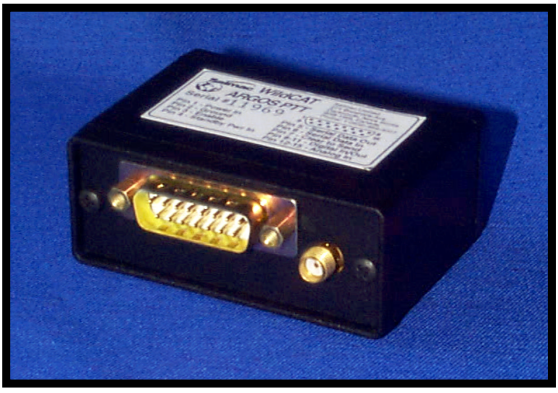
WildCAT Users Manual

UM-335-03-006 V2.0



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1 Introduction

Thank you for purchasing the Seimac WildCAT ARGOS Platform Transmitter Terminal (PTT). We have designed this product to be reliable, cost effective, and easy to use. It is fully compliant with the ARGOS PTT specifications and has been certified for use with that satellite system.

The WildCAT PTT represents a new generation of ARGOS transmitter. It is small, extremely battery efficient and fully user configurable.

This manual is intended to guide you through initial setup & test, configuration, and interface programming of the WildCAT. You may also want to refer to the on-line help notes that are accessible from the WildCAT User Interface Software. Please read and understand the entire manual before attempting to use the WildCAT PTT.

If you have suggestions for improvement or comments on this manual, please contact us directly. We strive to improve our products and documents continuously and we very much appreciate your feedback.

2 Overview

This section of the WildCAT manual gives a high-level overview of the product and indicates what previous experience, tools, and associated documents are required to understand and use the WildCAT PTT.

2.1 What Do You Need to Know to use the WildCAT PTT?

This manual assumes that the reader has a basic understanding of personal computers including knowledge of how to run an application program from Windows 3.1 or Windows 95/98/NT. The manual also assumes some basic familiarity with the function of the ARGOS satellite system, although no detailed understanding of this is required to begin using the system. The user must have applied for and obtained an ARGOS program authorization, PTT ID's and PTT repetition periods for each WildCAT that will be used. Users that intend to interface other devices to the WildCAT should have some understanding of serial interface protocols, analog and digital data acquisition and of the bandwidth constraints of the ARGOS satellite system.

2.2 Reference Documents

ARGOS User's Guide

2.3 Brief Description of the WildCAT PTT

The WildCAT PTT is packaged in a rugged extruded aluminum case with all power and interface connections provided via a DB-15 male connector located on one end of the container. In operation, the WildCAT is connected to a 50 Ohm antenna via the SMA connector adjacent to the DB-15 connector. The WildCAT does not contain any user serviceable components, and opening of the WildCAT case can damage internal components voiding any applicable warranties.

2.4 Tools required to use the WildCAT

The WildCAT can be easily configured and interfaced with simple tools and test equipment found in most electronics labs. No specialized hardware is required for simple operational verification. The following tools are required:

1) IBM compatible personal computer running Windows 95/98. This is used to run the WildCAT User Interface Software provided by Seimac with your WildCAT PTT. The personal computer should have an available serial port to connect with the WildCAT PTT during configuration. If you wish to print out configuration information for your PTT, then a printer compatible with your computer is also required.

   Note: An older version of the User Interface software, which runs on Windows 3.1 is also available by request.

2) Digital Multimeter. To monitor power supply voltage levels and power supply current drain.

3) DC power supply or battery pack. The WildCAT PTT draws only a few microamps during standby, but can draw up to 650 mA during the brief transmission period of the transmitter. Ensure that the power supply chosen can supply the required current *without* reducing its supply voltage.

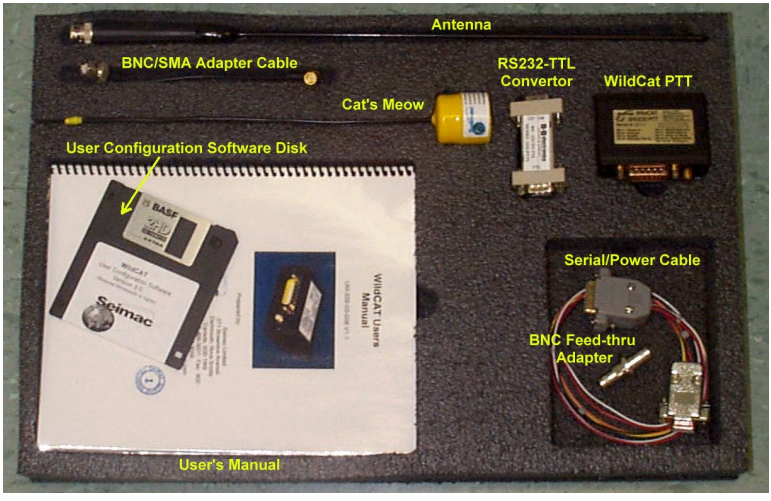
4) Oscilloscope (Optional). A simple oscilloscope can be useful in monitoring serial data exchanges between the WildCAT and externally interfaced devices.

5) Argos Test Receiver (Optional). Useful to verify the messages being sent without transmitting to the satellite.

2.5 The WildCAT Developer's Kit

Seimac can provide a WildCAT Developer's Kit to enable you to interface and configure the WildCAT. This kit consists of:

- One WildCAT PTT;
- This manual;
- One serial interface/power cable;
- One copy of the WildCAT User Configuration Software on 3.5" floppy disk;
- One RS232-TTL converter;
- One SMA/BNC adapter;
- One BNC Feed-through adapter;
- One half-wave antenna;
- One "Cat's Meow" RF detector.



This kit is available at low cost from Seimac and is required to configure the WildCAT. Once you have purchased the kit, you can continue to use it to configure all of the PTT's you may buy from Seimac.

2.6 Precautions / Handling

The WildCAT is designed to be used in rugged environments, however it can be damaged by mishandling during configuration and interface. You should observe the following basic precautions and warnings while handling the WildCAT to prevent damage to the device and to prevent interruptions to the ARGOS satellite system.

1) Exercise proper static control practices including the use of grounding straps and anti-static coverings on workbenches while working with the WildCAT.

2) Do not reverse polarize the power connections to the WildCAT.

3) The WildCAT container is not intended to be water or gas proof. If the device is to be used in wet conditions, it should be separately housed in an external waterproof case. The WildCAT is not intended to be used in explosive gas environments under any conditions.

4) Only enable the WildCAT transmitter when your valid ARGOS-authorized ID code and repetition period have been programmed into the device and verified (see section 5). Do not assume that because you are operating the WildCAT inside a building, it will not communicate with the ARGOS satellite. Under many circumstances, it will.

5) Do not attempt to over-ride the control circuitry to leave the radio portion of the WildCAT on the air continuously for testing purposes. This will invalidate your ARGOS ID and will significantly disrupt ARGOS usage in your vicinity. It will also potentially damage the output stage of the WildCAT radio.

6) The WildCAT PTT requires a properly matched 50 Ohm antenna with a clear view of the sky to be able to properly communicate with the ARGOS satellites. We recommend operating the WildCAT only while a matched 50 Ohm antenna is attached or when a 50 Ohm dummy load is attached for testing purposes. Transmitting without an antenna will draw excessive current and may permanently damage the transmitter.

7) No analog, digital or serial input should greater than +5 volts or less than 0 volts.

2.7 How to Get Help Using the WildCAT

There are a number of ways you can get help from Seimac in using your WildCAT PTT. You should first consult this manual. Additional information is also provided in the on-line help included as part of the WildCAT User Interface Software. You can access this help information by typing **ALT+H** from anywhere in the software menus. The latest version of the User Interface Software, sample configurations, user manual updates and application notes, are available on the WildCAT Technical Support web site at http://www.seimac.com/wcatsup.htm

We provide application assistance and product update information on this site for the WildCAT products. You can also contact us by e-mail at wildcatsupport@seimac.com or by telephone at 1-(902)-468-3007 and asking for WildCAT Product Support. Before contacting us, you should have with you the model and serial number of your WildCAT, a clear description of your interface circuitry and a listing of any program configuration you have loaded into the WildCAT. You can print a listing of the configuration by accessing the **Print Configuration** option on the **File** menu. We may ask you to forward a copy of this configuration to our engineering support staff via fax or e-mail so that they can better assist you.

We are pleased to provide you with simple engineering assistance as you start to use the WildCAT for the first time. We hope that you will find the WildCAT to be easy to use and this user manual easy to understand. Obviously we cannot be familiar with all of the interface applications that the WildCAT will be used in, and so we can only provide direct simple information about the WildCAT at no cost. We are also able to provide full application engineering consulting services on a fee-for-service basis. If you would prefer to have us design a complete data acquisition and telemetry application around the WildCAT, we would be happy to quote you on this basis.

3 Specifications

The following minimum specifications apply to all WildCAT PTT products. Where a feature or specification is optional, this is indicated.

3.1 Functionality

Base Function	Fully compliant with ARGOS PTT operating specifications
User programmable functions	User ID, Transmit Repetition Rate, Transmit Windowing based on data acquired and/or on timers (see section 4).
ID Multiplexing	Supports up to 4 ID's and 128 Byte message in a single WildCAT (up to 10 ID's and 1280 Bytes with Extended Memory Option)
Data Acquisition	Analog, Digital or Serial Data

3.2 Physical

Dimensions	7cm (2.8") wide x 2.9cm (1.2") high x 5.9cm (2.3") long
Weight	110 grams (3.9 oz)

3.3 Environmental

Temperature (Operating)	-40^0C to $+50^0$C
Temperature (Storage)	-55^0C to $+80^0$C
Relative Humidity	95% non-condensing
Shock	100 g, 11 mSec half sine wave shock, three shocks on each of the three primary axes
Vibration	1 hour vibration on each of three primary axes with random vibrations

3.4 Power Supply

Voltage Range	6 to 20 volts
Current Drain	
Sleep	50µA typical
Data Acquisition	10mA typical
Transmit	550mA typical

3.5 RF

Output Power	1.0 Watt typical
Antenna Output Impedance	50 Ohms
Modulation Type	Manchester encoded phase modulated
Modulation Depth	1.1 radians peak

3.6 Interface

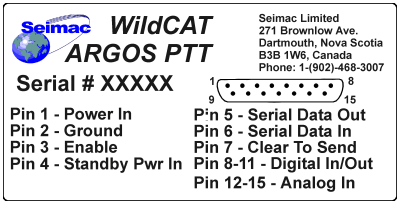
Serial	
Baud Rate	1200, 2400, 4800, 9600 (user selectable)
Bits	8 bits
Parity	None
Stop Bits	1
Handshaking	Hardware – RTS, CTS or Software Controlled
Digital	
Number of Inputs	4 default, optionally 7
Equivalent Input Circuit	1 CMOS gate load per input
Control Output Lines	1 (used to control power to external sensors)
Analog	
Number of Inputs	4 default, optionally 8
Resolution	8 bits
Voltage Range	0-5 Volts
Input Leakage Current	<400nA

3.7 Extended Memory Option

Mechanical	Installed within standard WildCAT enclosure
Configuration	32 KB of RAM, 32 KB of ROM
ID Multiplexing	Extends multiple IDs to 10 with messages of up to 1280 bytes of user data

3.8 Connector Pinout

The default connector pinout (also shown on the serial number label on top of the PTT enclosure) is shown below. Custom pinouts can be arranged to access the optional sensor inputs.

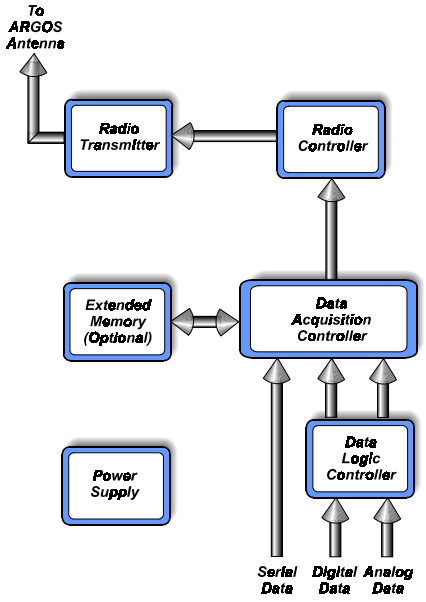


PLEASE NOTE: *Because the WildCAT PTT can have multiple Argos IDs and the IDs can be changed by the user, the serial number is used to distinguish one PTT from another. It is* ***NOT*** *an Argos ID, even though it may have a similar number of digits.*

4 Theory of Operation

The following paragraphs provide a simple description of the Seimac WildCAT PTT.

The WildCAT PTT can be thought of as consisting of 4 basic blocks with 2 optional blocks as shown in the following diagram. (Note that this description serves as a user's model of the WildCAT. The actual hardware does not necessarily conveniently break down into equivalent modules.) The Radio, Data Acquisition and the Data Logic controllers each have a number of User Programmable Parameters that can be set using the WildCAT User Interface Software. These parameters control the overall function of the WildCAT and can be used to customize the operation for your particular application.



4.1 Power Supply

The power supply regulates raw battery voltage and distributes dc power to all other modules in the device. All of the control circuits and the optional Extended Memory and GPS are powered from a 5 volt regulated voltage supply. The 5 volt power supply within the WildCAT is not intended to power external sensors or data acquisition devices. An output control line is provided from the Data Acquisition Controller to allow you to control power to external devices. The Power Supply Module has no User Programmable Parameters.

4.2 Radio Transmitter

The WildCAT Radio Transmitter is a phase modulated UHF transmitter with a nominal output power of 1.0 Watts (30 dBm). It makes use of a very accurate temperature compensated crystal oscillator (TCXO) as its transmit frequency reference. This reference frequency is multiplied up to the transmit frequency of 401.65 MHz and phase modulated in a phase looked loop circuit. A very efficient power amplifier circuit amplifies the modulated signal to the required signal level and matches the output impedance of the transmitter to a nominal 50 Ohm antenna impedance at 401.65 MHz.

The Radio Transmitter has three basic inputs, all of which are controlled by the Radio Controller. They are the transmit enable, the +modulation and the –modulation lines. The Radio Transmitter Module has no User Programmable Parameters.

4.3 Radio Controller

The Radio Controller Module turns the Radio Transmitter on and off under program control, creates the Manchester encoded control signals for the + and – modulation control lines of the Radio Transmitter, receives acquired data from the Data Acquisition Controller and formats standard ARGOS messages to be transmitted by the Radio Transmitter Module. The Radio Transmitter Module begins transmitting continuous wave (cw) soon after it is provided with power by the Radio Control Module. The cw signal is then phase modulated in a bi-phase L (Manchester encoding) scheme through two modulation control lines coming from the Radio Control Module.

The Radio Controller Module has the following User Programmable Parameters:

PTT ID number — Up to four ARGOS ID numbers may be entered (10 with extended memory option). The IDs are entered in hexadecimal as provided by Service Argos.

Primary Repetition Rate — The time (in seconds) between transmissions for the first ID.

Secondary Repetition Rate — The time (in seconds) between transmissions for the additional IDs (may be the same as primary).

EXPERT TIP! *To save money on ARGOS charges, many users of the multiple ID feature use 90 seconds as the primary rep rate (for position fixes) and 200 seconds as the secondary rep rates (for data-only fixes).*

Transmission On Time — The time (in seconds) when the transmitter in enabled.

Transmission Off Time — The time (in seconds) when the transmitter in disabled.

These can be used to set a transmission duty cycle (for example, 6 hours on, 12 hours off).

Number of Additional IDs — Enables one or more of the additional IDs for multiplexed transmissions (set to zero for single ID use).

28-bit ID Enable	To use the newer 28-bit IDs (IDs with a decimal number of 100,000 or higher), set this parameter to one (1). To use older 20-bit IDs, set this parameter to zero (0). If you are using multiple IDs, you may **not** mix 20-bit and 28-bit IDs.
Start-up Delay	Delay time (in seconds) between when the unit is powered up, and when it begins running its program. It is in low-power sleep mode during this period and does not read sensors or accept serial data until the start up delay is over.
Shut-down Timer	Time (in seconds) for the unit to operate, after which it shuts down and will not transmit (set to zero to never shutdown).
Shut-down Flag	This parameter is used internally by the processor to know if the unit has gone into shut down mode. Reset this back to zero to exit shut down mode (the user interface program does this automatically).

Notes on 28-bit IDs: *Due to increasing demand for ID numbers, Argos has created a new block of IDs. They did this by removing one byte from the data message and adding it to the ID. This means that 28-bit IDs have a maximum message length of 31 rather than 32 bytes. WildCAT PTT is able to support either type of ID. However, most uplink receivers do not yet support 28-bit IDs, so the transmission will appear as if it is coming from a different ID (the 20-bit "root" ID) with the first data byte set to an odd value. Please consult Service Argos for more information on working with 28-bit IDs.*

4.4 Data Acquisition Controller

The Data Acquisition Controller takes in serial, digital and analog data from externally connected sensors. The user can program the Data Acquisition Controller to determine when and how these externally connected devices are read.

4.5 Data Logic Controller

The Data Logic Controller takes the digital and analog input data and processes it via user defined formulas. It can optionally use this data to enable and disable Argos transmissions. The Data Acquisition & Logic Controller Modules have the following User Programmable Parameters:

Baud Rate	The serial baud rate may be set to 300, 1200, 2400, 4800 or 9600 baud. The default is 4800.
Serial Data Enable	Enables input of serial data. When not in Serial Mode, the WildCAT is in Sensor Data Acquisition Mode (see section 6.1).
Hardware Handshaking Enable	Enables hardware handshaking (see section 6.1.1)
Serial Timeout	Time (in seconds) to allow for serial data packets to be sent.
Serial Debug Message Enable	Enables diagnostic debug messages on the serial port.
Active Digital Inputs	A bit field to enable or disable the 7 individual digital inputs. For example, enabling inputs 2 and 4 would be 00001010 in binary or 06 in hex.
Digital AND Mask	A bit field to enable or disable the active digital inputs being logically ANDed together, the result of which enables or disables the Argos transmitter.
Digital OR Mask	A bit field to enable or disable the active digital inputs being logically ORed together, the result of which enables or disables the Argos transmitter.
Digital XOR Mask	A bit field to enable or disable the active digital inputs being logically exclusive ORed together, the result of which enables or disables the Argos transmitter.
Digital Invert Mask	A bit field to enable or disable the inverting the state of the active digital inputs before being logically ANDed, ORed or XORed by the other settings.
Digital Combine Mask	A bit field to enable or disable the following options: Bit 0: enables XOR mask Bit 1: enables OR mask

	Bit 2: enables AND mask Bit 3: enables analog min/max testing Bit 4: enables latching (i.e. if the test conditions are met once, the transmitter remains on even if the test conditions return to normal)
Transmit On Logic True Enable	Enables the transmitter for one "Transmission On Time" period when the test conditions are met.
Sensor History Enable	Transmits the sensor readings from the two previous sensor samples as well as the latest sample.
Sensor Power Enable	Sets a digital output high when reading sensors. Can be used to control a relay to power up sensors only while they are being read.
Sensor Delay	Time (in seconds) between sensor power being applied (see above) and sensor readings being taken. This can allow for sensors that require a "warm-up" period.
Active Analog Sensors	A bit field to enable or disable the 8 individual analog inputs. For example, enabling inputs 1, 3 and 4 would be 00001101 in binary or 0D in hex.
Sensor Maximums	The maximum value for each individual analog input, above which the test condition is true.
Sensor Minimums	The minimum value for each individual analog input, below which the test condition is true. (Note: when the sensor minimum is higher than the maximum, the test will be true when the sensor value is between the min and max rather than outside the min and max.)
Sensor Sample Period	Time (in seconds) between sensor samples.

4.6 Extended Memory (Optional)

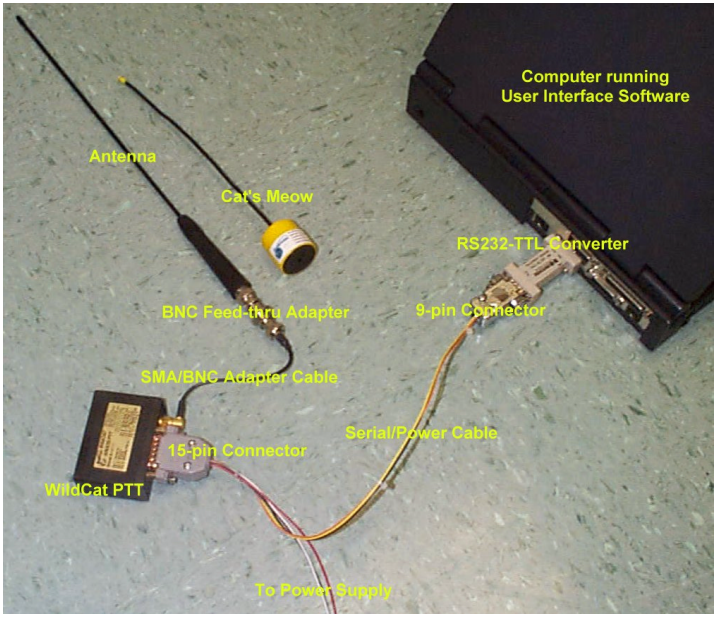
This is an optional add-on board, which fits inside your existing WildCAT enclosure. Depending on the options chosen, it adds up to 32K of RAM, up to 48K of ROM, and up to 1M of flash RAM.

4.7 Built-in GPS Receiver (Optional)

This is an optional add-on board which adds a GPS receiver (the extended memory board is required for this option). The GPS-WildCAT comes in a similar extruded enclosure but is longer to accommodate the GPS receiver.

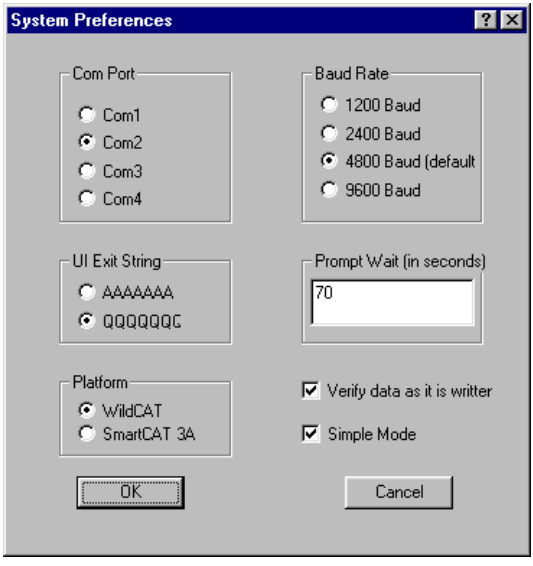
5 Interface and Configuration

This section describes connecting your WildCAT PTT to a PC and setting the configuration. Please read and understand the entire section before attempting to change the WildCAT's configuration.



The pin-out of the interface connector on the WildCAT is printed on the label on the unit itself, as well as in the diagram in section 3.8. Plug the 15-pin connector of the supplied power/serial cable into the WildCAT. Plug the 9-pin connector of the supplied power/serial cable into the supplied RS232-to-TTL converter. Plug the converter into a serial port of the Windows PC running the User Interface program. To install the program, simply insert the supplied floppy disk into your disk drive and run **INSTALL.BAT**. This will install the required files to a directory called **C:\PTTCOMM** and will automatically run **PTTCOMM.EXE**. Once you have installed the program, you can later just run **PTTCOMM.EXE**.

Connect the RF output (SMA coax connector) to an appropriate antenna or dummy load (If the Seimac "Cat's Meow" is placed close to the antenna, a short beep will be heard when the SmartCAT transmits). Connect the red wire of the supplied cable to your battery or power supply (6V to 20V DC) and the black wire to the ground of the battery or power supply. The white wire (enable pin 3) is used to switch power to the WildCAT on and off with a TTL/CMOS line (logic low = power off, logic high or floating = power on). If you do not wish to use this feature, or are switching the power supply on and off directly, simply leave this line disconnected (floating).



The first time you run PTTCOMM, you should check the **Preferences** settings under the **File** menu. This allows you to set which of your PC's serial ports (COM ports) the PTT is connected to and what baud rate to use to talk to it. Unless you request otherwise, WildCAT PTTs are shipped with a default of 4800 baud, and the baud rate of your PC must match (even if the configuration you are sending changes the WildCAT's baud rate). If you change the WildCAT's baud rate, the new baud rate will not take effect until the next time the WildCAT powers up. If you later wish to change any of the WildCAT's configuration parameters, the System Preferences must match the WildCAT's *new* baud rate.

On the PC running the User Interface program, select the **File** menu then **Open** or click the open file button on the tool bar. Select the **wildcat.cfg** file (it should be the only configuration file available).

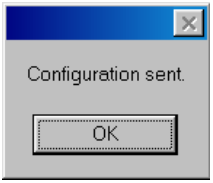
You should now see the configuration window containing all of the user programmable parameters in a spreadsheet-style table. You may change any of the user configurable settings to suit your application. Descriptions of these parameters are given in section 4.

Note: *Some parameters will be in "grayed" uneditable fields. These are values which should not be modified from their default values without consulting with Seimac technical support staff.*

Once you have configured the UPP's and set your preferences, then select **Start** from the **PTT Communications** menu, or click the start button on the tool bar. A terminal communications window will launch automatically. If at any time you want to see data coming from the PTT, open the terminal window as described in the help file. This will allow you to see all debug information being sent from the PTT.

Now connect power (or disconnect the white wire of the interface cable from ground). The PTT only allows configuration access during the first few seconds after power-up (to lock out accidental changes). Therefore, when configuring the WildCAT, **DO NOT power it on until AFTER you click the start button.** The program should respond after several seconds with a dialog box stating "Communication Started".

If the PTT was already on when you hit the start button communications will **not** start. Turn the PTT off and wait a minute or so for the capacitors to discharge, then click the start button and power the PTT back on.



Now select **Send Configuration** (Send File prior to version 3.0) from the **PTT Communications** menu, or click the send configuration button on the tool bar. This will send the configuration settings to the PTT. When the configuration has been completely sent, a dialog box stating "Configuration Sent" will appear. This means that the configuration transmitted successfully from the PC's end. If the configuration was received successfully at the WildCAT's end as well, the message:

```
Valid EEPROM for following bytes: 0280
```

will appear in the terminal window. This configuration will remain stored in the PTT in non-volatile EEPROM memory (even when the PTT is powered off). If the conformation message does not appear in the terminal window, there has been some problem with the serial communication between the PTT and the PC. Power down the PTT, select "Verify Data As It Is Written" from the preferences menu (if it is not already checked), and then try sending the configuration again (repeating all steps from the beginning).

When you are ready to use the configured PTT, simply select **Stop** from the **PTT Communications** menu and turn the power to the PTT off and then on again.

Your new configuration can also be saved to disk using the **Save As** options in the **File** menu (you will be prompted for a new configuration file name so you do not overwrite the original). It is recommended that you save the configuration of each WildCAT you have to a separate file (perhaps using the serial number as the file name) to simplify things when you need to modify the configuration in the future.

6 Modes of Operation

6.1 Serial Mode

In this mode, the WildCAT transmits the data it receives on the serial port. This mode is useful for transmitting data collected by a computerized data acquisition system. If the data received is two large to fit in a standard Argos message of 32 bytes, the data can be multiplexed over up to four separate ID numbers or different transmissions on the same ID number. Data packets are assigned on a first-come-first-serve basis. That is, if you have 4 IDs and you send 128 bytes, the first 32 go on ID #1, the second 32 go on ID #2, etc. To save money on ARGOS charges, if you have 4 IDs and you only send 64 bytes of data, it will only use the first 2 IDs. You can change the number of bytes you send at any time and the PTT will adjust accordingly. If you send less than 32 bytes (or less than an even multiple of 32 bytes), the message will be "padded" with zeros to the nearest valid ARGOS message length (data messages must be 4, 8, 12, 16, 20, 24, 28 or 32 bytes in length). It is up to the user to put an identifying header in each 32-byte packet, so the full message can be re-assembled in the correct order.

Please Note: *If you are using a 28-bit ID number, the maximum amount of data for each transmission is 31 bytes, and valid message lengths are 3, 7, 11, 15, 19, 23, 27 and 31 bytes.*

The serial data received by the WildCAT must be in the following format. The first byte is always a "star" (ASCII character 42 or 2A in hex). The next two bytes are the number of data bytes being sent (data only – not the header or checksum). Then the data bytes are sent and finally a one byte arithmetic checksum of the data only, not the header (in other words, add all the data bytes together and use the least significant byte of the result as the checksum). In the sample data packet is shown below, the sum of the data is 12 + 34 + 56 + 78 + 9A = 01AE, so the checksum is AE.

2A	00 05	12	34	56	78	9A	AE
"star"	length	data	data	data	data	data	chksum

The header and checksum are used only to verify the data, they are not transmitted via Argos. If you send the WildCAT a message with no data (header only) and data length and checksum specified as zero, the data buffer will be cleared and the PTT will stop transmitting until it receives new data. This message is shown below:

2A	00 00	00
"star"	length	chksum

6.1.1 Software Handshaking

Software handshaking is the default operation. Once every repetition period, the WildCAT will send the message "Send Data Now:" out the serial port (if the serial debug parameter is enabled) and set the RTS output line (pin 8) low indicating that it is ready to receive data. The peripheral has until the end of the serial timeout period (programmable via the **Advanced Setup** window) to respond with a valid data packet. If a valid data packet is received, the WildCAT responds with an ACK (ASCII character 06) and the data will be transmitted during the next Argos transmission. If no packet is sent (or if the checksum is wrong, or the packet is not completely sent before the serial timeout) the WildCAT responds with a NAK (ASCII character 21 or 15 in hex) and will continue transmitting the last valid packet it received. If the serial debug parameter is enabled, additional error messages (besides the NAK) are transmitted to identify certain types of errors. For example:

`Error 3: Bad Checksum. Got` *`zz`*`, expected` *`yy`*`.`
where *zz* is the checksum received and *yy* is the checksum expected based on the data received.

`Error 4: Byte count greater than available RAM.`
This occurs when the byte count (the 2 bytes following the star) is too large for the Wildcat to handle. With no memory expansion board, the maximum byte count is 128 (0x00 0x80).

`Error 2: First character not a star (*)`
This occurs when the first byte is not a star (0x42).

If it has never received a valid packet since applying power, it will send a default message (4 bytes consisting of 00, 01, 02 and 03).

6.1.2 Hardware Handshaking

Hardware handshaking mode is similar to what was described above, except that the peripheral may request to send a packet at any time (via the Clear-To-Send input) rather than waiting for a "Send Data Now:" message, even while the unit is in low-current sleep mode. When the WildCAT senses its CTS line (pin 7) has been pulled low, it sets the RTS output line (pin 8) low indicating that it is ready to receive data.

6.2 Sensor Data Acquisition Mode

If serial mode is not enabled, then the WildCAT is in sensor data acquisition mode. Every sensor sample period, the WildCAT reads all active analog and digital sensors (inactive sensors are not read or transmitted). It formats this information into an Argos message and continues to transmit it until the next sensor sample period.

The WildCAT PTT has 7 digital and 8 analog sensor inputs and the message format reflects that. However, by default only digital inputs 1 to 4 and analog inputs 1 to 4 are available at the connector (custom connector configurations are available by request).

6.2.1 Digital I/O

If any digital inputs are enabled, the first byte of the Argos message indicates the state of each digital input. For example, if digital inputs 1, 3 and 4 were logic high (and enabled); the byte would be 00001101 in binary or 0D in hex.

6.2.2 Analog I/O

If any analog inputs are enabled, the next bytes indicate the value of each of the enabled analog inputs. The resolution is 8 bits, therefore for an input of 0 to 5 volts; the value would be 0 to 255 (or 00 to FF in hex).

6.2.3 Logic Combinations

Various logic combinations can be set as shown in section 4.5 to transmit only when the sensor reading meet a predefined state. The default state however is to transmit the sensor message regardless of the values read.

6.2.4 Checksum

The WildCAT automatically places a simple arithmetic checksum in the last byte of the sensor message. This allows the user to verify the integrity of the data after reception. After the checksum, the WildCAT pads with zeros if necessary to the nearest standard message length (Argos has 8 standard message lengths in 4 byte increments).

6.2.5 Sample Transmissions

The following sample transmission shows the various portions of the sensor message. It is a single sensor transmission with checksum.

0D	03	2B	FF	3A	00	00	00
digital inputs	analog input 1	analog input 2	analog input 4	chksum (LSB)	unused byte	unused byte	unused byte

Please Note: *If the above example used a 28-bit ID number, there would be only two unused bytes padding the message.*

This is a sample transmission with "Sensor History" turned on. The first set of data is from the most recent sensor sample (sensor sample period is a user programmable parameter). The second set is from the previous sensor sample and the last set of data is from the sample prior to it. For example, if the "Sensor Sample Period" were set to one hour, these would be the most recent samples, the samples from one hour ago, and the samples from two hours ago.

0D	03	2B	FF	04	07	25	FE
digital inputs	analog input 1	analog input 2	analog input 4	digital inputs	analog input 1	analog input 2	analog input 4

01	0A	28	FD	98	00	00	00
digital inputs	analog input 1	analog input 2	analog input 4	chksum (LSB)	unused byte	unused byte	unused byte

Please Note: *If the above example used a 28-bit ID number, there would be only two unused bytes padding the message.*