computer)
> CLEAR-MEM[Enter]
Data Logging Memory Cleared
```

Data logging memory and tables are also cleared by an INIT command.

WARNING: **Once data logging memory is cleared, logged data reports can no longer be recovered.**

VERSION: 1.4 Original command set.

SEE: ALIGN, CHK-MEM, GET-MEM, INIT, SET-MEM

GET-MEM

Display logged data reports.

FORMAT:

There are two formats for GET-MEM depending on the system time mode. The system time mode can be *Real Time* or *Elapsed Time*.

In *Real Time* mode the format is:

GET-MEM *{id},{h1},{m1},{YYY1},{M1},{D1},{h2},{m2},{YYY2},{M2},{D2}*

In *Elapsed Time* mode the format is:

GET-MEM *{id},{h1},{m1},{DD1},{h2},{m2},{DD2}*

OUTPUT:

In *Real Time* mode the data will be displayed one sensor value per line in the following format:

 # *SSSS YYYY MM DD hh mm ss VVVV*

Where:

#	ASCII pound sign (character 23H)
SSSS	4 digit sensor ID
YYYY	4 digit year
MM	2 digit month (01 = January)
DD	2 digit day
hh	2 digit hour (24 hour clock)
mm	2 digit minute
ss	2 digit second
VVVV	4 digit sensor value

Each line is followed by:

[CR]	ASCII carriage return (character 0DH)
[LF]	ASCII line feed (character 0AH)

All numbers are displayed in decimal with leading zeros to pack the fields. For example, a data value of 12 from sensor ID# 1935 logged at 12:41:02 on May 19, 1994 would be displayed as:

```
# 1935  1994 05 19 12 41 02  0012
```

OUTPUT: In *Elapsed Time* mode the data will be displayed one sensor value per line in the following format:

```
# SSSS  DDDDD hh mm ss  VVVV
```

Where:

#	ASCII pound sign (character 23H)
SSSS	4 digit sensor ID
DDDDD	5 digit elapsed days
hh	2 digit elapsed hours (24 hour clock)
mm	2 digit elapsed minutes
ss	2 digit elapsed seconds
VVVV	4 digit sensor value

Each line is followed by:

[CR]	ASCII carriage return (character 0DH)
[LF]	ASCII line feed (character 0AH)

All numbers are displayed in decimal with leading zeros to pack the fields. For example, with Elapsed Time started at 12:00:00 on May 1, 1994, a data value of 12 from sensor ID# 1935 logged at 12:41:02 on May 19, 1994 would be displayed as:

```
# 1935  00019 00 41 02  0012
```

PARAMETERS: *Real Time* mode format

Name	Description	Range	Default Value
id	Sensor ID	1 to 8191	All
h1	Start Hour	0 to 23	0
m1	Start Minute	0 to 59	0
YYY1	Start Year	1970 to 2105	1970
M1	Start Month	1 to 12	1
D1	Start Day	1 to 31	1
h2	End Hour	0 to 23	23
m2	End Minute	0 to 59	59
YYY2	End Year	1970 to 2105	2105
M2	End Month	1 to 12	12
D2	End Day	1 to 31	31

PARAMETERS: *Elapsed Time* mode format

Name	Description	Range	Default Value
id	Sensor ID	1 to 8191	All
h1	Start Hour	0 to 23	0
m1	Start Minute	0 to 59	0
DD1	Start Day	0 to 49710	0
h2	End Hour	0 to 23	23
m2	End Minute	0 to 59	59
DD2	End Day	0 to 49710	49710

DESCRIPTION: This command will display all data collected between the start and end times for the specified sensor. If no sensor ID is specified, then all sensor values will be displayed.

For example, to display logged data reports for sensor ID# 1935 since 12:30 P.M. on May 19, 1994, type the command:

```
> GET-MEM 1935,12,30,1994,05,19[Enter]
# 1935  1994 05 19 12 41 02  0012
```

For example, to display logged data reports for all sensors up to midnight on May 31, 1994, type the command:

```
> GET-MEM ,,,,,,0,0,1996,6,1[Enter]
# 1936  1994 05 19 12 00 00  0537
# 1935  1994 05 19 12 41 02  0012
# 1936  1994 05 19 13 00 00  0537
```

When the 5096 Data Transmitter is connected to a portable computer loaded with communications software, you can save the data to disk using the command GET-MEM. Section 2.1.5 has detailed instructions on how to download data.

VERSION: 1.4 Original command set.

SEE: CHK-MEM, CLEAR-MEM, SET-MEM

HELP

Display a list of transmitter commands and their parameters.

FORMAT: **`HELP`** ***{string}***

OUTPUT: **(*Command synt*ax)**

PARAMETERS:

Name	Description	Range	Default Value
string	Search String	8 chars	All commands

DESCRIPTION: The HELP command will display a list of commands and their parameters. If the HELP command is entered alone, all commands will be listed alphabetically. When a ***string*** is entered after the command, only commands which start with ***string*** will be listed. For example, to display a list of commands that start with SET type the command:

```
> HELP SET[Enter]
SET-AN sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}
SET-BATT {t_int},{s_int},{cgt},{cga},{id}
...
```

VERSION: 1.4 Original command set.

SEE: See Section 4.5 for more information on help facilities.

INIT

Initialize all battery-backed-up parameters to their default values and clear the data-logging memory.

FORMAT: `INIT`

OUTPUT:
```
Battery Backed Up Parameters Initialized
Data Logging Memory Cleared
```

PARAMETERS: None

DESCRIPTION: The parameters set by commands are stored in non-volatile, battery-backed-up RAM. Values are retained even when the 5096 Data Transmitter is disconnected from the main battery. The INIT command resets all battery backed up parameters to their default values and clears data-logging memory. The station ID number is read from the switches and all sensor timers are aligned.

Before programming a transmitter, it is wise to do an INIT command so you are starting with a known set of command parameters. For example:

```
> INIT[Enter]
Battery Backed Up Parameters Initialized
Data Logging Memory Cleared
> SET-EV 1, ...
```

WARNING: **Using the INIT command will reset ALL programmed parameters to the default settings and will CLEAR ALL data stored in memory. You cannot recover previously set parameters or logged data after performing an INIT command.**

VERSION: 1.4 Original command set.

SEE: ALIGN, CLEAR-MEM

READ-AN

Read and display ANALOG sensor data values.

FORMAT: `READ-AN` ***sn***

OUTPUT:

```
ANALOG sn ID     : id
Raw Reading      : raw
Cal Reading      : cal
```

Name	Description	Range
sn	Sensor Number	1 to 7
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 1023
cal	Cal Reading	0 to 32767

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 7

DESCRIPTION: This command turns on analog power, reads the ANALOG sensor value, and displays both the **RAW** and **CAL** data values.

For example, to read and display data values for ANALOG 4, type the command::

```
> READ-AN 4[Enter]
ANALOG 4 ID      : 1934
Raw Reading      : 512
Cal Reading      : 128
```

Note that the battery sensor is not read with this command but with the command READ-BATT.

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: AD-ON, AD-OFF, READ_BATT, SET-AN, SET-WARM

READ-BATT Read and display the BATTERY sensor data values.

FORMAT: `READ-BATT`

OUTPUT:

```
BATTERY sn ID    : id
Raw Reading      : raw
Cal Reading      : cal
```

Name	Description	Range
sn	Sensor Number	8
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 1023
cal	Cal Reading	0 to 32767

PARAMETERS: None

DESCRIPTION: This command turns on analog power, reads the BATTERY sensor value, and displays both the **RAW** and **CAL** data values. **CAL** data units are in hundredths of a volt, and the calibration cannot be changed.

For example, to read and display the data values for the BATTERY sensor, type the command:

```
> READ-BATT[Enter]
BATTERY 8 ID     : 1938
Raw Reading      : 798
Cal Reading      : 1251
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: AD-ON, AD-OFF, READ-AN, SET-BATT, SET-WARM

READ-CTR

Read and display COUNTER sensor accumulator values.

FORMAT: `READ-CTR` ***sn***

OUTPUT:

```
COUNTER sn ID    : id
Raw Reading      : raw
Cal Reading      : cal
```

Name	Description	Range
sn	Sensor Number	1 to 2
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 65535
cal	Cal Reading	-32768 to 32767

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2

DESCRIPTION: This command gets the current accumulator value of a COUNTER sensor and displays the **RAW** and **CAL** data values. For sensors that have the ***we*** parameter enabled, only the wind run counter data value is displayed; use the READ-WI command to display both the wind run counter and wind direction data values.

For example, to get and display the data values for COUNTER 2, type the command:

```
> READ-CTR 2[Enter]
COUNTER 2 ID     : 1928
Raw Reading      : 12
Cal Reading      : 12
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: READ-WI, SET-CTR, SET-WI, WRITE-CTR

READ-EV

Read and display EVENT sensor accumulator values.

FORMAT: `READ-EV` ***sn***

OUTPUT:

```
EVENT sn ID      : id
Raw Reading      : raw
Cal Reading      : cal
```

Name	Description	Range
sn	Sensor Number	1 to 2
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 65535
cal	Cal Reading	-32768 to 32767

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2

DESCRIPTION: This command gets the current accumulator value of a EVENT sensor and displays the **RAW** and **CAL** data values.

For example, to get and display the data values for EVENT 2, type the command:

```
> READ-EV 2[Enter]
EVENT 2 ID       : 1930
Raw Reading      : 12
Cal Reading      : 12
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: SET-EV, WRITE-EV

READ-IDSW Read and display the Station ID switches.

FORMAT: `READ-IDSW`

OUTPUT: `Station ID : staid`

Name	Description	Range
staid	Station ID	0 to 8191

PARAMETERS: None

DESCRIPTION: This command reads the Station ID switches and displays the **Station ID**. It can be used to verify that you are connected to the correct station.

For example, to get and display the **Station ID**, type the command:

```
> READ-IDSW[Enter]
     Station ID      : 1930
```

VERSION: 3.6 Added command.

SEE: None

READ-PK

Read and display PEAK WIND sensor data values.

FORMAT: `READ-PK` ***sn***

OUTPUT:

```
PEAK WIND sn ID : id
Raw Reading     : raw
Cal Reading     : cal
```

Name	Description	Range
sn	Sensor Number	1 to 2
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 65535
cal	Cal Reading	-32768 to 32767

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2

DESCRIPTION: This command gets the current peak wind data for a PEAK WIND sensor and displays the **RAW** and **CAL** data values. The **RAW** count is the maximum number of pulses saved and the **CAL** data value is maximum wind speed saved since the last PEAK WIND sensor transmission.

For example, to get and display the data values for PEAK WIND 1, type the command:

```
> READ-PK 1[Enter]
PEAK WIND 1 ID  : 1924
Raw Reading     : 37
Cal Reading     : 10
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: SET-PK

READ-SERIAL

Read and display SERIAL sensor data values.

FORMAT: `READ-SERIAL` ***sn***

OUTPUT:

```
SERIAL sn ID     : id
Raw Reading      : raw
Cal Reading      : cal
```

Name	Description	Range
sn	Sensor Number	1 to 8
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 65535
cal	Cal Reading	-32768 to 32767

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2

DESCRIPTION: This command displays the **RAW** and **CAL** data values for the SERIAL sensor.

For example, to get and display the data values for SERIAL SENSOR 5, type the command:

```
> READ-SERIAL 5[Enter]
SERIAL 5 ID      : 1935
Raw Reading      : 100
Cal Reading      : 100
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 3.6 Added command for EPROM type S.

SEE: SET-SERIAL, WRITE-SERIAL

READ-ST

Read and display the STATUS sensor data values.

FORMAT: `READ-ST`

OUTPUT:

```
STATUS sn ID     : id
Status           : cal
```

Name	Description	Range
sn	Sensor Number	1
id	Sensor ID	1 to 8191
cal	Cal Reading	00000000 to 11111111

PARAMETERS: None

DESCRIPTION: This command turns on analog power, reads the STATUS sensor value and displays its **CAL** data value in binary. The STATUS sensor data cannot be calibrated so the **RAW** data value is not shown. Each digit in the binary data value shows the status line state as **1** for open or **0** for closed. The rightmost digit shows the state for status line 1 and the leftmost digit show the state for status line 8.

For example, to read and display the data value for the STATUS sensor, type the command:

```
> READ-ST[Enter]
STATUS 1 ID      : 1926
Status           : 00000001
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.

SEE: SET-ST

READ-WI

Read and display WIND sensor data values.

FORMAT: **`READ-WI`** ***sn***

OUTPUT:

```
WIND sn ID       : id
Wind Speed - Raw: raw
Wind Speed - Cal: wcal
Wind Direction   : wdir
Wind Combined    : wind
```

Name	Description	Range
sn	Sensor Number	1 to 2
id	Sensor ID	1 to 8191
raw	Wind Run Raw Reading	0 to 65535
wcal	Wind Run Cal Reading	0 to 31
wdir	Wind Direction Reading	0 to 63
wind	Combined Wind Reading	0 to 2047

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2

DESCRIPTION: This command turns on analog power, reads the wind direction ANALOG sensor value, gets the WIND sensor value, computes and displays the wind run **RAW** and **CAL** data values, the wind direction **CAL** value and the combined wind data value.

Wind Speed - Raw shows the WIND **RAW** accumulator. **Wind Speed - Cal** shows the lower 5 bits of the WIND **CAL** data. **Wind Direction** shows the upper 6 bits of the wind direction sensor (ANALOG 7) **CAL** data. **Wind Combined** shows the WIND data in ALERT Wind format which is the Wind Speed - Cal shifted left 6 bits and ored with the Wind Direction. For example, to get and display the data value for WIND 1, type the command:

```
> READ-WI 1[Enter]
WIND 1 ID       : 1927
Wind Speed - Raw: 12
Wind Speed - Cal: 12
Wind Direction  : 32
Wind Combined   : 800
```

The data value read by this command is not logged. This command does not interfere with normal data sampling, logging and transmission.

VERSION: 1.4 Original command set.
SEE: READ-CTR, SET-CTR, SET-WI, WRITE-CTR

RESET

Reset the transmitter.

FORMAT: `RESET`

OUTPUT:

```
HydroLynx Systems, Inc. - 5096 ALERT Data Transmitter
Copyright Year. All Rights Reserved.
P9601-01-pn Ver verR Month Day, Year
```

Name	Description	Range
pn	Sensor input package	54,80,81,82,90,N,S
ver	Firmware Version Number	3.0 - 4.4
R	Radio type	(Blank),M,R,RI
Month	Month of version release date	
Day	Day of version release date	
Year	Year of version release date	

where: 54, 80, 81, 82, 90, N and S are the part number extensions for the sensor input package supported by the 5096 Data Transmitter firmware and (Blank), M, R and RI indicate the radio type default parameters used by the firmware.

PARAMETERS: None

DESCRIPTION: This command causes the same reset action as pressing the **RESET** switch on the 9601 board.

A reset restarts the firmware program. The firmware copyright notice, part number, version number and release date are displayed when the firmware program restarts.

```
> RESET[Enter]

HydroLynx Systems, Inc. - 5096-N ALERT Data Transmitter
Copyright 2005. All Rights Reserved.
P9601-01-N Ver 4.4M September 19, 2005
```

Sensor data values and non-volatile parameters are not initialized by the Reset command.

VERSION: 3.2 Added command.

SEE: RESETCNT

RESETCNT Display or set the Reset count.

FORMAT: **RESETCNT** ***{rcnt}***

OUTPUT: **Reset count : *rcnt***

Name	Description	Range
rcnt	Reset Count	0 - 65535

PARAMETERS:

Name	Description	Range	Default value
rcnt	Reset Count	0 - 65535	No change

DESCRIPTION: This command displays the Reset count if no parameter is supplied. If a parameter is supplied with this command, the Reset count is set to the parameter value before it is displayed.

The Reset count is incremented each time the transmitter is powered on, the **RESET** switch is pressed, the Reset command is entered or the micro-processor restarts the firmware program due to a hardware or software fault.

For example, to display the Reset count and then reset it, type the commands:

```
> RESETCNT[Enter]
Reset count     : 5
> RESETCNT 0[Enter]
Reset count     : 0
```

The RESETCNT command is a good diagnostic command to check if your transmitter is restarting the firmware too often due to hardware or software faults. Keep a record of the Reset count when you service a transmitter. If the count has increased dramatically since your last service visit, you should contact the factory service technician for instructions.

VERSION: 3.2 Added command.

SEE: RESET

RESETINIT

Display or set the Initialize on TEST-RESET parameter.

FORMAT: **RESETINIT *{0=OFF | 1=ON}***

OUTPUT: **TEST RESET Init : *rstate***

Name	Description	Range
rstate	Init on TEST-RESET	OFF | ON

PARAMETERS:

Name	Description	Range	Default value
rstate	Init on TEST-RESET	OFF | ON	ON

DESCRIPTION: This command displays the Init on TEST-RESET parameter state. If this parameter is ON, holding the **TEST** switch and then pressing the **RESET** switch will cause the transmitter to execute an INIT command. The INIT command initializes all the non-volatile parameters, setting them to their default values.

For example, to display the Init on TEST-RESET state and then turn it off, type the commands:

```
> RESETINIT[Enter]
TEST RESET Init : ON
> RESETINIT 0[Enter]
TEST RESET Init : OFF
```

The RESETINIT command is ON by default for 5096 Data Transmitter firmware part numbers 54,80,81,90 and N. This lets you quickly change a transmitter's **Station ID** and set up the default sensor parameters by holding **TEST** and pressing the **RESET** switch.

VERSION: 3.2 Added command.

SEE: INIT

SET-AN

Display or set ANALOG sensor parameters.

FORMAT: **SET-AN *sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}***

OUTPUT:

```
ANALOG sn ID     : id
Event threshold : ev_th
Transmit Intervl: t_int sec(s)
Sample Interval : s_int sec(s)
Change to Txmit : cgt
Change for Alarm: cga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 7	
ev_th	Event Threshold	0 to 32767	0
t_int	Transmit Intervl	0 to 2147483647	0 sec
s_int	Sample Interval	0 to 2147483647	0 sec
cgt	Change to Txmit	0 to 32767	1
cga	Change for Alarm	0 to 32767	50
a	Multiplier	-32767 to 32767	1
b	Divider	-32767 to 32767	4
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn***

DESCRIPTION: The 5096 Data Transmitter supports 7 external analog sensors numbered 1 to 7. The default ID for each ANALOG sensor is the ***staid*** number plus ***sn***. The ID can be changed by command to any other ID not currently assigned to another sensor. An ANALOG sensor is disabled when its ***t_int*** and ***s_int*** are zero.

For example, to set ANALOG 3 to have ***ev_th*** of 5, ***t_int*** of 1 hour (3600 secs), ***s_int*** of 1 minute (60 secs), ***cgt*** of 2, ***cga*** of 10, and offset the raw value with parameter ***c*** of -2 type the command:

```
> SET-AN 3,5,3600,60,2,10,,,-2[Enter]
ANALOG 3 ID     : 1933 ...
```

VERSION: 1.4 Original command set.
3.2 Event Threshold replaced the ***tx0*** transmit zero parameter.

SEE: READ-AN

SET-BATT

Display or set the BATTERY sensor parameters.

FORMAT: `SET-BATT` ***{t_int},{s_int},{cgt},{cga},{id}***

OUTPUT:

```
BATTERY sn ID    : id
Transmit Intervl: t_int sec(s)
Sample Interval : s_int sec(s)
Change to Txmit : cgt
Change for Alarm: cga
```

PARAMETERS:

Name	Description	Range	Default value
t_int	Transmit Intervl	0 to 2147483647	0 sec
s_int	Sample Interval	0 to 2147483647	0 sec
cgt	Change to Txmit	0 to 32767	25
cga	Change for Alarm	0 to 32767	50
id	Sensor ID	0 to 8191	***staid*** + 8

DESCRIPTION: The eighth analog channel on the 5096 Data Transmitter is connected to an internal battery sensor which reads the battery's voltage in units of hundredths of volts. This calibration is fixed. The default ID for the BATTERY sensor is the ***staid*** number plus 8. The ID can be changed by command to any other ID not currently assigned to another sensor. The BATTERY sensor is disabled when its ***t_int*** and ***s_int*** are zero.

For example, to set the Battery sensor to have ***t_int*** of 1 day (86400 secs), ***s_int*** of 1 minute (60 secs), ***cgt*** of 50, ***cga*** of 100, and ***id*** 1938 type the command:

```
> SET-BATT 86400,60,50,100,1938[Enter]
BATTERY 8 ID    : 1938 ...
```

VERSION: 1.4 Original command set.

SEE: READ-BATT

SET-BAUD

Display or set the console baud rate.

FORMAT: `SET-BAUD` ***{baud}***

OUTPUT: `BAUD RATE : baud`

PARAMETERS:

Name	Description	Range	Default value
baud	Baud Rate	300, 1200, 2400 4800, 9600	300 except 9600 type S

DESCRIPTION: The default console baud rate is 300 baud. This is sufficient for most programming applications; however, when downloading the logged memory, a higher baud rate will dramatically improve the speed of the operation. To change the baud rate, type the SET-BAUD command with the new baud rate (with the console set at the 5096 Data Transmitter's current baud rate). Then reset the baud rate in your communication software to the new baud rate. For example, to set ***baud*** to 9600 type the command:

```
> SET-BAUD 9600[Enter]
BAUD RATE       : 9600
(Reset your communication software baud rate)
(Press [Enter])
>
```

The 5096 Data Transmitter will retain the new baud rate setting after you disconnect the console. Record the new baud rate on the on-site checklist so that you can quickly establish communications on your next site visit.

NOTE: **IF the baud rate is unknown, try setting the console to each of the possible baud rate selections until communication is established with the 5096 Data Transmitter.**

The SET-BAUD command has no effect on the baud rate used in radio transmissions, which is fixed at 300 baud.

VERSION:
1.4 Original command set.
3.6 Default baud rate is 9600 for EPROM type S.
4.0 Default baud rate is 9600

SEE: INIT

SET-CTR

Display or set COUNTER sensor parameters.

FORMAT: `SET-CTR` ***sn,{en_ev},{pdc},{t_int},{cgt},{cga},{a},{b},{c},{we},{id}***

OUTPUT:

```
COUNTER sn ID    : id
Event Detection : en_ev
Pre-Divide Ctr  : pdc
Transmit Intervl: t_int sec(s)
Change to Txmit : cgt
Change for Alarm: cga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
en_ev	Event Detection	0=Dis...,1=Enabled	0
pdc	Pre-divide Counter	1 to 32767	1=3924,2=2
t_int	Transmit Intervl	0 to 2147483647	0 sec
cgt	Change to Txmit	0 to 32767	1
cga	Change for Alarm	0 to 32767	10
a	Multiplier	-32767 to 32767	1
b	Divider	-32767 to 32767	1
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn*** - 4
we	Wind Enable Flag	0=Dis...,1=Enabled	1=1,2=0

DESCRIPTION: The 5096 Data Transmitter supports two up only counters. COUNTER 2 counts switch closures (to ground). The default ID number for each COUNTER sensor is the ***staid*** number plus ***sn*** minus 4. A COUNTER sensor is disabled when its ***en_ev*** and ***t_int*** are zero.

For example, to set COUNTER 2 to have ***en_ev*** enabled, ***pdc*** of 1, ***t_int*** of 12 hours (43200 secs), ***cgt*** of 1, and ***cga*** of 2 and disable the ***we*** parameter, type the command:

```
> SET-CTR 2,1,1,43200,1,2,,,,0[Enter]
COUNTER 2 ID    : 1928 ...
```

VERSION: 1.4 Original command set.

SEE: READ-CTR, READ-WI, SET-WI, WRITE-CTR

SET-CTRRESET Display or set COUNTER sensor reset time.

FORMAT: `SET_CTRRESET` ***sn,{hh},{mm},{ss},{YYYY},{MM},{DD}***

OUTPUT:
```
COUNTER sn ID    : id
Reset Time       : hh:mm:ss YYYY/MM/DD
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
hh	Hour	0 to 23	0 hours
mm	Minute	0 to 59	0 minutes
ss	Second	0 to 59	0 seconds
YYYY	Year	1970 to 2105	1970
MM	Month	1 to 12	1 (January)
DD	Day of Month	1 to 31	1

DESCRIPTION: A COUNTER sensor can be set up to have its accumulator reset to 0 at a future reset time. When the 5096 Data Transmitter time is updated and the current time is equal to or past the reset time, the COUNTER sensor accumulator is reset to 0, the new CAL data value is transmitted and the reset time is incremented by one year.

For example, to set the COUNTER 2 reset time to September 1, 1995 at 06:30 A..M., type the command:

```
> SET-CTRRESET 2,06,30,00,1995,09,01[Enter]
COUNTER 2 ID     : 1928
Reset Time       : 06:30:00 1995/09/01
```

To disable a COUNTER sensor reset time, type the COUNTER sensor number follow by a zero alone. For example, to disable the COUNTER 2 reset time, type the command:

```
> SET-CTRRESET 2,0[Enter]
COUNTER 2 ID     : 1928
Reset Time       : Disabled
```

VERSION: 3.3 Added command.

SEE: SET-CTR, TIME=, TIME-MODE

SET-ENH

Display or set the radio transmission format, selecting between standard ALERT, Enhanced ALERT, and Enhanced IFLOWS format.

FORMAT: `SET-ENH` ***{enhflag}***

OUTPUT:
```
Tx format        : Standard ALERT
```

PARAMETERS:

Name	Description	Range	Default value
enhflag	Tx format	0, 1, or 2	0=Standard ALERT 1=Enh. ALERT 2=Enh. IFLOWS

DESCRIPTION: The 5096 Data Transmitter supports standard ALERT, Enhanced ALERT and Enhanced IFLOWS data packet formats. This command selects which format to use for radio transmissions.

Standard ALERT uses the ASCII format for sensor IDs 0 to 99 and the Binary format for sensor IDs 100 to 8191. Enhanced ALERT includes a 6-bit CRC in the data packet which is used for error detection at the receiving site. Enhanced ALERT reduces the bit storage of the sensor ID by 1-bit to the ID range: 0 to 4095. Enhanced IFLOWS also includes a 6-bit CRC but does not reduce the sensor ID range: 0 to 8191. See Drawing AC107484 in Section 6.2 for details on these formats.

All formats have a data range of 0 to 99 for sensor IDs 0 to 99 and a data range of 0 to 2047 for sensor IDs 100 to 8191.

Note that the receiving central site computer set up must be able to receive and decode the selected format.

For example, to set ***enhflag*** to 0 to select the Standard ALERT format, type the command:

```
> SET_ENH 0[Enter]
Tx format        : Standard ALERT
```

VERSION:
1.4 Original command set.
3.0 Set default format to Standard ALERT.
3.4 Added Enhanced IFLOWS format.

SEE: None

SET-EV

Display or set EVENT sensor parameters.

FORMAT: `SET-EV` ***sn,{en_ev},{mode},{t_int},{cgt},{cga},{a},{b},{c},{id}***

OUTPUT:

```
EVENT sn ID      : id
Event Detection : en_ev
Event Mode       : mode
Transmit Intervl: t_int sec(s)
Change to Txmit : cgt
Change for Alarm: cga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
en_ev	Event Detection	0=Dis..,1=Enabled	1=0,2=1
mode	Event Mode	0 to 12	1=4,2=6
t_int	Transmit Intervl	0 to 2147483647	1=0,2=43200
cgt	Change to Txmit	0 to 32767	1
cga	Change for Alarm	0 to 32767	1=10,2=2
a	Multiplier	-32767 to 32767	1
b	Divider	-32767 to 32767	1
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn*** - 2

DESCRIPTION: The 5096 Data Transmitter supports two event sensors. EVENT 1 is intended for use with a float and pulley type river-level gauge. EVENT 2 is intended for use with a precipitation gauge. The default ID for each EVENT sensor is the ***staid*** number plus ***sn*** minus 2. An EVENT sensor is disabled when its ***en_ev*** and ***t_int*** are zero.

For example, to set EVENT 1 to have ***en_ev*** enabled, ***mode*** of 4, ***t_int*** of 6 hours (21600 secs), ***cgt*** of 1, and ***cga*** of 10 type the command:

```
> SET-EV 1,1,4,21600,1,10[Enter]
EVENT 1 ID       : 1929 ...
```

VERSION: 1.4 Original command set.
4.0 Added default mode 12 for EV-1 absolute encoder.
4.2 Default mode for EV-2 is 6. This mode supports both the 5050P and the 5050P-MS rain gauges.

SEE: READ-EV, WRITE-EV

SET-EVRESET Display or set EVENT sensor reset time.

FORMAT: `SET-EVRESET` ***sn,{hh},{mm},{ss},{YYYY},{MM},{DD}***

OUTPUT:
```
EVENT sn ID      : id
Reset Time       : hh:mm:ss YYYY/MM/DD
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
hh	Hour	0 to 23	0 hours
mm	Minute	0 to 59	0 minutes
ss	Second	0 to 59	0 seconds
YYYY	Year	1970 to 2105	1970
MM	Month	1 to 12	1 (January)
DD	Day of Month	1 to 31	1

DESCRIPTION: An EVENT sensor can be set up to have its accumulator reset to 0 at a future reset time. When the 5096 Data Transmitter time is updated and the current time is equal to or past the reset time, the EVENT sensor accumulator is reset to 0, the new CAL data value is transmitted and the reset time is incremented by one year.

For example, to set the EVENT 2 reset time to September 1, 1995 at 06:30 A.M., type the command:

```
> SET-EVRESET 2,08,00,00,1995,09,01[Enter]
EVENT 2 ID       : 1930
Reset Time       : 06:30:00 1995/09/01
```

To disable an EVENT sensor reset time, type the EVENT sensor number follow by a zero alone. For example, to disable the EVENT 2 reset time, type the command:

```
> SET-EVRESET 2,0[Enter]
EVENT 2 ID       : 1930
Reset Time       : Disabled
```

VERSION: 3.3 Added command.

SEE: SET-EV, TIME=, TIME-MODE

SET-HOLDOFF

Display or set the transmitter hold-off time interval.

FORMAT: `SET-HOLDOFF` ***{holdoff}***

OUTPUT: `TX Holdoff : ` ***holdoff*** `(secs)`

PARAMETERS:

Name	Description	Range	Default value
holdoff	Transmitter Holdoff	0 to 32767	20 secs

DESCRIPTION: After each transmission the transmit hold-off timer is started. Only alarm transmissions, which override the hold-off, are allowed during the hold-off interval. If a transmit condition occurs for a sensor during the hold-off interval, the transmission pending flag for that sensor is set. When the hold-off timer expires, current values from all sensors with transmission pending flags will be transmitted. This feature reduces the possibility of collisions with transmissions from other stations and helps to conserve battery power.

The transmitter hold-off time must be a multiple of the station time step, SPT.

For example, to set ***holdoff*** to 10 seconds type the command:

```
> SET-HOLDOFF 10[Enter]
TX Holdoff      : 10 (secs)
```

VERSION: 1.4 Original command set.

SEE: SET-SPT

SET-MEM

Display or set the data logging parameters.

FORMAT: `SET-MEM` ***{en},{of}***

OUTPUT:
```
Data logging     : en
Data overwrite   : of
```

PARAMETERS:

Name	Description	Range	Default value
en	Data logging	0=Dis...,1=Enabled	1
of	Data overwrite	0=Dis...,1=Enabled	1

DESCRIPTION: In addition to transmitting the data that it collects, the 5096 Data Transmitter has the ability to log sensor values in memory. With data logging enabled (set to 1), each value transmitted is also stored in battery-backed-up RAM (along with the time that the sample was taken). Thus, the 5096 can still collect data without a radio path or even without a radio.

The overflow flag controls what the 5096 does when its logging memory gets full. To make room for new data by discarding older d data, set the flag to 1. Otherwise data logging will stop will logging memory gets full.

For example, to enable data logging and data overwriting when full, type the command:

```
> SET-MEM 1,1[Enter]
Data logging     : Enabled
Data overwrite   : Enabled
```

VERSION: 1.4 Original command set.

SEE: CHK-MEM, CLEAR-MEM, GET-MEM, INIT

SET-PK

Display or set PEAK WIND sensor parameters.

FORMAT: `SET-PK` ***sn,{s_int},{tx_int},{vgt},{vga},{a},{b},{c},{id}***

OUTPUT:

```
PEAK WIND sn ID : id
Sample Interval : s_int sec(s)
Transmit Intervl: tx_int sec(s)
Value to Txmit  : vgt
Value for Alarm : vga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
s_int	Sample Interval	0 to 2147483647	0 sec
tx_int	Transmit Intervl	0 to 2147483647	0 sec
vgt	Value to Transmit	0 to 32767	0
vga	Value for Alarm	0 to 32767	70
a	Multiplier	-32767 to 32767	360
b	Divider	-32767 to 32767	1308
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn*** - 7

DESCRIPTION: A peak wind sensor is a virtual sensor in that it derives its value from the wind sensor. It makes several samples of wind data over its transmit interval and transmits the largest of those values. The default ID for each PEAK WIND sensor is the ***staid*** number plus ***sn*** minus 7. A PEAK WIND sensor is disabled when its ***s_int*** and ***tx_int*** are zero.

The PEAK WIND raw count is the maximum number of WIND sensor pre-divide counts, ***pdc***, in a sample interval. To convert to kph, set the ***a*** parameter to 3600 / ***s_int*** and the ***b*** parameter to the ***pdc*** per km.

For example, to set PEAK WIND 1 to have ***s_int*** of 10 seconds, ***tx_int*** of 1 hour (3600 seconds), ***vgt*** of 0, and ***vga*** of 40 kph, type the command:

```
> SET-PK 1,10,3600,0,40,360,1308[Enter]
PEAK WIND 1 ID  : 1925 ...
```

VERSION: 1.4 Original command set.

SEE: READ-PK, SET-WI

SET-RFWARM

Display or set the radio warm-up and preamble time interval lengths, carrier detect wait and radio power state during wait.

FORMAT: `SET-RFWARM` ***{txrf},{pre},{cdw},{cdp},{pwron},{cd}***

OUTPUT:

```
RF Tx Warm Time : txrf msec
RF Preamble Time: pre msec
RF CD On Wait   : cdw msec
RF CD Wait Power: cdp
RF Power On Time: pwron msec
RF CD On State  : cd
```

PARAMETERS:

Name	Description	Range	Default value
txrf	RF Tx Warm Time	10 to 2000	200 msecs
pre	RF Preamble Time	20 to 2000	100 msecs
cdw	RF CD Wait Time	0 to 25500 0=Disabled	1500 msecs
cdp	RF CD Wait Power	0=OFF, 1=ON	see radio
pwron	RF Power On Time	10 to 2000	see radio
cd	RF CD on state	0=Low, 1=High	1

DESCRIPTION:

The ***txrf*** parameter sets the transmitter warm-up time interval in milliseconds (msecs) that gives the receiving station time to un-squelch. The data signal is sent at the end of the warm-up time interval.

The ***pre*** parameter sets the preamble time interval in milliseconds (msecs) during which tone is transmitted for receiving station decoder synchronization. The preamble time interval is during the last part of the warm-up time interval and is before the data signal is sent.

Without a sufficient warm up time and preamble, the first bits of data are liable to be lost. The appropriate warm time and preamble for a given 5096 Data Transmitter will depend on the equipment and configuration of your telemetry system; especially in those systems that use repeaters which are not of the store-and-forward type. Consult the factory for assistance in determining the correct value for this parameter if your system includes repeaters of this type.

The ***txrf*** parameter must be at least 10 milliseconds greater than the ***pre*** parameter.

The ***cdw*** parameter is the 5096 Data Transmitter carrier detect control parameter. If this parameter is not zero, it sets the maximum time the 5096 Data Transmitter will wait after detecting a radio carrier signal before forcing a data transmission.

The 5096 Data Transmitter can detect radio transmissions by other nearby transmitters or by repeaters and it will wait until the other transmission completes before it starts its own transmission. After a radio carrier is detected, the transmitter will wait 100 milliseconds and check for radio carrier again before starting its own transmission. This delay allows for repeaters to start transmitting after receiving a transmission from a nearby station. The radio carrier can stop and restart up to 3 times before the transmitter forces a data transmission.

If a radio carrier signal remains on for the maximum wait time set in the ***cdw*** parameter, a data transmission is forced. Increase the maximum wait time for systems with long transmission packets. Set ***cdw*** to 0 to disable radio carrier signal checking.

The ***cdp*** parameter determines the radio power state while waiting for a radio carrier signal to stop. If ***cdp*** is 0 (OFF) the radio power is turned off while waiting. If ***cdp*** is 1 (ON) the radio power is left on. Synthesized frequency radios will lose frequency lock when powered off and so should have this parameter set to 1 (ON).

The ***cd*** parameter defines the carrier detect on state for the **Radio type**. If ***cd*** is 1 then a positive voltage on the carrier detect pin indicates a carrier signal. If ***cd*** is 0 then a zero voltage on the carrier detect pin indicates a carrier signal.

The 5096 Data Transmitter firmware is delivered with the **RF Power On Time** parameter, ***pwron***, set to match the type of radio supplied with the transmitter. This parameter defines the time to wait after the radio is powered on before the radio carrier signal is turned on.

Radio Type	Power On Time	CD Wait Power	CD State
(Blank)	25 msec	OFF	1
R & RI	800 msec	ON	1
M	400 msec	ON	1

For example, to set the RF warm parameter ***txrf*** to 200, ***pre*** to 100, ***cdw*** to 2000 msec (2 secs), ***cdp*** to OFF, ***pwron*** to 400, and ***cd*** to 1, type:

```
> SET-RFWARM 200,100,2000,0,400,1[Enter]
RF Tx Warm Time : 200 msec
RF Preamble Time: 100 msec
RF CD Wait Time : 2000 msec
RF CD Wait Power: OFF
RF Power On Time: 400 msec
RF CD On State  : 1
```

VERSION:

1.4 Original command set.
3.0 Standardized radio parameters: 25 ms RF power on.
3.3 Added RF CD Wait Time parameter and Radio type R.
3.4 Added RF CD Wait Power and Power On Time parameters.
3.6 Added Radio type M.
4.1 Added RF CD On State parameter.

SEE: SET-SPT

SET-SERIAL

Display or set SERIAL sensor parameters.

FORMAT: `SET-SERIAL` ***sn,{ev_th},{t_int},{s_int},{cgt},{cga},{a},{b},{c},{id}***

OUTPUT:

```
SERIAL sn ID     : id
Event threshold  : ev_th
Transmit Intervl: t_int sec(s)
Sample Interval  : s_int sec(s)
Change to Txmit  : cgt
Change for Alarm: cga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 7	
ev_th	Event Threshold	0 to 32767	0
t_int	Transmit Intervl	0 to 2147483647	0 sec
s_int	Sample Interval	0 to 2147483647	0 sec
cgt	Change to Txmit	0 to 32767	1
cga	Change for Alarm	0 to 32767	50
a	Multiplier	-32767 to 32767	1
b	Divider	-32767 to 32767	4
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn***

DESCRIPTION: SERIAL sensors can be defined for a 5096 Data Transmitter using the SET-SERIAL command. SERIAL sensor data values can then be saved using the WRITE-SERIAL command.

A SERIAL sensor uses the data storage of an ANALOG sensor with the same number so you should only define SERIAL sensors for ANALOG sensor numbers that are not used. The parameter set up for a SERIAL sensor is the same as for an ANALOG sensor. Use the SET-AN command with some parameters to return the sensor number to an ANALOG sensor type.

For example, to set SERIAL 5 to have ***ev_th*** of 0, ***t_int*** of 1 hour (3600 secs), ***s_int*** of 1 minute (60 secs), ***cgt*** of 5, ***cga*** of 50, and no conversion of the raw value type the command:

```
> SET-SERIAL 5,0,3600,60,5,50,1,1,0[Enter]
SERIAL 5 ID     : 1935 ...
```

VERSION: 3.6 Added command for EPROM type S.

SEE: READ-SERIAL, SET-BAUD, WRITE-SERIAL

SET-SPT

Display or set the number of seconds per clock tick.

FORMAT: `SET-SPT` ***{spt}***

OUTPUT: `Seconds Per Tick:` ***spt***

PARAMETERS:

Name	Description	Range	Default value
spt	Seconds per Tick	0 to 300	10

DESCRIPTION: The 5096 Data Transmitter spends most of its time in a power-conserving standby mode, which minimizes its activity. Every time the real-time clock ticks, the 5096 wakes up to update the clock time, the timers, and as necessary to sample sensor data, perform calibrations, and make transmissions.

This command sets the number of seconds between ticks and stores that parameter in battery-backed-up RAM. Set longer intervals to have the 5096 consume slightly less power, or shorter intervals to more precisely resolve the time of a sensor's readings.

All other time-based functions in the 5096: system timers, sample intervals, hold-off intervals, and the real-time clock's time are based on the clock-tick interval. The intervals for each of these functions MUST be an integer multiple of the clock-tick interval, so when you change the clock-tick interval, the 5096 checks all intervals and modifies them to be multiples of the clock-tick interval.

For example, to set ***spt*** to 20 seconds, type the command:

```
> SET-SPT 20[Enter]
WARNING: Timers Being Realigned
Seconds Per Tick: 20
```

VERSION: 1.4 Original command set.

SEE: SET-HOLDOFF, TIME=

SET-ST

Display or set the STATUS sensor parameters.

FORMAT: `SET-ST` ***{tx0},{t_int},{s_int},{{-}tf},{{-}af},{id}***

OUTPUT:

```
STATUS sn ID     : id
Txmt Zero Status: tx0
Transmit Intervl: t_int sec(s)
Sample Interval : s_int sec(s)
Change Flag      : ANY (ALL) tf
Alarm Flag       : ANY (ALL) af
```

PARAMETERS:

Name	Description	Range	Default value
tx0	Transmit Zeroes	0=Dis...,1=Enabled	0
t_int	Transmit Intervl	0 to 2147483627	0 sec
s_int	Sample Interval	0 to 2147483627	0 sec
tf	Change Flag	±0 to ±11111111	+00000000
af	Alarm Flag	±0 to ±11111111	-11111111
id	Sensor ID	1 to 8191	***staid*** - 4

DESCRIPTION: The 5096 Data Transmitter has inputs for 8 individual status lines that are grouped for transmission and logging into a single 8-bit STATUS sensor. The default ID for the STATUS sensor is the ***staid*** number minus 4. The STATUS sensor is disabled when its ***t_int*** and ***s_int*** are zero.

The STATUS sensor has no interrupt capability and must be read on ***s_int*** or ***t_int*** time intervals. The ***tx0***, ***af***, and ***tf*** parameters are used to determine if a transmission is to be made at the ***s_int*** interval.

For example, to set the STATUS sensor to have ***tx0*** of 1 (enabled), ***s_int*** of 10 seconds , ***t_int*** of 1 hour (3600 seconds), ***tf*** of 00000011 (change on any status lines 1 and 2) and ***af*** of -00000011 (change of all status lines 1 and 2), type the command:

```
> SET-ST 1,3600,10,00000011,-00000011[Enter]
STATUS 1 ID     : 1926 ...
```

VERSION: 1.4 Original command set.

SEE: READ-ST

SET-WARM

Display or set the wait time before reading ANALOG and STATUS sensors after turning on the switched analog power.

FORMAT: `SET-WARM {wa}`

OUTPUT: `Analog Warm Time: wa × 10 msecs`

PARAMETERS:

Name	Description	Range	Default value
wa	Analog Warm Time	0 to 32767	10 except 300 type 81

DESCRIPTION: The 5096 Data Transmitter reads an ANALOG or STATUS sensor by first switching on the analog power supply. It waits the **Analog Warm Time** then takes sensor readings. This ***wa*** interval is required by most analog sensors to have a stable output.

Enter the warm time in 10-millisecond(msecs) units. For example, to set ***wa*** to 10 (10 × 10msecs = 100msecs), type the command:

```
> SET-WARM 10[Enter]
Analog Warm Time: 10 × 10 msecs
```

VERSION:
1.4 Original command set.
3.9-82 Added sensor input package with 3 second default.
4.1 SET-WARM no longer effects read times for status, wind direction or battery voltage.
4.2 Package 81 default warm time changed to 3 seconds.

SEE: READ-AN, READ-BATT

SET-WI

Display or set WIND sensor parameters.

FORMAT: `SET-WI` ***sn,{en_ev},{pdc},{t_int},{cgt},{cga},{a},{b},{c},{we},{id}***

OUTPUT:

```
WIND sn ID       : id
Event Detection  : en_ev
Pre-Divide Ctr   : pdc
Transmit Intervl : t_int sec(s)
Change to Txmit  : cgt
Change for Alarm : cga
Calibration CAL = (RAW * a)/b + c
```

PARAMETERS:

Name	Description	Range	Default value
sn	Sensor Number	1 to 2	
en_ev	Event Detection	0=Dis...,1=Enabled	0
pdc	Pre-divide Counter	1 to 32767	1=3924,2=2
t_int	Transmit Intervl	0 to 2147483647	0 sec
cgt	Change to Txmit	0 to 32767	1
cga	Change for Alarm	0 to 32767	10
a	Multiplier	-32767 to 32767	1
b	Divider	-32767 to 32767	1
c	Adder	-32767 to 32767	0
id	Sensor ID	0 to 8191	***staid*** + ***sn*** - 4
we	Wind Enable Flag	0=Dis...,1=Enabled	1=1,2=0

DESCRIPTION: The 5096 Data Transmitter supports two up only counters. WIND 1 is intended for use with a wind sensor that produces an AC sine-wave signal. The default ID for each WIND sensor is the ***staid*** number plus ***sn*** minus 4. A WIND sensor is disabled when its ***en_ev*** and ***t_int*** are zero.

For example, to set WIND 1 to have ***en_ev*** enabled, ***pdc*** of 1308 (1km), ***cgt*** of 1, and ***cga*** of 2 and enable the ***we*** parameter, type the command:

```
> SET-WI 1,1,1308,,1,2,,,,1[Enter]
WIND 1 ID       : 1927 ...
```

VERSION: 1.4 Original command set.

SEE: READ-CTR, READ-WI, SET-CTR, WRITE-CTR

SHOWALL

Display all sensor parameters, data values and system parameters.

FORMAT: **SHOWALL *{all}***

OUTPUT:

```
Real Time        : Current time
Station ID       : Station ID #
ANALOG sn ID     : Analog sn ID # ...
```

PARAMETERS:

Name	Description	Range	Default value
all	All Sensors	0=NO,1=YES	0

DESCRIPTION: This command displays all sensor parameters, data values and system parameters defined in the transmitter.

By default, only the active sensor parameters and data values are displayed. If the ***all*** parameter is set to 1, all sensors, active and inactive have their parameters and data values displayed.

For example to display all active sensor parameters, type the command:

```
> SHOWALL[Enter]
Real Time        : 1994 06 01 12:35:40
Station ID       : 1930
EVENT 1 ID       : 1930
Event Detection  : Enabled
Event Mode       : 4
Transmit Intervl: 43200 sec(s)
Change to Txmit  : 1
Change for Alarm: 2
Calibration CAL = (RAW * 1)/1 + 0
Reset Time       : Disabled
Raw Reading      : 12
Cal Reading      : 12
Analog Warm Time: 10 × 10 msecs
RF Tx Warm Time  : 200 msec
RF Preamble Time: 100 msec
RF CD Wait Time  : 1500 msec
RF CD Wait Power: OFF
RF Power On Time: 25 msec
```

VERSION: 3.2 Added command.

SEE: All other commands

TEST

Executes a test of the transmitter.

FORMAT: **`TEST`** ***{level},{defaultlevel}***

OUTPUT:
```
Level 1 test
Transmitting all Active Sensors
```
(Active sensor values at current time printed)
(Level 2 test output displayed)

PARAMETERS:

Name	Description	Range	Default value
level	Test level	1-2	***default***
defaultlevel	Default test level	1-2	2

DESCRIPTION: This command transmits all active sensor values for the Level 1 test and checks the 5096 Data Transmitter for the Level 2 test. The command functions as if the **TEST** switch was pressed.

The TEST command with no arguments performs the default test level. When initialized a 5096 Data Transmitter performs a levels 2 test by default. The ***level*** parameter selects the test level. The ***defaultlevel*** parameter sets the default test level. Changing the default test level effects the TEST switch level as well as the TEST command level.

For example to set the default test level to 1, type the command::

```
> TEST ,1[Enter]
```

To execute a Level 2 test (time mode is set to *Real Time*), type the command::

```
> TEST 2[Enter]
Transmitting all Active Sensors
# 1930  1994 06 01 12 41 40  0012 ...
Level I tests being performed
ROM test    : Passed
RAM test    : Passed
BATTERY test: Passed - Battery level = 13.21 v
CLOCK test  : Passed - drift = 1 secs/day
TEST-TX NO TONE
```

VERSION: 3.2 Added command.
3.3 Added TEST-TX NO TONE.
3.8 Added test level command parameters

SEE: None

TEST-TX

Turn-on the radio transmitter so you can check the radio's signal strength and frequency.

FORMAT: `TEST-TX` ***{testtone}***

OUTPUT: (None to console)
(Test transmission to radio)

PARAMETERS:

Name	Description	Range	Default value
testtone	Tone transmitted	0=High and low 1=No tone 2=High tone only 3=Low tone only	0

DESCRIPTION: This command sends a 5 second test radio transmission. Set ***testtone*** to 0 to transmit a test signal with alternating high and low tones. Set ***testtone*** to 1 to key on the radio without transmitting a ***testtone*** to 2 to transmit the high tone only. Set ***testtone*** to 3 to transmit the low tone only.

For example, to test the transmitter radio without tone set ***testtone*** to 1, type the command:

```
> TEST-TX 1[Enter]
```

VERSION: 3.2 Added command.
4.3 Added ***testtone*** parameters 2 and 3 to transmit high or low tone.

SEE: None

TIME-MODE Display or set the time-keeping mode to either *Real* or *Elapsed Time*.

FORMAT: `TIME-MODE` ***{tmode}***

OUTPUT:
```
Time Mode        : Real Time (Elapsed Time)
```

PARAMETERS:

Name	Description	Range	Default value
tmode	Time Mode Flag	0=*Real Time*, 1=*Elapsed Time*	0

DESCRIPTION: When ***tmode*** is set to 0 (*Real Time)*, time is displayed as the year, month, day, hour, minute, and second.

When ***tmode*** is set to 1 *(Elapsed Time)*, the time is displayed as the number of days, hours, minutes, and seconds that have elapsed since the time was set with the TIME= command.

For example, to set ***tmode*** to Elapsed Time, type the command:

```
> TIME-MODE 1[Enter]
Time Mode        : Elapsed Time
```

VERSION: 1.4 Original command set.

SEE: GET-MEM, TIME=

TIME=

Display or set the transmitter clock time.

FORMAT: There are two formats for this command depending on the time mode.

In the *Real Time* mode the format is:
`TIME = `*`{hh},{mm},{ss},{YYYY},{MM},{DD}`*

In *Elapsed Time* mode the format is:
`TIME = `*`{hh},{mm},{ss},{ddd}`*

OUTPUT: The form of the output depends on the time mode.

In the *Real Time* mode the output is:
`Real Time : `*`hh:mm:ss YYYY/MM/DD`*

In *Elapsed Time* mode the output is:
`Elapsed Time : `*`ddd hh:mm:ss`*

PARAMETERS:

Name	Description	Range	Default value
hh	Hour	0 to 23	0 hours
mm	Minute	0 to 59	0 minutes
ss	Second	0 to 59	0 seconds
YYYY	Year	1970 to 2105	1970
MM	Month	1 to 12	1 (January)
DD	Day of Month	1 to 31	1
ddd	Elapsed Days	0 to 49710	0

DESCRIPTION: The real time clock continuously increments the time every clock tick as long as the 5096 Data Transmitter is powered. The clock time is not reset when the main battery power is disconnected but the time will no longer increment.

The time entered must be a multiple of the clock tick step.

The format for time display depends on the TIME-MODE parameter. For example, to set the time in *Real Time* mode to June 1, 1994 at 12:41 P.M., type the command:

```
> TIME = 12,41,00,1994,06,01[Enter]
Real Time       : 12:41:00 1994/06/01
```

VERSION: 1.4 Original command set.

SEE: SET-SPT, TIME-MODE

WRITE-CTR Set the **RAW** value of a COUNTER sensor.

FORMAT: `WRITE-CTR` ***sn,val***

OUTPUT:
```
COUNTER sn ID    : id
Raw Reading      : raw
Cal Reading      : cal
```

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2
val	Value to Set	0 to 2047
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 2047
cal	Cal Reading	0 to 2047

DESCRIPTION: This command will set a COUNTER sensor's accumulator to any value within range. Note that you will be entering the **RAW** accumulator value.

This command is useful after field maintenance or testing. For example, if a tipping bucket has been tipped by hand (or the **INIT** command has been used), you can reset the sensor to the correct number of bucket tips.

For example, to zero the COUNTER 2 **RAW** accumulator, type the command:

```
> WRITE-CTR 2,0[Enter]
COUNTER 2 ID     : 1928
Raw Reading      : 0
Cal Reading      : 0
```

VERSION: 1.4 Original command set.

SEE: INIT, READ-CTR, READ-EV, WRITE-EV

WRITE-EV

Set raw value of an EVENT sensor.

FORMAT: `WRITE-EV` ***sn,val***

OUTPUT:

```
EVENT sn ID      : id
Raw Reading      : raw
Cal Reading      : cal
```

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 2
val	Value to Set	0 to 2047
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 2047
cal	Cal Reading	0 to 2047

DESCRIPTION: This command will set an EVENT sensor's accumulator to any value within range. Note that you will be entering the **RAW** accumulator value.

This command is useful after field maintenance or testing. For example, if a tipping bucket has been tipped by hand (or the INIT command has been used), you can reset the sensor to the correct number of bucket tips.

For example, to set the EVENT 1 **RAW** accumulator to 113, type the command:

```
> WRITE-EV 1,113[Enter]
EVENT 1 ID       : 1929
Raw Reading      : 113
Cal Reading      : 113
```

VERSION: 1.4 Original command set.

SEE: INIT, READ-CTR, READ-EV, WRITE-CTR

WRITE-SERIAL Set raw value of a SERIAL sensor.

FORMAT: `WRITE-SERIAL` ***sn,val***

OUTPUT:
```
SERIAL sn ID     : id
Raw Reading      : raw
Cal Reading      : cal
```

PARAMETERS:

Name	Description	Range
sn	Sensor Number	1 to 8
val	Value to Set	0 to 2047
id	Sensor ID	1 to 8191
raw	Raw Reading	0 to 2047
cal	Cal Reading	0 to 2047

DESCRIPTION: This command will set a SERIAL sensor's data to any value within range. Note that you will be entering the **RAW** value.

This command is the only way to enter a data value for a SERIAL sensor.

Note that the SERIAL sensor must be defined by the SET-SERIAL command before its data value can be written.

For example, to set the SERIAL 5 **RAW** accumulator to 100, type the command:

```
> WRITE-SERIAL 5,100[Enter]
EVENT 1 ID       : 1935
Raw Reading      : 100
Cal Reading      : 100
```

VERSION: 3.6 Added command for EPROM type S.

SEE: READ-SERIAL, SET-SERIAL

i4.8 Parameter Descriptions

a, b, c **Calibration Coefficients**

The 5096 Data Transmitter uses three calibration coefficients to scale and offset the **RAW** value of an ANALOG, EVENT, COUNTER, WIND or PEAK WIND sensor prior to transmission and logging. The **Raw Reading** is the actual reading obtained from the sensor (the ADC reading for an ANALOG sensor and the accumulator value for an EVENT, COUNTER, WIND or PEAK WIND sensor).

The calibration formula is:

CAL = ((**RAW** × ***a***)/***b***) + ***c***

These parameters must be entered as integers. Decimals and fractions are not allowed. (The **RAW** and **CAL** values are also always integers.)

All **Raw Readings** are converted by this formula prior to comparison with the **Change for Alarm**, ***cga***, and **Change to Txmit**, ***cgt***, parameters prior to transmission and logging.

The range of the transmitted values is 0 to 2047. This is fixed by the 11-bit ALERT format. Any calibrated values outside this range will have only their 11 least-significant bits transmitted.

all **All Sensors**

This parameter allows the display of all Active and Inactive sensors when set to one in the SHOWALL command. By default, only Active sensors are displayed.

baud **Baud Rate**

This parameter sets the console baud rate. Valid baud rates are 300, 1200, 2400, 4800, and 9600. The default baud rate is 300.

cal **Cal Reading**

The 5096 Data Transmitter reads raw (**RAW**) sensor values, calibrates the values using sensor calibration coefficients and transmits the calculated (**CAL**) data to the central site. Sensor calibration coefficients can be used to calculate **CAL** data in engineering units. Both the **RAW** and **CAL** data values are integers (no decimal point).

cd **RF CD On State**

Radio carrier detect state when checking for carrier signal. A value of 0 is a low state and a value of 1 is a high state.

cdp **RF CD Wait Power**

Radio power state when waiting for a radio carrier signal to stop. A value of 0 turns off radio power while waiting and a value of 1 leaves radio power on.

cdw **RF CD Wait Time**

Maximum wait time in milliseconds before forcing a data transmission when a radio carrier signal is detected. A wait time of 0 disables the radio carrier signal checking.

cga **Change for Alarm**

For ANALOG, EVENT, COUNTER or WIND sensors this parameter sets the sensor's **CAL** value change from its last transmitted value for the 5096 Data Transmitter to do an alarm transmission. An alarm transmission is sent before other pending transmissions. It can be sent during the transmission hold-off interval. An alarm transmission will be repeated by a normal transmission if it occurs during a hold-off interval.

The change for alarm parameter is effective for the sensor **Sample Interval**, ***s_int***, and EVENT, COUNTER and WIND sensor events. It does not effect transmit intervals for these sensors.

cgt **Change to Txmit**

For ANALOG, EVENT, COUNTER or WIND sensors this parameter sets the sensor's **CAL** value change from its last transmitted value for the 5096 Data Transmitter to do a normal transmission. A normal transmission is sent as soon as the transmission hold-off interval is cleared.

The change to txmit parameter is effective for the sensor **Sample Interval**, ***s_int***, and EVENT, COUNTER and WIND sensor events. It does not effect transmit intervals for these sensors.

D1 **Start Day (*Real Time*)**

Starting day for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1 to 31 with a default of 1.

D2 **End Day (*Real Time*)**

Ending day for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1 to 31 with a default of 31.

DD **Day of Month (*Real Time*)**

Transmitter time day number set by the TIME= command when the transmitter is in *Real Time* mode. Values can range from 1 to 31. The default is no change.

DD1 **Start Day (*Elapsed Time*)**

Starting day for the GET-MEM command when the transmitter is in *Elapsed Time* mode. Values can range from 0 to 49710 with a default of 0.

DD2 **End Day (*Elapsed Time*)**

Ending day for the GET-MEM command when the transmitter is in *Elapsed Time* mode. Values can range from 0 to 49710 with a default of 49710.

ddd **Elapsed Days (*Elapsed Time*)**

Transmitter time elapsed day number set by the TIME= command when the transmitter is in *Elapsed Time* mode. Values can range from 0 to 49710. The default is no change.

defaultlevel **Default test level**

Sets the default test level for when the TEST switch is pressed or the TEST command is entered with no test level parameter (see level).

en **Data Logging Enable Flag**

When enabled with the SET-MEM command, this parameter allows sensor data to be logged in memory. Set this parameter to 1 to enable, 0 to disable data logging. Changing this parameter value will not effect data currently logged in memory.

en_ev **Event Detection Flag**

This flag for the EVENT, COUNTER and WIND sensors enables (disables) transmission on an event basis. When this flag is enabled and the sensor accumulator is incremented or decremented by an event trigger, the **CAL** data is checked against the **Change for Alarm**, ***cga***, and **Change to Txmit**, ***cgt***, parameters. If these parameter conditions are met, the sensor data is transmitted and logged. When this flag is disabled, the sensor reading is still

incremented or decremented but the data value is not transmitted or logged unless a **Transmit Intervl**, ***t_int***, is defined.

enhflag **Tx format**

The 5096 Data Transmitter will transmit radio data in the format selected by this parameter. The formats are 0 = Standard ALERT, 1 = Enhanced ALERT and 2 = Enhanced IFLOWS format.

Standard ALERT uses the ASCII format for sensor IDs 0 to 99 and the Binary format for sensor IDs 100 to 8191. Enhanced ALERT includes a 6-bit CRC in the data packet which is used for error detection at the receiving site. Enhanced ALERT reduces the bit storage of the sensor ID by 1-bit to the ID range: 0 to 4095. Enhanced IFLOWS also includes a 6-bit CRC but does not reduce the sensor ID range: 0 to 8191. See Drawing AC107484 in Section 6.2 for details on these formats.

All formats have a data range of 0 to 99 for sensor IDs 0 to 99 and a data range of 0 to 2047 for sensor IDs 100 to 8191.

ev_th **Event Threshold**

This parameter sets a minimum **CAL** data value an ANALOG sensor must reach before readings taken at the **Sample Interval**, ***s_int***, meeting the **Change for Alarm**, ***cga***, or **Change to Txmit**, ***cgt***, criteria will be transmitted or logged. Readings taken at the **Transmit Intervl**, ***t_int***, are not effected by this parameter.

h1 **Start Hour**

Starting hour for the GET-MEM command when the transmitter is in either time mode. Values can range from 0 to 23 with a default of 0.

h2 **End Hour**

Ending hour for the GET-MEM command when the transmitter is in either time mode. Values can range from 0 to 23 with a default of 23.

hh **Hour**

Transmitter time hour number set by the TIME= command when the transmitter is in either time mode. Values can range from 0 to 23. The default is no change.

holdoff **Transmitter Holdoff**

After each transmission, the transmit hold-off timer is started. Except for alarm transmissions, which override the hold-off timer, no transmissions are allowed during the hold-off interval. This includes both sensor and test transmissions. The hold-off timer reduces the possibility of collisions with transmissions from other stations and helps to conserve battery power.

If a transmit condition occurs for a sensor during the hold-off interval, the sensor data value is logged but its transmission is delayed until the hold-off timer expires. After the hold-off timer expires, the current sensor reading (not necessarily the reading when the transmit condition occurred) is transmitted.

The transmitter hold-off parameter is entered in seconds with a range of 0 (No hold-off) to 32767 seconds. The default is 20 seconds.

id **Sensor ID**

The sensor ID is a number that uniquely identifies a sensor to the receiving base station. Each data transmission includes the sensor ID. Logged data includes the sensor ID.

The 5096 Data Transmitter provides default sensor IDs that are calculated from the ***staid*** read from the switch positions. The SET... commands can change a sensor's ID to any unused ID.

NOTE: **The 5096 Data Transmitter will not allow duplicate sensor IDs to be entered into the transmitter for active sensors; an error message will be displayed. The system operator must verify that there are no duplicate sensor ID assignments in the ALERT network.**

See Section 3.3.1 for default sensor ID offsets from the ***staid***.

level **Test level**

Test level 1 transmits all active sensors. Test level 2 transmits a 5 second test tone after the active sensors are transmitted. Then it tests the 5096 Data Transmitter ROM, RAM, battery sensor under load, and clock drift. The level 2 test ends by transmitting no tone for 5 seconds.

M1 **Start Month**

Starting month for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1 to 12 with a default of 1.

M2 **End Month**

Ending month for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1 to 12 with a default of 12.

MM **Month**

Transmitter time month number set by the TIME= command when the transmitter is in *Real Time* mode. Values can range from 1 to 12. The default is no change.

m1 **Start Minute**

Starting minute for the GET-MEM command when the transmitter is in either time mode. Values can range from 0 to 59 with a default of 0.

m2 **End Minute**

Ending minute for the GET-MEM command when the transmitter is in either time mode. Values can range from 0 to 59 with a default of 59.

ma **Total Memory**

The total memory available for data logging is displayed by CHK-MEM. The total memory is measured in bytes.

mm **Minute**

Transmitter time minute number set by the TIME= command when the transmitter is in either time mode. Values can range from 0 to 59. The default is no change.

mode **Event Mode**

The **Event Mode** defines how the accumulator value for an EVENT sensor is effected by the trigger and status inputs. Where the table indicates NO for Trig on A or Trig on B, that corresponding trigger input is tied low. Where the table indicate YES for both Trig on A and Trig on B, the sensor is a complementary type (i.e. Trig on A = normally open contact, Trig on B = normally closed contact). INCR indicates that the accumulator will be incremented and DECR indicates that the accumulator will be decremented. Match the mode to the sensor type you will connect to this sensor input.

Starting with version 4.2, mode 6 is the default mode for EV-2. Mode 6 supports both the 5050P and 5050P-MS rain gauges. A 5050P-MS bucket tip sends a momentary pulse which causes two trigger line state changes. Under mode 4, the accumulator is incremented twice. **Event Mode** 6 instructs the 5096 Data Transmitter to only increment the accumulator once when two trigger line state changes are less than 200 milliseconds apart.

WARNING: Before connecting a 5050LLFT liquid level sensor or a 5050TS test switch to the 5096 Data Transmitter, check the wiring of the sensor cable connector. Open the female MS connector at the cable end and cut off any wire that may be attached to pin B. Reassemble the connector when finished.

This action is required to prevent damage to the 5096 Data Transmitter.

MODE TABLE

Mode	A Trig Pulse	Trig on B Pulse	On Status Low	On Status High	Sensor Type
0	YES	NO	INCR	DECR	5050OE
1	YES	NO	DECR	INCR	5050OE
2	YES	NO	INCR	INCR	2500, 2501
3	YES	NO	DECR	DECR	
4	YES	YES	INCR	DECR	5050LLFT, 5050ELFT, 5050EL, 5050P
5	YES	YES	DECR	INCR	5050LLFT, 5050ELFT
6	YES	YES	INCR	INCR	5050P, 5050P-MS
7	YES	YES	DECR	DECR	
8	NO	YES	INCR	DECR	
9	NO	YES	DECR	INCR	
10	NO	YES	INCR	INCR	
11	NO	YES	DECR	DECR	
12	----	----	----	----	Absolute Encoder

mu **Used Memory**

The memory used for data logging is displayed by CHK-MEM. The used memory is measured in bytes.

Logged sensor data reports use 2 bytes for timed reports, 6 bytes for event reports and 8 bytes for non-aligned timed or event reports.

For example, if the station was logging timed reports every hour for 1 month

for 3 sensors (24hours * 31days * 3sensor * 2bytes) and 25 event reports were logged (25event * 6bytes), the CHK-MEM command would display 4614 bytes used.

of **Overflow Flag**

When enabled with the SET-MEM command, this parameter will cause new data to overwrite the oldest data when logging memory is full. When disabled, data logging stops when logging memory is full. Set this parameter to 1 to enable, 0 to disable overwriting when logging memory if full.

pct **Percent Used**

The percent of memory used for data logging is displayed by CHK-MEM. The percent of memory is computed from **Used Memory** / **Total Memory** * 100.

For example, if the **Total Memory** available is 24576 bytes, and the **Used Memory** is 4614 bytes, the Percent Used displays 18.77%

pdc **Pre-Divide Counter**

The number of input pulses required by a COUNTER or WIND sensor to increment the accumulator value by one unit and generate an event trigger interrupt.

pn **Sensor Input Package Part Number**

Part number extensions 54, 80, 81, 82, 90, N and S define the sensor input package supported by the 5096 Data Transmitter firmware. (See Section 1.4)

pre **RF Preamble Time**

The number of milliseconds the transmitter will generate its preamble signal before it starts transmitting sensor data signals. The preamble signal starts after (***txrf*** - ***pre***) milliseconds in the RF warm time interval.

pwron **RF Power On Time**

The number of milliseconds the transmitter will wait after turning on the radio power before it sends the carrier signal. This time allows the radio to warm up and lock on frequency.

R **Radio Type**

Indicates the default radio type parameters used by this EPROM version.

Radio Type	Power On Time	CD Wait Power	CD State
(Blank)	25 msec	OFF	1
R & RI	800 msec	ON	1
M	400 msec	ON	1

raw **Raw Reading**

The 5096 Data Transmitter reads raw (**RAW**) sensor values, calibrates the values using sensor calibration coefficients and transmits the calculated (**CAL**) data to the central site. Both the **RAW** and **CAL** data values are integers (no decimal point).

rcnt **Reset Count**

The count of the number of Resets at the station since the count was last initialized.

rstate **Reset Initialize State**

Set the Initialize on TEST-RESET parameter state to 0 = Off (Disabled) or 1 = On (Enabled). When the Initialize on TEST-RESET parameter is enabled, the station will execute an INIT command if the **TEST** switch is held down when the **RESET** switch is pressed.

s_int **Sample Interval**

This parameter is used to set the interval in seconds between successive reads for the specified sensor. Each sensor has its own sample interval which can be set independently from others. Sample intervals for all sensors can be aligned with each other using the ALIGN command.

When ***s_int*** is set to 0 this feature is disabled. When the sample interval is non-zero the sensor will be read every ***s_int*** seconds.

For ANALOG sensors, the **CAL** data value is compared to the **Event Threshold**, ***ev_th***, the **Change for Alarm**, ***cga***, and **Change to Txmit**, ***cgt***, parameters. If these parameter conditions are met, the sensor data is transmitted and logged.

For PEAK WIND sensors, the current wind run count is compared to the last count and the maximum of these two counts is saved. At the **Transmit Interval**, ***tx_int***, the maximum wind run count is transmitted and logged if the PEAK WIND **Value for Alarm**, ***vga***, or **Value to Transmit**, ***vgt***, criteria are met.

For STATUS sensors, the current status reading is compared to the **Transmit zeroes**, ***tx0***, **Alarm Flag**, ***af***, and **Change Flag**, ***tf***, criteria. If the criteria conditions are met, the data value is transmitted and logged.

sn **Sensor Number**

The sensor number parameter is used with the sensor READ..., SET... and WRITE... commands to identify which ANALOG, EVENT, COUNTER, WIND or PEAK WIND sensor is to be used. The sensor number range varies depending on the sensor type.

The sensor number is NOT the id number.

spt **Seconds Per Tick**

The number of seconds between each clock interrupt which allows the micro-processor to increment the real time clock and decrement timers. All time interval parameters must be multiples of the ***spt*** parameter.

ss **Second**

Transmitter time seconds number set by the TIME= command when the transmitter is in either time mode. Values can range from 0 to 59. The default is no change.

staid **Station ID**

The Station ID is read from the ID switches when the 5096 Data Transmitter program starts and is also displayed by the READ-IDSW or SHOWALL commands.

string **Search String**

The HELP command will display the command names and parameter list for commands that start with the search string characters. Up to 8 characters can be entered for the search string. If no string is entered, all commands are displayed.

testtone ***Test transmit tone***

Used by the TEST-TX command to set the tone transmitted during the test.

Value	Transmit tone
0	Alternating high and low tones
1	No tones
2	High tone
3	Low tone

tf, af **Status Change and Alarm Flag**s

The STATUS sensor **CAL** data is transmitted on the time interval set in the **Sample Interval**, ***s_int***, parameter when the **Txmt Zero Status**, ***tx0***, flag criteria and the Alarm Flag, ***af***, or **Change Flag**, ***tf***, criteria are met. The **CAL** data is transmitted on the time interval set in the **Transmit Intervl**, ***t_int***, transmissions regardless of any status line state change or flag criteria.

The Alarm Flag and Change Flag parameters mark which status lines are monitored for changes in state. The flag parameters can be set to monitor changes in state for **ANY** or **ALL** marked status lines. The flag criteria is met for **ANY** when any marked status line changes state; the flag criteria is met for **ALL** when all marked status lines change state. The flag criteria is met regardless of any status line state change when either parameter is set to 00000000 (the ***tx0*** flag criteria must still be met to transmit).

The change and alarm flags are signed 8 digit binary numbers. Each digit is used to mark whether or not a status line is monitored for changes in state. The rightmost digit marks status line 1 and the leftmost digit marks status line 8. If the digit is **1** the status line is monitor; If the digit is **0** the status line is ignored. When a minus sign (**-**) is typed before the binary number, **ALL** status lines marked must change in state to cause a transmission. When a plus sign (**+**) or no sign is typed **ANY** status line marked can change in state to cause a transmission.

tmode **Time Mode Flag**

This parameter sets the time mode to *Real Time* when set to 0 and *Elapsed Time* when set to 1 by the command TIME-MODE.

When the time mode is *Real Time*, the time is displayed as the year, month, day, hour, minute and second. When the time mode is *Elapsed Time*, the time is displayed as the number of days, hours, minutes and seconds that have elapsed since the time was set with the TIME= command.

txrf **RF Tx Warm Time**

The number of milliseconds the transmitter will send a carrier signal before it starts transmitting sensor data signals.

t_int **Transmit Intervl**

This parameter sets the interval in seconds between transmissions of sensor readings regardless of change or threshold parameters. Each sensor has its own transmit interval which can be set independently from others. The transmit intervals for all sensors can be aligned with each other using the ALIGN command.

When ***t_int*** is set to 0 this feature is disabled. When the **Transmit Intervl** is non-zero the sensor will be read and its data value will be transmitted and logged every ***t_int*** seconds. Transmissions at the transmit interval are effected by the transmission hold-off timer.

tx_int **Transmit Interval (PEAK WIND)**

This parameter sets the interval in seconds between transmissions of a PEAK WIND sensor's readings. Each PEAK WIND sensor has its own transmit interval which can be set independently from others. The transmit intervals for all sensors can be aligned with each other using the ALIGN command.

When ***tx_int*** is set to 0 this feature is disabled. When the **Transmit Interval** is non-zero the maximum wind run count is checked against the **Value for Alarm**, ***vga***, and **Value to Transmit**, ***vgt***, parameters every ***tx_int*** seconds. If the parameter conditions are met, the sensor data is transmitted and logged. Transmissions at the transmit interval are effected by the transmission hold-off timer.

tx0 **Transmit Zero Status**

When enabled, this flag allows the transmission of zero status values. When disabled, the status value must be non-zero to transmit. Set this parameter to 1 to enable, 0 to disable zero status value transmissions.

val **Value to Set**

This is the EVENT or COUNTER sensor accumulator value to set by the WRITE-EV or WRITE-CTR commands. This is the sensor **RAW** value. The value range is 0 to 2047.

ver **Firmware Version Number**

5096 Data Transmitter firmware version. See Section 6.3 for a list of firmware versions. Always check for the latest firmware version and related documentation whenever the 5096 Data Transmitter is to be programmed.

vga **Value for Alarm**
vgt **Value to Transmit**

These parameters are used by the PEAK WIND sensor to determine whether an alarm or normal transmission is to be made at the **Transmit Interval**, ***tx_int***.

At the transmit interval, when the PEAK WIND **CAL** data is greater than or equal to the ***vga*** parameter an alarm transmission is made. Otherwise, when the **CAL** data is greater than or equal to the ***vgt*** parameter a normal transmission is made (or set pending if the transmit hold-off is in effect).

wa **Analog Warm Time**

This parameter sets the time to wait (in 10 millisecond counts) after turning on the switched analog power before reading ANALOG sensors. The warm time does not effect status, wind direction or battery voltage.

wcal **Wind Run Cal Reading**

The wind run calibrated reading displayed by the READ-WI command shows the lower 5 bits of the WIND **CAL** data.

wdir **Wind Direction Reading**

Wind direction reading displayed by the READ-WI command shows the upper 6 bits of the wind direction sensor (ANALOG 7) **CAL** data.

we **Wind Enable Flag**

This parameter enables a COUNTER sensor to become a WIND sensor. WIND sensors transmit data in the ALERT Wind format. This format combines the wind run count and the wind direction. A value of 1 enables a WIND sensor. A value of 0 disables a WIND sensor, leaving the input as a COUNTER sensor.

wind **Combined Wind Reading**

The Combined wind reading displayed by the READ-WI command shows the WIND data in ALERT Wind format which is the **Wind Run Cal Reading** shifted left 6 bits and ored with the **Wind Direction Reading**.

YYY1 **Start Year**

Starting year for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1970 to 2105 with a default of 1970.

YYY2 **End Year**

Ending year for the GET-MEM command when the transmitter is in *Real Time* mode. Values can range from 1970 to 2105 with a default of 2105.

YYYY **Year**

Transmitter time year number set by the **TIME=** command in *Real Time* mode. Values can range from 1970 to 2105. The default is no change.

4.9 ERROR Messages

1: **No such command**

The command typed is not supported by the 5096 Data Transmitter. Check your spelling and the firmware version type and number. Use HELP to get the correct command spelling and a list of commands.

2: **Parameter out of range**

The value typed for one or more parameters exceeds the limits for the parameter. Consult the manual under the command description. Check your command parameter positioning. Did you type enough commas to separate or skip over parameters?

3: **Parameter format wrong**

The parameter cannot be interpreted as typed. This error would normally be displayed if a non-numerical was typed in a numerical parameter. Consult the manual under the command description. Check your command parameter positioning. Did you type enough commas to separate or skip over parameters?

4: **Wrong number of parameters**

Either a required parameter has been omitted or too many parameters have been typed for the command. Consult the manual under the command description. Check your command parameter positioning. Did you type enough commas to separate or skip over parameters?

5: **ID already exists**

An attempt was made to set a sensor's ID number to one that is already assigned to another active sensor. Type the SHOWALL command to list the active sensors and their assigned ID numbers.

6. **Invalid request for an absolute encoder**

The WRITE-EV command cannot be used on a absolute encoder sensor.

7. **Sensor type is not analog**

The READ-AN command cannot be used on an ANALOG sensor number assigned to a SERIAL sensor.

8. **Sensor type is not serial**

   The READ-SERIAL or WRITE-SERIAL commands cannot be used on an SERIAL sensor that has not been defined by the SET-SERIAL command.

9. **Sample interval must be modulo the transmit interval**

   A sample interval divide evenly into the transmit interval.

5 Maintenance, Testing and Troubleshooting

5.1 Maintenance

The 5096 Data Transmitter is designed for long term use with a minimum of maintenance. HydroLynx Systems recommends that there should be visits to the site at least twice a year to perform routine maintenance and to check the battery. Visits should be scheduled prior to seasonal rainy periods. Whenever a site is to be visited for either service or maintenance, HydroLynx Systems recommends keeping a record describing the purpose of the visit and the maintenance performed. This information can be helpful on future visits. An example of a Maintenance Report form can be found in Section 6.2, Document number A104973.

5.1.1 Station Check

Any visit to the station site should include a visual inspection of all exposed hardware and cables to locate damage or wear due to severe weather conditions. Check all of the cables and connectors to ensure that there has been no damage. Check closely any cables that may have been whipped by the wind, looking for bare wires next to any adjacent structures. Check the connectors for corrosion. Check the forward and reverse power of the antenna and antenna cable by using a wattmeter. If the antenna is a directional antenna, check the mounting to ensure that the antenna is still pointed in the correct direction. Replace any cables and connectors that have been damaged to avoid future system failures.

5.1.2 Battery

Replace the system battery with a freshly charged one, at least once yearly (twice a year for the 7AH battery in the 5096N). Batteries in rain gauges should be replaced just before the rainy season begins. Always maintain a fully charged battery for immediate placement into the system should the system battery become weak or fail entirely. For systems with multiple stations, several batteries should by available for replacement of system batteries. Ideally, one spare battery per site is desired. A single float charger may be used to periodically charge the spare batteries to maintain full charges.

5.1.3 Silica Gel

Replace the moisture absorbent silica gel packet with a freshly charged packet once a year. Old packets may be recharged by heating them to 250 ˚F for 16 hours. You may purchase new desiccant packs from HydroLynx Systems.

5.1.4 Sensor Maintenance

Check calibration and perform maintenance as indicated in the sensor manuals. Perform a system operation test, manually operating the sensors to ensure they are still working correctly.

5.1.5 Radio Maintenance

FCC regulations state:

1. The RF power at a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.

2. Frequency and deviation of a transmitter must be checked before it is placed into service and re-checked once each year there after.

Check calibration and perform maintenance as indicate in the radio's manual. Should any adjustments be necessary, they should be performed by a qualified technician using the proper test equipment.

5.2 Testing

The following tests will cause the 5096 Data Transmitter to transmit sensor data reports Check that an antenna or dummy load is connected before starting the test to prevent damage to the transmitter. If you do not want your central site computer to receive the test reports, disconnect the station antenna and connect a 50 Ohm dummy load to the antenna connector.

WARNING: Transmitting without an antenna connected may cause damage to the radio. Use a dummy load in place of an antenna for testing.

5.2.1 Power-up Test

Connect a battery to the 5096 Data Transmitter and watch the LEDs flash during the power-up sequence. Watch carefully, the LEDs flash quickly. If you do not see the entire LED power-up sequence, disconnect the battery power and try again.

No.	LED	Color	Activity
1	RUN	Green	Turn on and stay on
6	TEST	Yellow	Flash
3	SENS PWR	Yellow	Flash
1	RUN	Green	Stay on 20 seconds, then turn off. If a 5071C-5096 cable is connected, the LED will stay on.

5.2.2 Level 1 Test

A Level 1 test is executed by pressing and releasing the **TEST** switch, SW2 . Note that the **TEST** switch may automatically perform a level 2 test depending on the default test level.

The Level 1 test reads and transmits all active sensor data values. If you are connected to the console RS232 port the following should appear on the screen:

```
Level 1 test
Transmitting all Active Sensors
# SSSS YYYY MM DD hh mm ss VVVV
```

Each Active sensor will have its current data value printed with the current time on a line starting with **#**, where the information on the line is:

SSSS	4 digit sensor ID number
YYYY	4 digit year
MM	2 digit month (MM = 01: January)
DD	2 digit day
hh	2 digit hour (24 hour clock)
mm	2 digit minute
ss	2 digit second
VVVV	4 digit sensor value

During the Level 1 test, you should see the following LED sequence:

No.	LED	Color	Activity
6	TEST	Yellow	Turn on and stay on for the duration of the test.
1	RUN	Green	Turn on and stay on for the duration of the test.
3	SENS PWR	Yellow	On to take Active sensor readings, then off.
5	Tx ON	Red	On to transmit Active sensor readings, then off.

5.2.3 Level 2 Test

The Level 2 Test includes the transmit of active sensors in the level 1 test with an extended tone signal for 5 seconds, a series of internal tests of the ROM, RAM, Battery and clock, and a 5 second no-tone transmit test.

The ROM test calculates a CRC value from the code section of the EPROM program and compares it to the CRC value stored as part of the EPROM code. If the CRC values do not match, the test fails. Replace your EPROM if this test fails.

The RAM test does a non-destructive test of logging memory RAM by writing and reading a test pattern. If a RAM read does not match the pattern written, the test fails. Replace your RAM if this test fails.

The BATTERY test turns on the radio power and then reads the BATTERY sensor voltage. If the battery voltage is less than 11 VDC, the test fails. Replace the battery and check battery recharge equipment if this test fails.

The CLOCK test compares the real-time clock interrupts to the internal CPU clock to check for clock drift. If the real-time clock drift is greater than 15 seconds per day, the test fails. Have your 5096 Data Transmitter serviced by the factory if this test fails.

The TEST-TX NO TONE message appears at the end of the test indicating that a transmitter test is underway without tone. This test last approximately 5 seconds.

If you are connected to the console RS232 port the following should appear on the screen:

```
Level 1 test
Transmitting all Active Sensors
# SSSS YYYY MM DD hh mm ss VVVV
Level 2 test
ROM test    : Passed
RAM test    : Passed
BATTERY test: Passed - Battery level = 13.21 volts
CLOCK test  : Passed - drift = 1 secs/day
TEST-TX NO TONE
```

All tests **Passed** in the example above. If a test fails, **FAILED** will be displayed. During the Level 2 test, you should see the following LED sequence:

No.	LED	Color	Activity
6	TEST	Yellow	Turn on and stay on for the duration of the test.
1	RUN	Green	Turn on and stay on for the duration of the test.
3	SENS PWR	Yellow	On to take Active sensor readings, then off.
5	Tx ON	Red	On for 5 seconds for Active sensor transmit and tone test, then off.
			Pause for ROM abnd RAM test, no other LED activity.
5	Tx ON	Red	On to put battery under load for test, then off.
3	SENS PWR	Yellow	On to read Battery voltage, then off.
			Pause for 20 seconds for Clock test.
5	Tx ON	Red	On for 5 seconds to transmit with no tone, then off.
2	TEST ERR	Red	Flash 4 times if any of the Level 2 tests fail. No activity if all tests pass.

5.2.4 Level 3 Test

Use the test procedure outlined in Section 4.1 Testing in the Basic Gauge manual. This test procedure checks:

Power: Battery and solar panel parameters.

Signal out: Radio transmitter forward and reflected power, frequency error and deviation.

Signal in: Compares transmitter data to sensor input parameters.

5.3 Troubleshooting

If the 5096 Data Transmitter does not perform according to specifications, follow the step by step procedure as outlined in Section 4.1 of the Basic Gauge manual. Before changing station or sensor parameters, record the current parameters. Use the SHOWALL command to display all parameters and the console software to log to a disk file. Refer to Section 2.1.5 for information on logging to disk files. For more information, contact a Customer Service Representative at (916) 374-1800 between 8:00 AM and 4:00 PM Pacific Time.

5.3.1 Battery Failures

One common cause of 5096 Data Transmitter failure is a weak or discharged battery. With low voltage from the battery the transmit signal will be at a lower power level, and may not have the strength to reach the receiving antenna.

The following steps should be used to check for battery problems.

1. Connections — Check that the connections on the battery and the 9601 board are secure. These wires can become loose by carelessly opening and closing the transmitter.

WARNING: Incorrect wiring of the battery will damage the 5096 Data Transmitter.

2. Test - NoLoad — Use a voltmeter to check the battery voltage without a load. If the voltage is lower than 12VDC, replace the battery. This check can be done using the console with the READ-BATT command.

3. Level 1 Test — Use the **TEST** switch to run the board through a transmit cycle. If the TEST ERR LED comes on, the battery voltage is low.

4. Test - Load — Use a voltmeter to check the battery voltage between TP2 (V+) and TP5 (Gnd). Type the command, TEST-TX, on the console. During transmission the voltage should dip no more than 0.5Vdc. If the voltage does change by more than 0.5Vdc, the battery should be replaced, even if the no load voltage is above 12Vdc. If the battery voltage does not dip at all, the transmitter is probably not keying ON.

The 5096N has an ON/OFF **POWER** switch located on the Screw Terminal Panel. This switch must be ON to connect power into the 9601 board.

5.3.2 Sensor Failures

Most sensor failures are caused by bad connections. Check all sensor cable connectors. Try disconnecting and then reconnecting the connectors to fix the problem. If this makes the sensor operable, try to make the sensor to fail again by wiggling the points where the cable goes into the connectors. Intermittent operation indicates a loose or broken wire and either the cable or the connector or both should be replaced.

Threaded MS connectors used with the 5096 Data Transmitter are keyed and have a specific number of pins arranged in a pattern to help prevent plugging the cable connectors into the wrong receptacle. Inspect the connectors for the key location and look at the pin arrangement. Make certain that the pin locations match those of the mating connector on the 5096. It is difficult to do, but the connectors can be forced onto the wrong receptacle if enough force is exerted to distort the cable connector. Connecting sensors to the wrong connectors may cause severe damage to the transmitter and to the sensors.

When installing cable connectors be sure to push down firmly on the connector shell for a good connection. With the connector properly seated, the threaded collar should easily thread onto the mating connector shell. If the threads become tight press downward again and continue turning the collar. Do not force the connector threads. If the threading is difficult, pull the connector off and inspect for crossed or damaged threads. Try again taking care to properly fit the threaded pieces together.

Inspect sensor cable connectors to ensure that the rubber boot is correctly installed and forms a water-proof seal at the cable entrance to the connector. This is very important to sensor connectors that are exposed to outdoor weather conditions. A good seal will prevent corrosion from causing problems inside the connectors. Spare and replacement connectors can be obtained from HydroLynx Systems, Inc.

Refer to the appropriate sensor manual for troubleshooting individual sensors.

5.3.3 Transmission Failures

If the 5096 Data Transmitter does not transmit, first check the battery as described in Section 5.3.1. Replace the battery if it is bad and try transmitting again. If the battery is not the cause of the failure, disconnect the antenna and check the cable for shorts and opens. Connect a wattmeter and a dummy load to the antenna connector on the transmitter. Check the output and reflected power. If the problem is in the cables or connectors, replace or repair them. If the 5096 still does not transmit, use a radio receiver tuned to the transmit frequency to listen for the two tone signal when you key the transmitter.

5.4 Troubleshooting with the Console

Through the use of a portable or a lap-top personal computer it is possible to check both the system parameters and the sensor parameters of the 5096 Data Transmitter. If a programming error is causing the 5096 to fail this can be fixed in the field by reprogramming the 5096 option or the sensor input parameters.

The following commands are useful in locating a programming problem.

AD-ON	READ-AN	SET-AN
AD-OFF	READ-BATT	SET-BATT
ALIGN	READ-CTR	SET-BAUD
CLEAR-MEM	READ-PK	SET-CTR
GET-MEM	READ-ST	SET-EV
INIT	READ-WI	SET-PK
	RESETCNT	SET-RFWARM
		SET-ST
		SET-WARM
		SET-WI
		SHOWALL

5.4.1 TEST Sequence

Push the **TEST** switch first to observe the test sequence. If one of the tests does not pass, the 5096 Data Transmitter needs further troubleshooting, and may need to be returned from the field. See Section 5.2.3 for the **TEST** switch sequence.

All Active sensors are transmitted when the **TEST** switch is pressed. Review the list of sensor ID numbers. If a sensor is missing from the list, it is not programmed properly.

When the **TEST** switch is pressed a second time within 5 seconds after the radio transmission completes, the switched ANALOG power -- and the SENS PWR LED -- will turn on for about 60 seconds. If the switch is pressed again within the 60 second period the switched analog power will go off. Using the **TEST** switch to turn the analog power on is similar to using the AD-ON command, which can be entered from the console. This analog power feature allows you to test the analog sensors without a portable computer plugged into the 5096 Data Transmitter.

5.4.2 READ-BATT Command

Use the READ-BATT command to check the battery voltage. If the battery voltage is below 12Vdc replace the battery. The 5096N has an ON/OFF **POWER** switch on the Screw Terminal Panel. This switch must be ON for the 5096 Data Transmitter to work.

5.4.3 READ Commands

The READ command will allow you to check individual sensors. Use this command to read the latest value for the sensor. When used with the ANALOG sensors, the READ command will also turn the analog power on.

5.4.4 GET-MEM and Time of Failure

The GET-MEM command shows all the data collected and is a quick way to check the past performance of the sensors. If a sensor failed, this command helps find the time of failure.

5.4.5 SHOWALL Command

The SHOWALL command displays all station and active sensor parameters. Type the SHOWALL command with the parameter 1 to include non-active sensor parameters.

5.4.6 SET Commands

Use the SET commands to check parameters. Incorrect settings will disable sensors. For example with EVENT sensors, if the ***en_ev*** is set to 0, the sensor will not transmit on events. ANALOG sensors with ***s_int*** set to 0 will not be sampled. Reprogram incorrect sensor parameters and test 5096 Data Transmitter again.

5.4.7 Signal Input Protection

All inputs have Zener diodes for line protection. Disconnect the sensor signal cable and check the Zener diodes with an Ohm meter. If the signal line is shorted to ground, the diode must be replaced.

5.4.8 Tipping Bucket and Transmitter

Use the tipping bucket to check the functioning of the transmitter. Tip the bucket and check that the Tx ON LED flashes. The transmitted report will be displayed on the console. If the LED does not flash and there is no message on the monitor, check the cables and the tipping bucket. If they are okay then the problem may be in the board and the 5096 Data Transmitter will need further troubleshooting that may not be possible in the field.

5.4.9 ANALOG Sensors

Use the following set up to troubleshoot the ANALOG sensors. This set up does not require that a sensor be connected to the 5096 Data Transmitter. It checks the circuits in the board itself, however all of the data will be 0s. To check the analog power use the AD-ON command to turn the analog power on, which makes it easier to troubleshoot the sensors. Use the AD-OFF command to turn the analog power off when you are finished troubleshooting.

SET-AN 5,0,0,30,0[Enter]
Sensor 5 is probably an unused channel
Set the Event Threshold to 0.
No Transmit Interval.
Sample every 30 seconds
No change required to generate a transmission

With this set up, the 5096 Data Transmitter should transmit a 0 value for ANALOG 5 every 30 seconds. If this test works correctly, then the problem is probably in the sensor or the cables and not in the 5096. Check the cables to ensure that they have not been damaged and that they are correctly connected. Refer to the manual for the specific sensor for further troubleshooting of the ANALOG sensor. If this test does not work, then the problem may be in the board and the 5096 will need further troubleshooting that may not be possible in the field.

5.4.10 SET-WARM and ANALOG Sensors

If SET-WARM is incorrectly set, then the ANALOG sensors may not warm up enough prior to being read, resulting in poor data or none at all. Use the SET-WARM to check the analog sensor warmup time. The default warmup time is 100 milliseconds (10 X 10 msecs), which is adequate for most of the HydroLynx Systems ANALOG sensors. Some sensors require a longer warmup time, as much as 6 seconds. The parameter ***wa*** should be set to 600 to give the sensor the 6 second (600 X 10 msecs) warmup time.

5.4.11 RFWARM and the Transmitter

If the RFWARM parameters ***txrf***, ***pre*** and ***pwron*** are not set correctly, then the radio may not warmup prior to transmission. The default settings are 200 milliseconds for ***txrf,*** 100 milliseconds for ***pre*** and either 25, 400 or 800 milliseconds for crystal or synthesized frequency radios. (See Section 4 SET-RFWARM command). These defaults are fine for most applications. However if your system has repeaters that are not the 'store and forward' type, then RFWARM parameters may need to be longer. If you change from a crystal to a synthesized frequency radio without changing firmware, you must set the ***pwron*** parameter correctly.

5.4.12 RESETCNT Command

The RESETCNT command will display the number of RESETs counted since the count was last initialized. If the Reset Count is large, something is causing the transmitter to RESET too often. During transmissions, power feedback from a bad antenna connection can cause the 5 Volt Reference to change and result in transmitter RESETs. Press the **TEST** switch to force a transmission of all active sensors and check if the 5096 Data Transmitter does a RESET. Correct the antenna problem or consult the factory for an ECO board level repair.

5.4.13 INIT and Default Settings

The INIT command will return all sensor parameters to their default values. Prior to using this command write down the current sensor parameters using the Sensor Set Up Checklist, see Section 6.2 Document number A101229-2. Using the INIT command will also erase all data in logging memory. Use this command in the field if you feel that a programmable parameter is creating the problem with the 5096 Data Transmitter and you can not reprogram the error.

For a more detailed explanation of each command, refer to Section 4, Programming.

6 Appendix

6.1 Programming summary

A list of programming commands, their functional groupings and parameter descriptions are provided in this section.

6.1.1 Alphabetical List of Commands

Commands used to program the 5096 Data Transmitter are listed alphabetically.

Command	Description
AD-OFF	Turn off the switched analog power.
AD-ON	Turn on the switched analog power.
ALIGN	Align all system timers to the same starting point.
CHK-MEM	Display the data logging memory available, memory used and percentage of memory used.
CLEAR-MEM	Clear all data from the data logging memory.
GET-MEM	Display logged data reports.
HELP	Display a list of transmitter commands and their parameters.
INIT	Initialize all battery-backed-up parameters to their default values and clear data logging memory.
READ-AN	Read and display ANALOG sensor data values.
READ-BATT	Read and display the BATTERY sensor data values.
READ-CTR	Read and display COUNTER sensor data values.
READ-EV	Read and display EVENT sensor data values.
READ-IDSW	Read and display the Station ID switches.
READ-PK	Read and display PEAK WIND sensor data values.
READ-SERIAL	Read and display SERIAL sensor data values.
READ-ST	Read and display the STATUS sensor data values.
READ-WI	Read and display WIND sensor data values.
RESET	Reset the transmitter.
RESETCNT	Set the Reset count.
RESETINIT	Set the Initialize on TEST-RESET parameter.
SET-AN	Set ANALOG sensor parameters.
SET-BATT	Set the BATTERY sensor parameters.
SET-BAUD	Set the console baud rate.
SET-CTR	Set COUNTER sensor parameters.
SET-CTRRESET	Set COUNTER sensor reset time.
SET-ENH	Set the radio transmission format, selecting between standard ALERT and Enhanced ALERT (with CRC) format.
SET-EV	Set EVENT sensor parameters.
SET-EVRESET	Set EVENT sensor reset time.
SET-HOLDOFF	Set the transmitter holdoff time.
SET-MEM	Set the data logging parameters.
SET-PK	Set PEAK WIND sensor parameters.
SET-RFWARM	Set the radio warm-up, preamble and carrier wait period lengths.
SET-SERIAL	Set SERIAL sensor parameters.
SET-SPT	Set the number of seconds per clock tick.

SET-ST	Set the STATUS sensor parameters.
SET-WARM	Set the wait time before reading ANALOG and STATUS sensors after turning on the switched analog power.
SET-WI	Set WIND sensor parameters.
SHOWALL	Display all sensor parameters, data values and system parameters.
TEST	Executes a test of the transmitter, sets default test level.
TEST-TX	Turn on the radio transmitter so you can check the radio's signal strength and frequency.
TIME-MODE	Set the time-keeping mode to either *Real* or *Elapsed Time*.
TIME=	Set the transmitter clock time.
WRITE-CTR	Set the raw value of COUNTER sensors.
WRITE-EV	Set the raw value of EVENT sensors.
WRITE-SERIAL	Set the raw value of SERIAL sensors.

6.1.2 Functional Grouping of Commands

Commands used to program the 5096 Data Transmitter are listed in functional groups.

System Commands	**Sensor Set Up Commands**	
ALIGN	SET-AN	SET-SERIAL
HELP	SET-WARM	SET-WI
INIT	SET-BATT	SHOWALL
RESET	SET-EV	WRITE-CTR
RESETINIT	SET-EVRESET	WRITE-EV
SET-ENH	SET-ST	WRITE-SERIAL
SET-HOLDOFF	SET-CTR	
SET-RFWARM	SET-CTRRESET	
SET-SPT	SET-PK	

Data Logging Commands	**Testing and Maintenance Commands**	
CHK-MEM	AD-ON	READ-IDSW
CLEAR-MEM	AD-OFF	READ-PK
GET-MEM	READ-AN	READ-SERIAL
SET-BAUD	READ-BATT	READ-WI
SET-MEM	READ-EV	RESETCNT
TIME-MODE	READ-ST	TEST
TIME=	READ-CTR	TEST-TX

6.1.3 Parameter Descriptions

Command parameters used to program the Model 5096 Data Transmitter are listed alphabetically.

Parameter	Description	Associated Command(s)
a,b,c	Calibration Coefficients	SET-AN, BATT, CTR, EV, PK, WI, SERIAL
af	Status Alarm Flags	SET-ST
all	All Sensors	SHOWALL
baud	Baud Rate	SET-BAUD
cal	Cal Reading	READ-..., WRITE-...
cd	RF CD on state	SET-RFWARM
cdp	RF CD Wait Power	SET-RFWARM
cdw	RF CD Wait Time	SET-RFWARM
cga	Change for Alarm	SET-AN, BATT, CTR, EV, WI, SERIAL
cgt	Change to Txmit	SET-AN, BATT, CTR, EV, WI, SERIAL
D1	Start Day (*Real Time*)	GET-MEM
D2	End Day (*Real Time*)	GET-MEM
DD	Day of Month (*Real Time*)	SET-CTRRESET, SET-EVRESET, TIME=
DD1	Start Day (*Elapsed Time*)	GET-MEM
DD2	End Day (*Elapsed Time*)	GET-MEM
dd	Elapsed Days (*Elapsed Time*)	TIME=
defaultlevel	Default test level	TEST
en	Data Logging Enable Flag	SET-MEM
en_ev	Event Detection Flag	SET-CTR, EV, WI
enhflag	Tx Format	SET-ENH
ev_th	Event Threshold	SET-AN
h1	Start hour	GET-MEM
h2	End hour	GET-MEM
hh	Hour	SET-CTRRESET, SET-EVRESET, TIME=
holdoff	Transmitter Holdoff	SET-HOLDOFF
id	Sensor ID	SET-AN, BATT, CTR, EV, PK, WI, SERIAL
level	Test level	TEST
M1	Start Month	GET-MEM
M2	End Month	GET-MEM
MM	Month	SET-CTRRESET, SET-EVRESET, TIME=
m1	Start Minute	GET-MEM
m2	End Minute	GET-MEM
ma	Total Memory	CHK-MEM
mm	Minute	SET-CTRRESET, SET-EVRESET, TIME=
mode	Event Mode	SET-EV
mu	Used Memory	CHK-MEM
testtone	Test transmit tone	TEST-TX
of	Overflow Flag	SET-MEM
pct	Percent Used	CHK-MEM

Parameter	Description	Associated Command(s)
pdc	Pre-Divide Counter	SET-CTR, WI
pn	Package Part Number	RESET
pre	RF Preamble Time	SET-RFWARM
pwron	RF Power On Time	SET-RFWARM
R	Radio Type	RESET
raw	Raw Reading	READ-..., WRITE-...
rcnt	Reset Count	RESETCNT
rstate	Reset Initialize State	RESETINIT
s_int	Sample Interval	SET-AN, BATT, PK, ST, SERIAL
sn	Sensor Number	SET-..., READ-..., WRITE-...
spt	Seconds Per Tick	SET-SPT
ss	Second	SET-CTRRESET, SET-EVRESET, TIME=
staid	Station ID	READ-IDSW, SET-...
string	Search String	HELP
tf	Status Change Flags	SET-ST
tmode	Time Mode Flag	TIME-MODE
txrf	RF Tx Warm Time	SET-RFWARM
t_int	Transmit Interval	SET-AN, BATT, CTR, EV, WI, SERIAL
tx_int	Transmit Interval (PEAK WIND)	SET-PK
tx0	Transmit Zero Status	SET-ST
val	Value to Set	WRITE-CTR, EV, SERIAL
ver	Firmware Version Number	RESET
vga	Value for Alarm	SET-PK
vgt	Value to Transmit	SET-PK
wa	Analog Warm Time	SET-WARM
wcal	Wind Run Cal Reading	READ-WI
wdir	Wind Direction Reading	READ-WI
we	Wind Enable Flag	SET-CTR, WI
wind	Combined Wind Reading	READ-WI
YYY1	Start Year	GET-MEM
YYY2	End Year	GET-MEM
YYYY	Year	SET-CTRRESET, SET-EVRESET, TIME=

6.2 Drawings

The following drawings are enclosed to assist in the installation, set up, and trouble-shooting of problems.

AC107897 5096-81 Diagram shows the 7 input 5096 Data Transmitter assembly.

AC104045 5096 Wire Diagram shows the wiring between the 9601 board and the interconnection board, sensor connectors, radio, solar panel and battery.

AC107911 Wiring Diagram, Typical Sensors to 5096N shows the sensor connection points for the 5096N.

AC107908 T9601 PCB Assembly Diagram shows the components on the 9601 board.

AC104974 Interconnect PCB All Season Power to Pin B shows the trace to cut and jumper to solder on the Interconnect Board B104010-1 to select +12V power for the All Season Precipitation Gage.

AC104020 Console RS232 Cable, 9 Pin to 9 Pin shows the 5071C-5096 cable pin-outs.

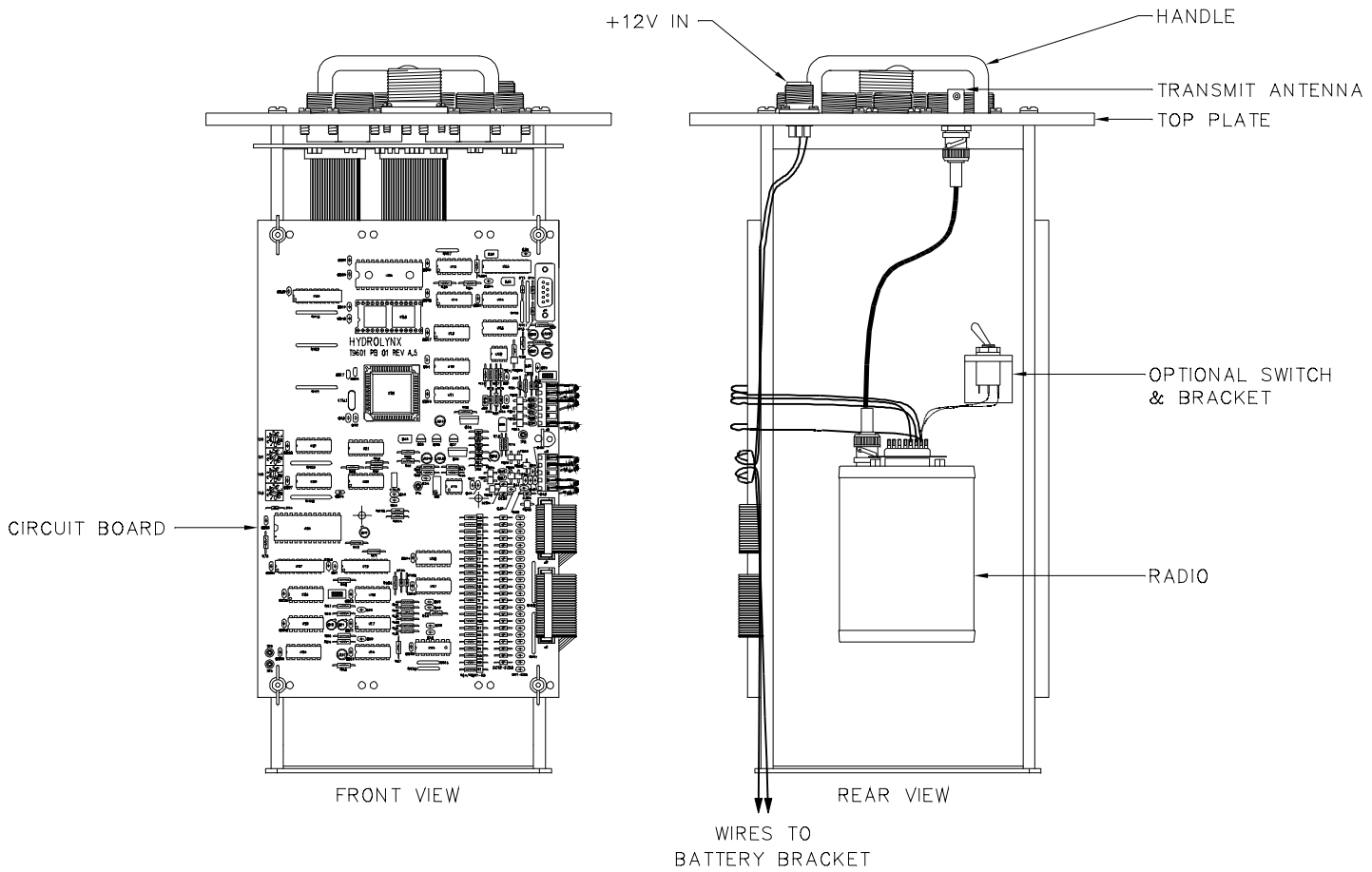
AC104180 Outline, Pin Outs for Interconnect Circuit Board shows the 5096 Data Transmitter top cover connector pin outs for standard ALERT sensors, solar panels, antennas, and RS232 console cable bulkhead connector.

A104973 Maintenance Report is used for recording general site and transmitter information and information taken during the recommended service checks.

A101229-2 Sensor Set Up Checklist is a worksheet used when setting up the 5096 Data Transmitter before installation. Keep a copy of the checklist with the unit.

A101018-4 Test Results Report is used for writing down information while testing the 5096 Data Transmitter. Use it with tests outlined in Section 5.

AC107484 Transmission Formats shows the ALERT transmission formats. It is useful in decoding reports received from a 5096 Data Transmitter through a radio receiver and decoder.

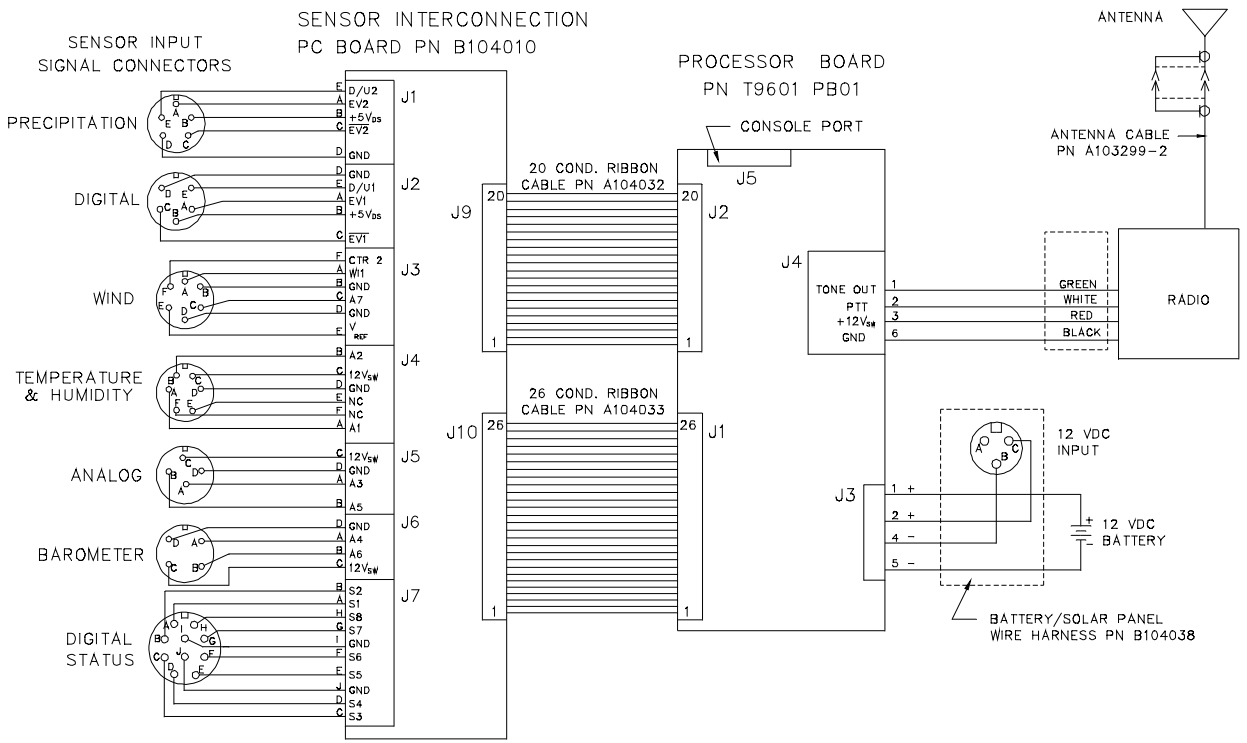


NOTES: 1. BATTERY BRACKET NOT SHOWN.

ECN#	DESCRIPTION	DATE
N/A	REDRAWN ON NEW BORDER	03-22-04

MODEL USAGE	HydroLynx
5096	
	MODEL NO. 5096
	TITLE 7 INPUT DATA TRANSMITTER

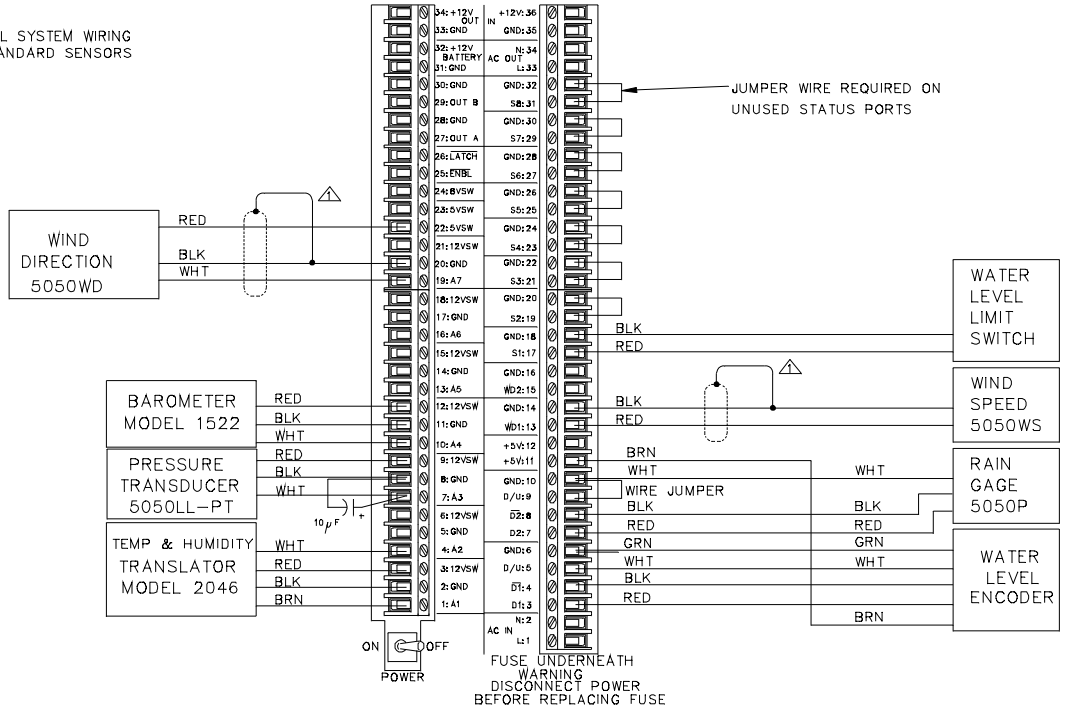
DRAWN BY M.MALONEY	DATE 3-22-04	DWG TYPE OUTLINE, CHASSIS ASSEMBLY		
CHECKED BY	DATE	SIZE B	DWG NO. AC107897	REV A



ECN#	DESCRIPTION	DATE
N/A	REDRAW ON NEW BORDER	08/14/00

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES	MODEL USAGE		HydroLynx	
FRACTIONS = ± N/A				
.XX = ± N/A			MODEL NO. 5096	
.XXX = ± N/A			TITLE ALERT TRANSMITTER	
MAT'L N/A				
FINISH N/A	DRAWN BY P. COSTA	DATE 08/14/00	DWG TYPE WIRING DIAGRAM	
TREATMENT N/A	CHECKED BY	DATE	SIZE B	DWG NO. AC104045 REV A

TYPICAL SYSTEM WIRING
WITH STANDARD SENSORS



NOTES – 1. CABLE SHIELDS SHOULD BE CONNECTED TO GND TERMINALS.
2. TERMINALS SHOWN WITHOUT PANEL.

ECN#	DESCRIPTION	DATE

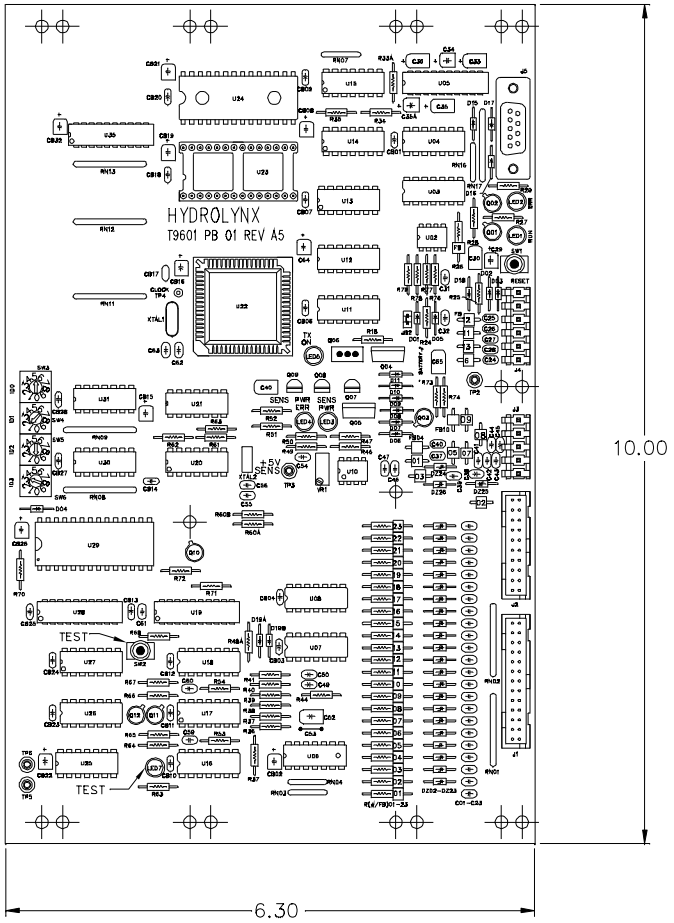
MODEL USAGE

HydroLynx

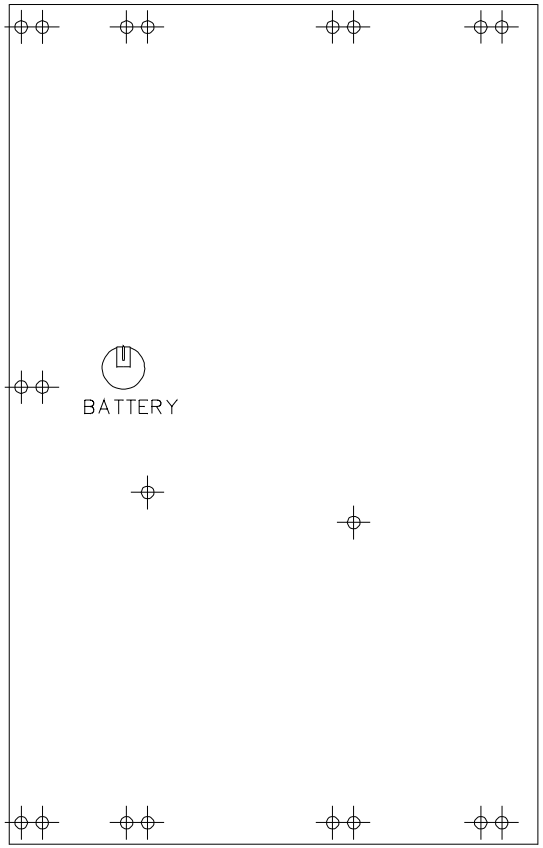
MODEL NO. 5096N

TITLE: WIRING DIAGRAM
TYPICAL SENSORS TO 5096 N

DRAWN BY	DATE	DWG TYPE		
R. COLBORN	11-2-00	ASSEMBLY		
CHECKED BY	DATE	SIZE	DWG NO.	REV
		B	AC107911	B



FRONT VIEW
SCALE 2/1

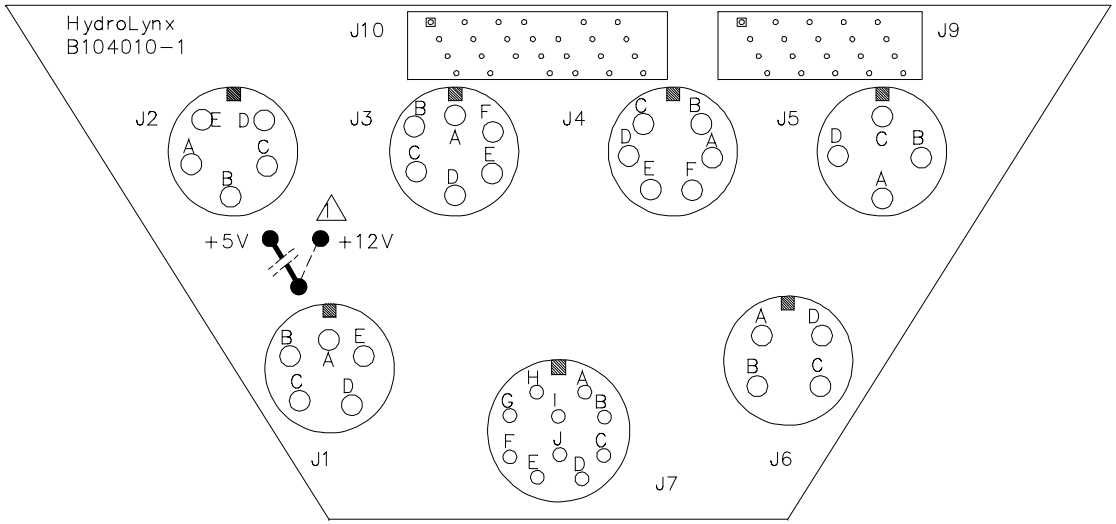


BACK VIEW
SCALE 2/1

ECN#	DESCRIPTION	DATE

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES	MODEL USAGE		HydroLynx
FRACTIONS = ± N/A			
.XX = ± .01			MODEL NO. 5096
.XXX = ± .005			TITLE PCB, 9601
MAT'L			
FINISH	DRAWN BY K. KOELSCH	DATE 3/4/99	DWG TYPE OUTLINE
TREATMENT	CHECKED BY	DATE	SIZE B DWG NO. AC107908 REV A

NOTES: ⚠1 CUT TRACE AT +5V & SOLDER JUMPER TO +12V
2. DRAWING NOT TO SCALE, CONNECTOR TRACES NOT SHOWN.



N/A	REDRAWN ON NEW BORDER	3/18/99
ECN#	DESCRIPTION	DATE

MODEL USAGE

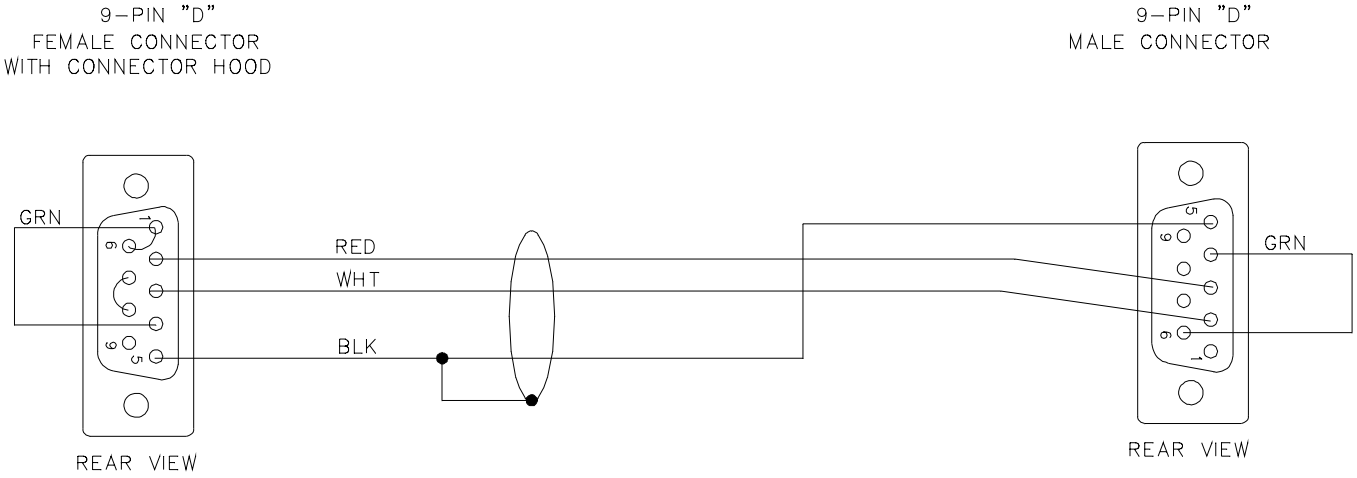
HydroLynx

MODEL NO. 5096-xx1PLB

TITLE 12vDC ALL SEASON GAUGE TO PIN B

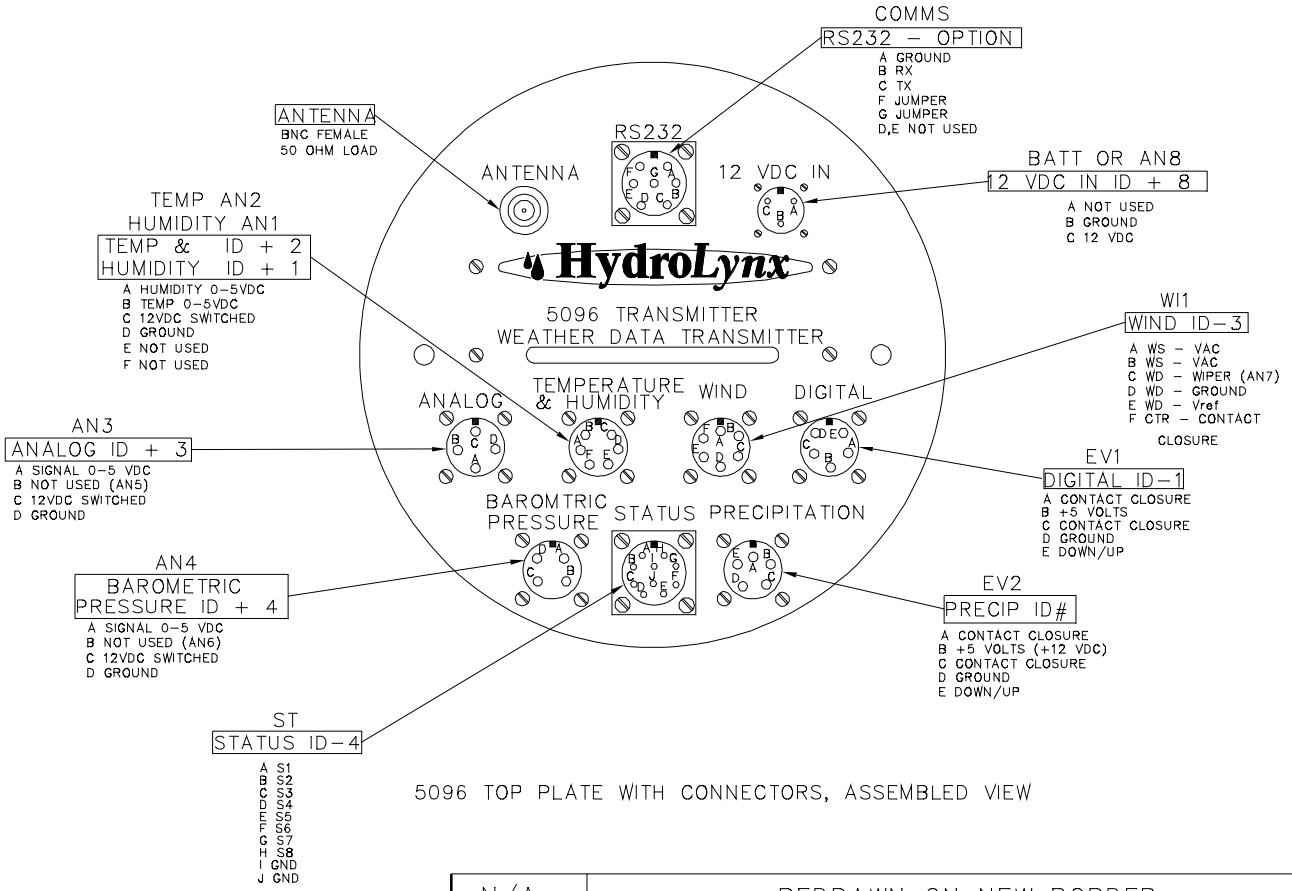
DRAWN BY	DATE	DWG TYPE		
S.HEINEMANN	2-28-95	MOD		
CHECKED BY	DATE	SIZE	DWG NO.	REV
		A	AC104974	B

NOTES: 1. CABLE IS BELDEN #9533, 3 COND., 24 AWG, SHIELDED.
CABLE LENGTH IS 10 FT.
2. NOTE JUMPER ON MALE CONNECTOR, 4 TO 6.
USE INSULATED GREEN WIRE 24 AWG.
3. NOTE JUMPER ON FEMALE CONNECTOR, 7 TO 8.
USE BARE BUS WIRE, 24 AWG.



ECN#	DESCRIPTION	DATE
N/A	REDRAWN ON NEW BORDER	12/15/99

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES	MODEL USAGE		HydroLynx		
FRACTIONS = €					
.XX = €			MODEL NO. 5071C–5096–1		
.XXX = €			TITLE CONSOLE CABLE RS232		
MAT'L					
FINISH	DRAWN BY J. HOPECK	DATE 12/15/99	DWG TYPE WIRING DIAGRAM		
TREATMENT	CHECKED BY	DATE	SIZE A	DWG NO. AC104020	REV B



5096 TOP PLATE WITH CONNECTORS, ASSEMBLED VIEW

ECN#	DESCRIPTION	DATE
N/A	REDRAWN ON NEW BORDER	3/18/99
NL004	ACAD REDRAW	3/9/94

MODEL USAGE

HydroLynx

MODEL NO. 5096

TITLE: PIN OUTS FOR INTERCONNECT CIRCUIT BOARD

DRAWN BY	DATE	DWG TYPE		
S.HEINEMANN	3–9–94	OUTLINE		
CHECKED BY	DATE	SIZE	DWG NO.	REV
		A	AC104180	C

Maintenance Report

Document No. A104973

SITE INFORMATION		
Location:	Gauge type:	ID#:
Purpose/Comments:		
Weather conditions:		

EQUIPMENT INFORMATION			
Equipment	**Model #**	**Asset #**	**Comments**
Data transmitter			
Antenna			
Battery			
Solar panel			
Sensors			

TEST DATA				
POWER				
Battery voltage	w/o load:	Vdc	w/ load: Vdc	Difference: Vdc
Current	Standby:	µA	w/ load: A	
Solar panel	w/o load:	Vdc	w/ load: A	Reverse: mA
SIGNAL OUT - TX				
Power out: W	Reverse power: W		Freq error: Hz	Dev: ± kHz

SIGNAL IN - SENSOR

Sensor	Measured	Reading	Comments

COMMENTS

HydroLynx Systems, Inc. ● 950 Riverside Pkwy., Suite 10 ● West Sacramento, CA 95605
Phone 916-374-1800 ● Fax 916-374-1877 ● Email hydro@hydrolynx.com

5096/5096N Sensor Set Up Checklist

Document Number A101229-2

Station ID:	Station serial #:	EPROM Version #:	
Location:		By:	Date:

ANALOG Sensors

Cal = (Raw * a) / b + c

Command	*sn*	*ev_th*	*t_int*	*s_int*	*cgt*	*cga*	*a*	*b*	*c*	*id*
SET-AN	1									
SET-AN	2									
SET-AN	3									
SET-AN	4									
SET-AN	5									
SET-AN	6									
SET-AN	7									
SET-BATT	▮	▮					▮	▮	▮	

EVENT Sensors

Command	*sn*	*en_ev*	*mode*	*t_int*	*cgt*	*cga*	*a*	*b*	*c*	*id*
SET-EV	1									
SET-EV	2									

WIND/COUNTER Sensors

Command	*sn*	*en_ev*	*pdc*	*t_int*	*cgt*	*cga*	*a*	*b*	*c*	*we*	*id*
SET-WI	1										
SET-CTR	2										

STATUS Sensor

Command	*sn*	*tx0*	*t_int*	*s_int*	*tf*	*af*	*id*
SET-ST	▮						

PEAK WIND Sensors

Command	*sn*	*s_int*	*tx_int*	*vgt*	*vga*	*a*	*b*	*c*	*id*
SET-PK	1								
SET-PK	2								

Notes:

HydroLynx Systems, Inc. ● 950 Riverside Pkwy., Suite 10 ● West Sacramento, CA 95605
Phone 916-374-1800 ● Fax 916-374-1877 ● Email hydro@hydrolynx.com

5096/5096N TEST RESULTS REPORT

Document Number A101018-5

Date:	Chassis serial number:
Inspector:	PCB serial number:
Job number:	EPROM version number:
Transmitter frequency: MHz	Transmitter serial number:
Transmitter deviation: ± kHz	Transmitter manufacturer:

PCB CHECK

BY: DATE:

Vcc: Vdc	Test switch:	Reset switch:	Analog on/off test:
Stand-by current: µA	ROM: RAM:	ID switches:	Analog:
Back-up batt:	Battery test:	Transmit power:	Digital:
Init:	Clock:	LED test:	Status:

UNIT TESTS

BY: DATE:

Battery jumper:	3-pin connector check:	Set UID:

A-1:	A-2:	A-3:	A-4:	A-5:	A-6:	A-7:	BATT:
EV-1:	EV-2:	WD-1:	WD-2:	S1...S8:			

RADIO TESTS

BY: DATE:

Frequency error: Hz	Deviation: ± kHz	Power output: W

Self-report test:	Burn-in:	
RF warm:	ENH Tx:	

VISUAL INSPECTION

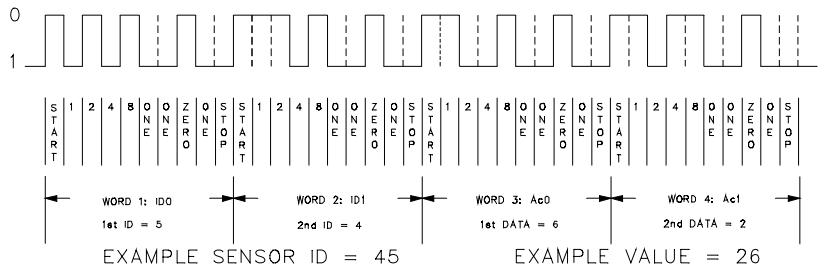
BY: DATE:

Serial number tag?	Connections?	Dust covers?
Silkscreen?	Solder joints?	Strain reliefs?
Screws & lockwashers tight?	Wiring?	Lid closes?
Neatness/completeness?	Bulkhead connectors?	Fuse (ac only)?
Notes:		

HydroLynx Systems, Inc. ● 950 Riverside Pkwy., Suite 10 ● West Sacramento, CA 95605
Phone 916-374-1800 ● Fax 916-374-1877 ● Email hydro@hydrolynx.com

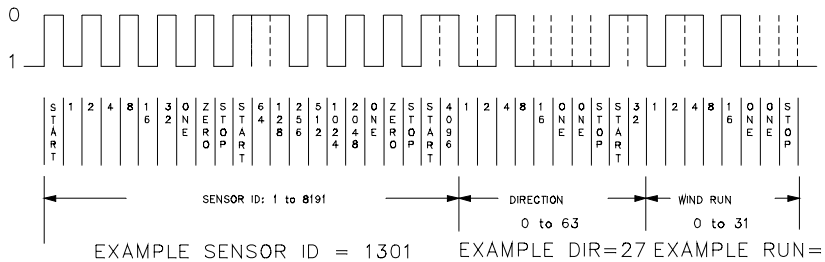
5096 -- 5096N TRANSMISSION FORMATS

ASCII FORMAT



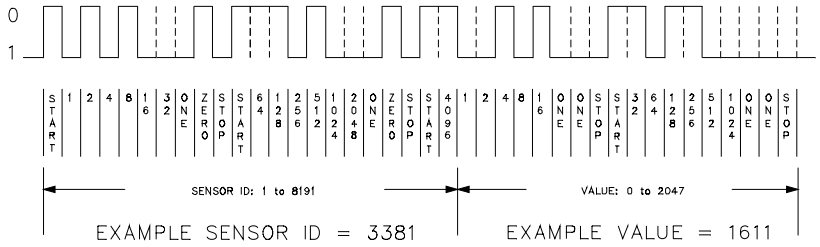
EXAMPLE SENSOR ID = 45 EXAMPLE VALUE = 26

WIND FORMAT



EXAMPLE SENSOR ID = 1301 EXAMPLE DIR=27 EXAMPLE RUN=9

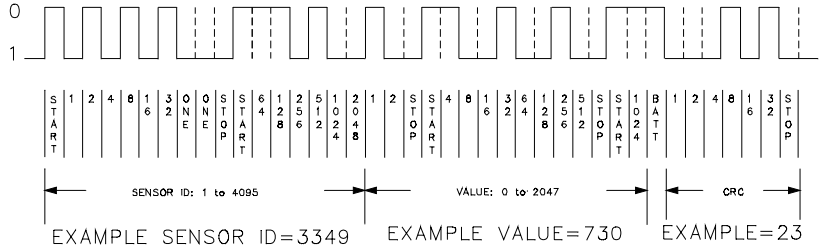
BINARY FORMAT



EXAMPLE SENSOR ID = 3381 EXAMPLE VALUE = 1611

ENHANCED ALERT FORMAT

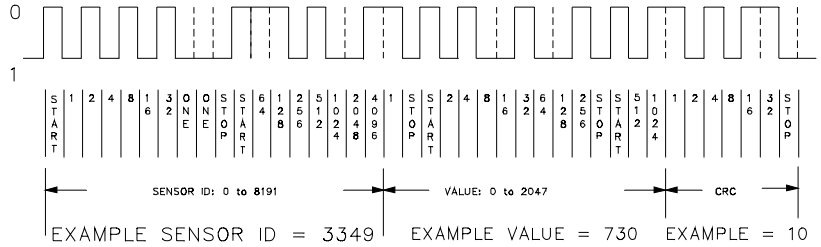
6 BIT CRC POLYNOMIAL = $X^6 + X^4 + X^3 + 1$



EXAMPLE SENSOR ID=3349 EXAMPLE VALUE=730 EXAMPLE=23

ENHANCED IFLOWS FORMAT

6 BIT CRC POLYNOMIAL = $X^6 + X^4 + X^3 + 1$



EXAMPLE SENSOR ID = 3349 EXAMPLE VALUE = 730 EXAMPLE = 10

N/A	REDRAWN ON NEW BORDER	10/7/98
960901	ADD IFLOWS/ CORRECTIONS	9/26/96
ECN#	DESCRIPTION	DATE

MODEL USAGE

HydroLynx

MODEL NO. 5096/5096N

TITLE SPECIFICATION, TRANSMISSION FORMAT

DRAWN BY MYERS DATE 10/7/98

DWG TYPE FORMATS FOR MODEL 5096&5096N

CHECKED BY DATE

SIZE B DWG NO. AC107484 REV B

6.3 5096 Firmware Enhancements

The following documents list the enhancements made to the 5096 firmware versions.

A101100 5096 Firmware Enhancements Version 3.0

A101101 5096 Firmware Enhancements Version 3.1

A101102 5096 Firmware Enhancements Version 3.2

A101103 5096 Firmware Enhancements Version 3.3

A101104 5096 Firmware Enhancements Version 4.0

A101105 5096 Firmware Enhancements Version 3.4

A101106 5096 Firmware Enhancements Version 3.5

A101107 5096 Firmware Enhancements Version 3.6

A101108 5096 Firmware Enhancements Version 3.7

A100740 5096 Firmware Enhancements Version 3.8

A100741 5096 Firmware Enhancements Version 3.9

A100742 5096 Firmware Enhancements Version 4.1

A100743 5096 Firmware Enhancements Version 4.2

A100744 5096 Firmware Enhancements Version 4.3

A100745 5096 Firmware Enhancements Version 4.4

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Version No.: 3.0

Effective Date: January 5, 1994

Description of Changes:

1. Firmware copyright changed to NovaLynx Systems Inc.
2. Default parameters changed:

   Rfwarm: 200, 100

   Enhanced transmit mode: Off
3. Both RFwarm parameters displayed for SET-RFWARM command.
4. Status sensor transmission shows correct value.
5. Peak wind sample interval is displayed correctly.
   Peak wind computation and transmission works.
6. Memory logging will continue when old data overwriting enabled.
7. No sensor ID numbers are excluded from transmitting.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 3.1

Effective Date: May 6, 1994

Description of Changes:

1. 5096-54,88,90,81,N versions available with Plug and Play parameter sets.

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Version No.: 3.2

Effective Date: August 19, 1994

Description of Changes:

1. Pressing the RESET button twice quickly will initialize parameters with the station ID set in the switches. This feature can be disabled or enabled.

2. Added new commands TEST and RESET that mimic the TEST and RESET button functions.

3. Added a new command SHOWALL to display all active sensor parameter sets, current raw and calibrated readings and all station setup parameters.

4. Resets are counted and can be displayed as a maintenance check. The reset count is reset on inits or by command.

5. Resets no longer align (restart) sample and transmit timers.

6. The TEST-TX command transmits for 5 seconds. A command parameter can be used to do a test transmission without tone for a frequency check. The TEST-TX command is now subject to the transmit hold-off timer.

7. Sample intervals on event and wind(counter) sensors were changed to transmit intervals. Reports are transmitted on transmit intervals without having to satisfy a change requirement. Event transmissions are still subject to the change requirement.

8. Added a transmit interval to the status sensor.

9. Sample readings are no longer logged to memory unless they meet the change requirement for transmission.

10. Analog sensor calibrated readings can no longer go negative, they are limited to 0.

11. The transmit 0 parameter for analog sensors was changed to an event threshold. The sensor reading must be greater or equal to this threshold before an event change report is transmitted. This allows a narrow change to transmit to be set on PTs to track water level rises but eliminates useless reports from a dry PT due to temperature fluctuations.

12. Sensor ID setup no longer is effected by default sensor ID numbers assigned to inactive sensors.

13. The HELP command now shows the command list alphabetically.

14. The parameter displays are now organized into columns for easy reading.

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Version No.: 3.3

Effective Date: June 30, 1995

Description of Changes:

1. Holding down the TEST button and then resetting the 5096 by pressing the RESET button or by powering off and then on executes a parameter reset. This replaces the double RESET feature in version 3.2. The double reset feature caused problems on some transmitters whose power up voltage fluctuated and creating multiple resets thus inadvertently causing a parameter reset.

2. EVENT and COUNTER sensor accumulators can be reset to 0 at a programmed day of year. A report is transmitted when the accumulator is reset.

3. A "listen before talk" feature was added to the 5096 firmware. The 5096 can test for radio carrier detection before transmitting. This helps prevent radio "collisions" that would occur if two or more 5096 units transmitted at the same time. This feature requires a board modification and only works with the certain radios (consult factory).

4. The 5096 and certain radios have hardware timers that shutdown the radio if it is left on too long. This is done to prevent the radio from overheating. It also prevents a radio from getting stuck on and interfering with all other transmitters near it. To avoid the radio hardware shutdown the 5096 firmware turns the radio power on to test for carrier and then turns off power while it is waiting for its next test (100 milliseconds).

5. Special version 3.3R added to support the Ritron synthesized frequency radio. This radio requires an 800 millisecond warm-up for frequency lock before transmitting.

   Note: Do not use the carrier detect feature in version 3.3 with the Ritron radio. The radio hardware timer will shutdown the radio before a lack of carrier is detected after the 5096 first detects a carrier.

6. Firmware versions:
   - 3.3 - Use with crystal radios.
   - 3.3R - Use with synthesized frequency radios.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 3.4

Effective Date: October 1, 1996

Description of Changes:

1. The Enhanced IFLOWS transmission format was added to the radio data formats. Transmission formats are now defined as Standard ALERT, Enhanced ALERT, and Enhanced IFLOWS. Firmware version type 3.4RI has the Enhanced IFLOWS transmission format selected by default. Other firmware version types, 3.4 and 3.4R, have the Standard ALERT format selected by default.

2. Two new parameters were added to the SET-RFWARM command to control the "listen before talk" radio power and to allow programming of the radio power on wait time.

   The radio power is turned off by default for crystal radios (version 3.4) while waiting for no radio carrier. The radio is turned on and allowed to warm-up before testing for carrier again. Since synthesized radios have such a long warm-up timer (800 milliseconds), the radio power is not turned off by default (version 3.4R) while waiting for no radio carrier. Override the carrier detect wait power state with the *cdp* parameter in the SET-RFWARM command.

   The radio power on wait time for crystal radios is 25 milliseconds by default (version 3.4). It is 800 milliseconds for synthesized frequency radios by default (version 3.4R). Override the power on wait time default with the *pwron* parameter in the SET-RFWARM command.

3. Eliminated repeat transmission of 2 wire rain gage reports after the hold-off timer. This program fix also eliminated repeat transmission of 5050P rain gages that would occur occasionally.

4. The test transmission time on (with tone and no tone) is adjusted to match the radio power on time to prevent radio shutdown by the hardware timer because of longer power on wait times required by synthesized frequency radios.

   Firmware versions:
   - 3.4 - Use with crystal radios.
   - 3.4R - Use with synthesized frequency radios.
   - 3.4I - Use Enhanced IFLOWS format with crystal radios.
   - 3.4RI - Use Enhanced IFLOWS format with synthesized frequency radios.

   Firmware upgrade costs:
   - $100.00 for the firmware upgrade license.
   - The upgraded firmware is provided on one EPROM chip.
   - Duplication by copying the EPROM is authorized within the same agency or company.
   - Additional firmware upgrades on EPROM chips can be ordered at $50.00 each.
   - Firmware costs do not include tax or shipping.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 4.0

Effective Date: October 1, 1996

Description of Changes:

1. The 5096 console port communications now use half duplex mode.

2. Serial sensor support has been added to version type 4.0A. The first serial sensor supported is the absolute encoder. A sample interval parameter, *s_int*, was added to the SET-EV command. Serial port switch control was added to switch the 5096 RS232 port between the console and the absolute encoder.

   Firmware versions:

4.0	- Use with crystal radios.
4.0R	- Use with synthesized frequency radios.
4.0I	- Use Enhanced IFLOWS format with crystal radios.
4.0RI	- Use Enhanced IFLOWS format with synthesized frequency radios.
4.0A	- Absolute encoder with crystal radios.
4.0AR	- Absolute encoder with synthesized frequency radios.
4.0AI	- Absolute encoder, Enhanced IFLOWS format with crystal radios.
4.0ARI	- Absolute encoder, Enhanced IFLOWS format with synthesized frequency radios.

   Firmware upgrade costs:

   $100.00 for the firmware upgrade license.
   The upgraded firmware is provided on one EPROM chip.
   Duplication by copying the EPROM is authorized within the same agency or company.

   Additional firmware upgrades on EPROM chips can be ordered at $50.00 each.

   Firmware costs do not include tax or shipping.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 3.5

Effective Date: June 6, 1997

Description of Changes:

1. Log memory and showall displays would hang at 9600 baud. The serial output task had a memory request imbedded in its FIFO request. A standoff would occur between the serial output task and the command task when memory was loaded with many lines of output. The memory request was taken out from within the FIFO request to solve this problem.

2. CTRL-C did not terminate serial output for showall and did not work reliably for get-mem commands. Now CTRL-C terminates output for all commands.

Firmware upgrade costs:

$100.00 for the firmware upgrade license.
The upgraded firmware is provided on one EPROM chip.
Duplication by copying the EPROM is authorized within the same agency or company.

Additional firmware upgrades on EPROM chips can be ordered at $50.00 each.

Firmware costs do not include tax or shipping.

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Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 3.6

Effective Date: December 7, 1999

Description of Changes:

1. A 5096-S version of the firmware was added to support serial sensors and dial-in modems. New commands were added to program serial sensors for wireless sensor links: read-serial, set_serial, write-serial. Serial sensors take over an analog sensor number when at least one parameter is set by the set-serial #,... command, where # is the analog sensor number. Use the set-an #,... command programming at least one parameter to restore the sensor to the analog number. The default console baud rate was set to 9600 baud.

2. A new command, READ-IDSW, was added to read and display ID switches.

3. An 'M' radio version for the firmware was added to support Maxon radio parameters: 100ms radio power on delay and radio power is on while waiting for carrier detect to drop.

4. The transmitter tone and battery voltage test was fixed for radios with longer power on times. The test now waits the radio power on delay after turning on the radio power and before keying the radio. The battery voltage is read under load after the transmitter tone test.

5. The 5096-90 version now allows programming of Analog sensor 5.

6. The allowed radio preamble time was increased from 100ms to 2000ms.

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Version No.: 3.7

Effective Date: February 23, 2000

Description of Changes:

1. Added a delay at startup to let power supply come up before starting program. This prevents reset looping at power up caused by reading ID switches before power supply voltage is up to operational level.

2. Fixed version 3.6 error in CHK-MEM command display of percent of logging memory used.

3. Fixed version 3.6 error in READ-CTR command display of COUNTER parameters as WIND parameters when the wind enable flag was not set.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 3.8

Effective Date: September 14, 2000

Description of Changes:

1. Divided the 5096 test into two levels. Test level one transmits all active sensors. Test level two transmits all active sensors and extends the tone signal for 5 seconds. Then it tests the ROM, RAM, battery and clock. Finally it transmits without tone for 5 seconds.

2. Added command arguments to the test command. The first argument sets the test level: 1 or 2. The second argument sets the default test level: 1 or 2. If no arguments are used the default test level is performed.

3. The TEST switch performs the default test level set by the TEST command.

4. The SHOWALL command displays the default test level.

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Version No.: 3.9.02

Effective Date: January 31, 2005

Description of Changes:

Initial Release: February 7, 2001

1. Fixed a problem that corrupted the data logging memory after a power down reset.

2. Added version 82 that has a 3 second analog warm default.

Updated Release: January 31, 2005

3. Fixed the error that caused a time offset in the logged rainfall data after an automatic counter reset to zero.

4. When GET-MEM reads an event data report, it adjusts the following timed data reports to keep the data report time in sync.

5. When GET-MEM reads an invalid logged data report, it skips the report and then continues with the logged data report display.

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Version No.: 4.1

Effective Date: May 20, 2004

Description of Changes:

1. Fixed peak wind computational error that caused erroneous large peak wind values.
2. Fixed time update and event processing during long logged memory dumps.
3. Pausing the logged data, help or showall displays no longer causes serial output buffer errors.
4. Time and event interrupts are now processed in the middle of a logged data display.
5. Morse code logic has never been used and so was removed.
6. Added command arguments to set-rfwarm to define the carrier detect on state.
7. Transmissions are no longer held until the next clock tick when the transmit holdoff timer is set to zero.
8. Fixed analog warm time drift for longer warm times (greater than 100 milliseconds).
9. Test transmission no longer transmit before a long sensor warm time is done.
10. Limit analog warm wait to 10msec for status, battery voltage, and wind direction sensor reads. Long analog warm times no longer effect these sensors. This eliminates the event wind transmission delay caused by long warm times when reading the wind direction.
11. The battery test was changed to power up the radio to put the battery under load then power down the radio before reading the battery voltage. This eliminated bad battery voltage reads caused by noise from power amps.
12. Eliminated pause in the middle of a line of serial output when a transmission occurs.
13. Fixed wind/counter display type for read-wi/read-ctr.
14. Added 5096-82 version the has a default 3 second analog warm time.
15. Changed Maxon RF Power on default to 400 milliseconds to correct key drop out when radio is cold.
16. An NB package has been added that is like the N package except that the battery sensor is enabled with an ID offset of 8 and transmit interval of 24 hours.
17. Display copyright year on program start.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 4.2

Effective Date: September 10, 2004

Description of Changes:

1. Set default mode for EV-2 to mode 6 for all packages. Mode 6 uses a 200ms timer to ignore the second pulse generated by 5050P-MS momentary pulse rain gauges. This eliminates the need to set the event mode to 2. If a high speed counter is used on EV-2, reset the mode to 4 to disable the 200ms timer logic.

2. The 81 package now uses a 3 second analog warm time by default. The 82 package has been retired.

3. A new package NB was added that is similar to the N package with the battery sensor default transmit interval set to 1 day, sample interval set to 3 hours with a change to generate a transmission set to 50 (0.50 volts).

4. Fixed the error that caused a time offset in the logged rainfall data after an automatic counter reset to zero.

5. Wind sensor timed transmission are not done until the wind direction sensor reading is finished.

Hydro*Lynx* Systems, Inc. ! 950 Riverside Pkwy., Suite 10 ! West Sacramento, CA 95605-1501
Phone 916-374-1800 ! Fax 916-374-1877 ! Email hydro@hydrolynx.com

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Version No.: 4.3.2

Effective Date: June 30, 2005

Description of Changes:

Initial Release: February 23, 2005

1. The status sensor will now transmit and log one report on the test interval when it returns to a zero state. In previous versions, the status sensor would only transmit on the test interval when the status value was not zero.

2. If no time parameters are specified for a GET-MEM command then a logged data report's date and time are not checked before printing it. This allow the printing of all logged data reports even if they are out of time order.

3. When GET-MEM reads an event data report, it adjusts the following timed data reports to keep the data report time in sync. Timed data logging starts with an event report to record the time of the first report. When data logging is stopped and restarted, new start times are recorded.

4. When GET-MEM reads an invalid logged data report, it skips the report and then continues with the logged data report display.

5. When the wind direction sensor is calibrated, the calibrated direction is used in the wind report format.

6. A new option was added to the TEST-TX command to transmit a single high or low tone.
   TEST-TX 0 transmits both high and low tones
   TEST-TX 1 transmits no tones
   TEST-TX 2 transmits the high tone
   TEST-TX 3 transmits the low tone

7. Allow use of READ-AN and SET-AN for battery sensor for all packages. This allows calibration programming of the battery sensor if desired.

8. The transmit hold off timer is reset when the SET_HOLDOFF command is executed.

Updated Release: 4.3.1 April 11, 2005

9. Limit calibrated wind direction sensor value in the wind report format to range 0 to 63.

Updated Release: 4.3.2 June 30, 2005

10. Fixed error in computing radio power on and key on wait timers longer than 100ms.

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Version No.: 4.4.1

Effective Date: January 30, 2006

Description of Changes:

Initial Release: September 19, 2005

1. Fixed display of logged memory date and time broken in version 4.3.

2. Allow time samples during display of logged memory.

3. Timed and event report printing do not interrupt command printing.

4. Fixed decimal display of logged memory used.

5. Align timers and change in time no longer close logging memory tables. The next report is logged as an event report which re-aligns the time.

Updated Release: 4.4.1 January 30, 2006

6. Increased rain gauge momentary pulse delay from 200 to 450 milliseconds to support the All Weather Rain Gauge.

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Phone 916-374-1800 ● Fax 916-374-1877 ● Email hydro@hydrolynx.com