Pulsar 200 Users Guide

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Description of the Pulsar 200

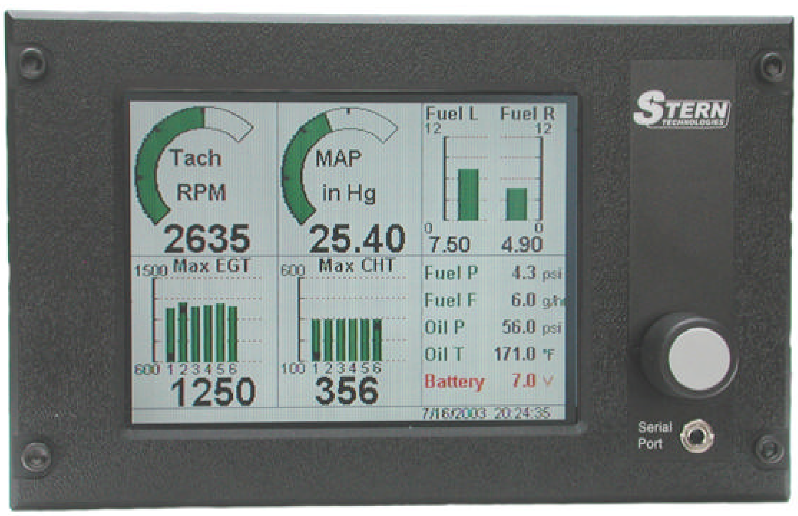
The Pulsar is an electronic data collection and display device designed specifically for use in experimental aircraft. The Pulsar 200 has a number of inputs specifically configured for tachometer and thermocouple inputs. The Pulsar 200 also provides 15 configurable general-purpose inputs suitable for monitoring a wide variety of engine related sensors. The general-purpose Pulsar inputs can also be used to monitoring non-engine related parameters.

The Pulsar is housed in a single module measuring 6.25” W x 4.0” H x 3.0” D. The color liquid crystal display (LCD) measures 4.0” W x 3.0” H and 5.0” diagonally. The Pulsar will fit into a standard radio stack. The Pulsar faceplate bezel mounts through the front of the panel.

The Pulsar will work with power inputs ranging from 8 VDC to 28 VDC. Its current draw is about one amp at 12 VDC with the display at maximum intensity. The Pulsar provides an input for backup power system. It will detect a failure of the primary power input and automatically switch to the backup power. The backup power source is external to the Pulsar.

The user interfaces consists of the 5” diagonal LCD and a single control knob. As show below in figure 1-1, large digital readouts and color-coded gauges make the Pulsar display easy to read and comprehend. Control knob is the only input required during normal operation. This pilot-friendly design allows scanning of monitored parameters with minimal pilot distraction.

Figure 1-1



Glossary

Alarm Levels: Alarm levels define the point at which a data value is out of limits. When a data value is out of limits, it will go into an alarm state. The user can define both minimum and maximum alarm limits for the Pulsar.

Alarm: The audio and/or visual warnings produced by the Pulsar when a data value is outside of its defined limits.

Block: During normal operation, the Pulsar display is divided into six equal squares – called blocks. The user can control the type of information shown in each display block.

Cylinder head temperature (CHT): The temperature, measured by thermocouple, at the top of the engine cylinder.

Data Logging: Users can selected inputs to monitor and store internally. The Pulsar will place readings from the selected inputs into a section of memory that is saved even through power on-off cycles. This section of memory can be downloaded from the Pulsar. The downloaded data is used for historical analysis of operation.

Display: The Pulsar uses a color video monitor for its display. The Pulsar display can show high-resolution graphics and text. During normal operation, the Pulsar display is divided into six equal blocks.

Download and Downloading: Downloading is the transfer of electronic information from one computing device to another.

Engine parameter: An engine parameter is any engine data monitored by the Pulsar. A parameter may be a directly monitored value, such as oil temperature. An engine parameter may also be a calculated value, such as the EGT span – the difference from the highest to lowest EGT reading.

Exhaust gas temperature (EGT): The temperature, as measure by thermocouple, at the immediate outlet of each cylinder's exhaust port.

Fuel totalizer: A summary status of important fuel system information. The fuel totalizer reports on fuel flow, fuel pressure, fuel used, fuel remaining (volume) and flight time to empty.

Inputs: External electrical signals brought into the Pulsar on its back panel pins. The external electrical signals are typically from sensors.

Liquid crystal display (LCD) The Pulsar display is a liquid crystal display (LCD). Modern LCD technology allows the use of displays that are compact, rugged and low power while still producing high brightness and full color.

Page: The user can control the Pulsar display to show different views of monitored data. The control knob switches from one view of display data to the next. Each unique screen of the display with its associated gauges and data represents a Page.

Range: The span from a gauge's minimum value to its maximum value is its range. A temperature gauge that displays from 100 to 250 ºF has a range of 150 ºF.

Red line: Indicates the danger zone alarm for a data value.

Sensors: Sensors are devices for converting physical properties (such as pressure, temperature and flow) into electrical signals. The Pulsar can then read these electrical signals.

Set Up: The initial steps required to prepare the Pulsar for operation. Set up steps may include setting Pulsar alarm limits or customizing the display.

Thermistor: A temperature sensor that changes its resistance in response to a change in temperature. Thermistors are typically used for measuring lower temperatures (up to 200 °F).

Thermocouple: A temperature sensor constructed by welding two wires of different metal alloys into a junction. A temperature difference between the bi-metallic junction and a remote section of the wires will produce a very small voltage differential. For different combinations of metals linear voltage vs. temperature charts can be produced. Thermocouples are used for measuring high temperatures (up to several thousand degrees Fahrenheit).

Yellow line: Indicates the warning or caution zone alarm for a data value.

Use of the Guide

The Pulsar Basic User's Guide is divided into six sections.

Section I – Checking out the Pulsar 200 describes the initial preparation and handling steps.

Section II – Operation of the Pulsar 200 describes the operation of the unit including inputs, outputs, the display, pilot controls and data logging.

Section III - Installation covers the mounting of the unit, sensor installation, and wiring connections.

Section IV – Description shows how to download the Pulsar 200 customization software from the supplied CD-ROM to your PC.

Section V – Configuring the Pulsar 200 describes the procedure for basic customization of the software for your Pulsar 200.

Section VI – Specifications provides detailed electrical and mechanical specifications for the Pulsar 200 and other useful information.

The basic software configuration has many present selections. For complete customization of all the configurations of the Pulsar 200 refer to the Pulsar 200 Advanced User's Guide.

Pulsar Field Updates

From time to time Stern Technologies will provide updates for the Pulsar. These updates may add new features or correct reported problems. The field updates will change the program memory resident on the Pulsar. Field update distribution will be via CD-ROM or from the Stern Technologies web site.

Field updates must be downloaded to the Pulsar using the front panel serial port and a PC. Windows application documentation provides detailed instructions for performing Pulsar field updates.

SECTION I - CHECKING OUT THE PULSAR

Unpacking

Unpack the Pulsar and verify that you have received the following materials:

- ? Pulsar 200
- ? Packing list and/or detail receipt
- ? Connector/harness kit (contents will vary depending on order - see packing list for specific items delivered)
- ? Sensor package (contents will vary depending on order – see packing list for specific items delivered)
- ? Pulsar 200 User's Guide
- ? AC power adapter
- ? *Pulsar 200 Configuration CD-ROM
- ? *Serial data cable (3.5mm audio jack to 9-pin DB)

* - Optional material for PC-based customization of the Pulsar.

Inspection

- ? Carefully inspect the contents of this package for damage. If damage is found, save all packaging for carrier insurance claims.
- ? Inspect the contents of the shipment to ensure receipt of all component parts and materials.
- ? Visually inspect all components for proper identification or damage. Report any discrepancies to Stern Technologies within 15 days.

Care and Handling

The Pulsar can withstand rugged use. However, standard precautions for electronic equipment are required:

- ? Do not expose to rain or water
- ? Handle with care – do not drop
- ? Be sure that all electrical connections are correct and properly made
- ? The Pulsar display may be cleaned with a soft cloth and mild non-abrasive cleaning solution
- ? If the display cracks, it is possible for the liquid crystal to escape from the panel. Use soap and immediately wash any contact with the liquid crystal.

Guaranty

Stern Technologies provides a 60-day money back guaranty on all its products. This provides you with ample time to determine that you are pleased with your purchase. If at any time during this 60-day period you determine that you would like to return the product please contact Stern Technologies customer support department for a return material authorization (RMA) number. Do not return material to Stern Technologies without first obtaining an RMA number.

Stern Technologies will not charge a restock fee for equipment returned complete and undamaged during the initial 60-day evaluation period.

Do Not Open the Pulsar Enclosure!

There are no user serviceable parts or adjustments inside the Pulsar. Opening the Pulsar enclose will break the internal safety seals and VOID your warranty and guaranty.

Powering on the Pulsar for the First Time

Connect the supplied AC voltage adapter to the Pulsar rear panel connector J1 (six pin connector). The connector on the AC voltage adapter is keyed and cannot be inserted incorrectly. Plug the AC voltage adapter into a convenient AC outlet.

Pulsar Power-on Self Tests (POST)

? When powered on the Pulsar will test its internal memory and processors. A screen message will briefly display the results of the power-on self-test (POST).

? After a successful completion of the POST the Pulsar will proceed to normal operation mode.

? If any errors are detected during the POST the Pulsar will attempt to repair the errors and will inform the user. Note if errors keep reoccurring you should contact Stern Technologies as soon as possible.

Pulsar 200 Generic Display

? The Pulsar 200 ships with generic software loaded. After a successful power-on, the first page of the generic display is shown. Rotate the control knob clockwise to change display pages.

? Rotate the control knob counter-clockwise to return to the first display page. When the display stops changing, you have scrolled through to the first (turning counter-clockwise) or the last (turning clockwise) page in the display.

Checking the Brightness Control

? The control knob on the front panel adjusts display brightness when the knob is pushed in and turned.

? Turning counter clockwise dims the display. If the knob continues to be rotated in the counter-clockwise direction (while being pushed in) the background will change to black for low light viewing.

SECTION II – OPERATION OF THE PULSAR 200

Design Goals

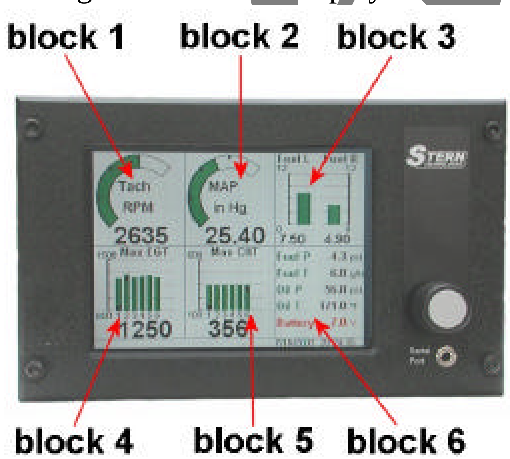
The major design goals for the Pulsar 200 are:

- To present many engine parameters in an easy to comprehend format
- To make selections of engine data simple and easy
- To provide the aircraft owner with an extremely flexible customization of all the Pulsar's operating characteristics (displays, inputs selections, special functions, parameter ranges and alarm levels)

Display Screen

- The five-inch diagonal color screen presents sensor data from 36 inputs (such as cylinder head temperatures) as well as calculated data (such as rate of change of cylinder head temperature)
- Up to ten different display pages can be assessed during normal operation. Each page has six individual blocks – two rows of three columns. Each block can be set to display one or multiple gauge formats.
- The control knob is used to scroll between display pages.

Figure 2-1: Pulsar display screen



Gauge Formats

Each display page block can be set to display one or multiple gauge formats. Five different types of gauge formats are available: four types of analog gauges and one type of text gauge. The gauge format selected will depend on the parameter or parameters to be displayed and the preference of the user. The five gauge formats are shown below:

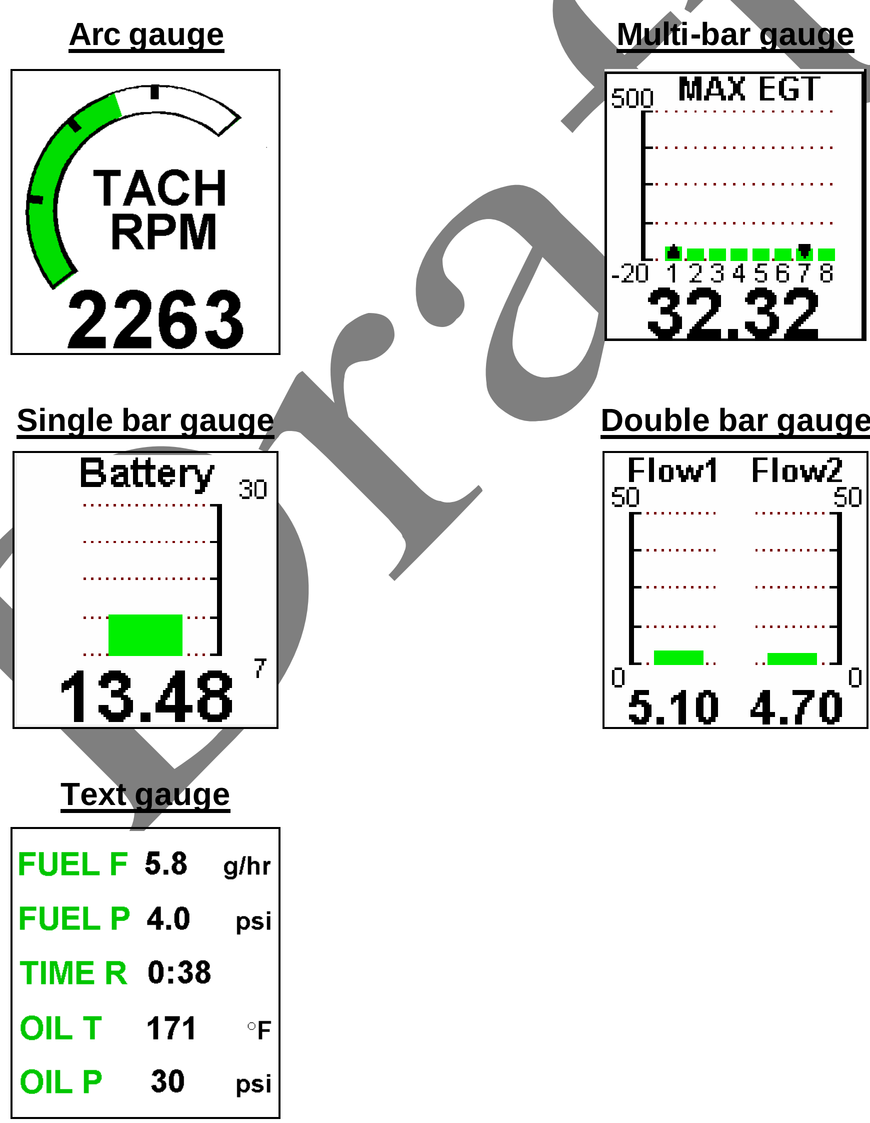
Some of the gauges include special features. The multi-bar gauge indicates which of the parameters shown has the highest value (up pointer) and which has the lowest value (down pointer).

The user can configure text gauges to display up to five parameters in one block. For diagnostic purposes, an entire page can be devoted to text gauges. This allows simultaneous viewing and comparison up to 30 parameters.

The user can also set the range of a gauge. For example, the RPM range might be set from 0 to 3000 RPM for a Lycoming engine – or it could be set from 0 to 3500 for a Jabiru engine.

The user sets the alarm limits separately from the gauge displays. Alarms can be set for minimum and maximum values. Alarm limits can be set to indicate a warning range (yellow) and a danger range (red).

Figure 2-2: Gauge Formats



Alarms

The user can configure different alarm levels on the Pulsar. A warning level alarm (normally indicated with a yellow color) tells the pilot a parameter is about to enter a dangerous level. A danger level alarm (normally indicated with a red color) tells the pilot a parameter has entered the danger zone.

The Pulsar provides both audio and visual indications for alarms. If the audio alarm pins on the J1 connector are attached to an audio device (such as an intercom), a tone will be generated when an alarm is active. In addition, the gauge containing the out-of-level parameter will be display in its alarm color (yellow or red – depending on the alarm level) and begin to blink.

The pilot can acknowledge this alarm by pushing in the control knob. The audio alarm and display blinking will stop. The gauge will remain in its alarm color as long as the value of the parameter stays in the alarm range. An alarm status indicator will also appear in a status area at the bottom of the display. The alarm status will always be display, even if the pilot switches pages.

If the parameter remains at the danger alarm level (red), the alarm sequence (audio and display blinking) will reoccur every 5 minutes to remind the pilot of the alarmed parameter. The user can modify this interval if desired.

Status Bar

A status bar is placed at the bottom of each page and is the same for all pages. The status bar includes the date and time and indicates if any parameters are in an alarm condition. If multiple parameters are in an alarm condition, only one alarm is shown.

The time display is in 24-hour format. The user can set both date and time. The format for the date and time display is:

MM/DD/YYYY HH/MM/SS

Pilot Controls

A single knob on the front panel provides the pilot with three functions during normal operation.

1. **Page Selection** – Turning the control knob scrolls the display pages. Turning the knob counter clockwise will scroll up toward the first page. Turning the knob clockwise will scroll down toward the last page. Scrolling will stop when the reaching the first or last page.
2. **Acknowledge** – The pilot acknowledges warnings and alarms by pushing in the control knob.
3. **Screen brightness** – The pilot can push in and turn the control knob to adjust the screen brightness. Turning counter clockwise will dim the screen while turning clockwise will brighten the screen. As the screen dims, the screen contrast will

change from dark characters on a light background to light characters on a dark background.

The control knob is also used for various selections when the Pulsar is in menu mode.

Inputs

The Pulsar directly monitors 36 inputs. In many applications, not all of the inputs are used.

Some Pulsar inputs work with specific types of signals such as thermocouple voltages or the signals from magneto P leads. The configurable inputs can handle signals from a variety of sender types.

Table 2-1: Pulsar Inputs

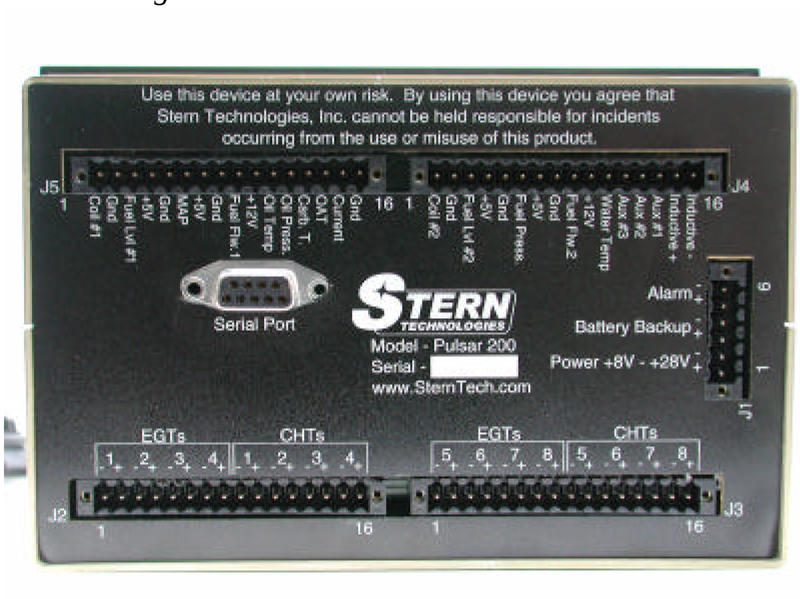
Input Connector Pins	Input Type
J2-9 (-), J2-10 (+)	thermocouple
J2-11 (-), J2-12 (+)	thermocouple
J2-13 (-), J2-14 (+)	thermocouple
J2-15 (-), J2-16 (+)	thermocouple
J3-9 (-), J3-10 (+)	thermocouple
J3-11 (-), J3-12 (+)	thermocouple
J3-13 (-), J3- (+)	thermocouple
J3-15 (-), J3-8 (+)	thermocouple
J2-1 (-), J2-2 (+)	thermocouple
J2-3 (-), J2-4 (+)	thermocouple
J2-5 (-), J2-6 (+)	thermocouple
J2-7 (-), J2-8 (+)	thermocouple
J3-1 (-), J3-2 (+)	thermocouple
J3-3 (-), J3-4 (+)	thermocouple
J3-5 (-), J3-6 (+)	thermocouple
J3-7 (-), J3-8 (+)	Thermocouple
J4-15 (+), J4-16 (-)	Inductive input
J5-1	AC voltage (coil, magneto, alternator)
J4-1	AC voltage (coil, magneto, alternator)
J5-15	Configurable
J4-11	Configurable
J5-13	Configurable
J5-14	Configurable
J5-11	Configurable
J5-12	Configurable
J5-6	Configurable
J4-6	Configurable
J5-3	Configurable
J4-3	Configurable
J5-9	Configurable
J4-9	Configurable
J4-14	Configurable
J4-13	Configurable
J4-12	Configurable
J1-1 (+), J1-2 (-)	Voltage
J1-3 (+), J1-4 (-)	Voltage
J1-6(+), J1-5(-)	Alarm Output

Configurable inputs will accurately measure resistive, voltage or frequency output senders.

? The input range for resistive senders is from 10 ohms to 12,000 ohms
? The input range for voltage senders is from 0.4V DC to 4.5V DC
? The input range for frequency senders is 5 Hz to 10,000 Hz.
? The input range for coil inputs is 0 Hz to 500 Hz.

Figure 2-4 shows the rear panel connections for the Pulsar. J1 through J5 are printed circuit board mounted connectors. Sensor inputs are terminated to cable plugs with a screw down latch. These connections are gas tight and provide long-term reliability.

Figure 2-4: Pulsar Rear Panel Connections



Data Logging

The Pulsar 200 provides a data logging capability. The user determines the parameters to log and the rate of data logging (the maximum data logging rate is 10 samples per second). The depth of data logging (number of hours that can be record) is determined by:

1. the number of parameters logged, and
2. the frequency of data logging

Logging twelve parameters (for example: 4 EGT's, 4 CHT's, tachometer, oil pressure, oil temperature and fuel flow) at a sample rate of once per second (all parameters record each second) will provide approximately 100 hours of data recording time. Each sample includes a time and date stamp.

Users retrieve logged data from the Pulsar front panel serial port. A PC is required to download data from the Pulsar. Downloaded data can be directly imported into a number of computer programs for analysis or graphing. Figure 2-5 shows data logged by the Pulsar and graphed in a Microsoft Excel spreadsheet. Chapter xx provides details on data logging, downloading and analysis.

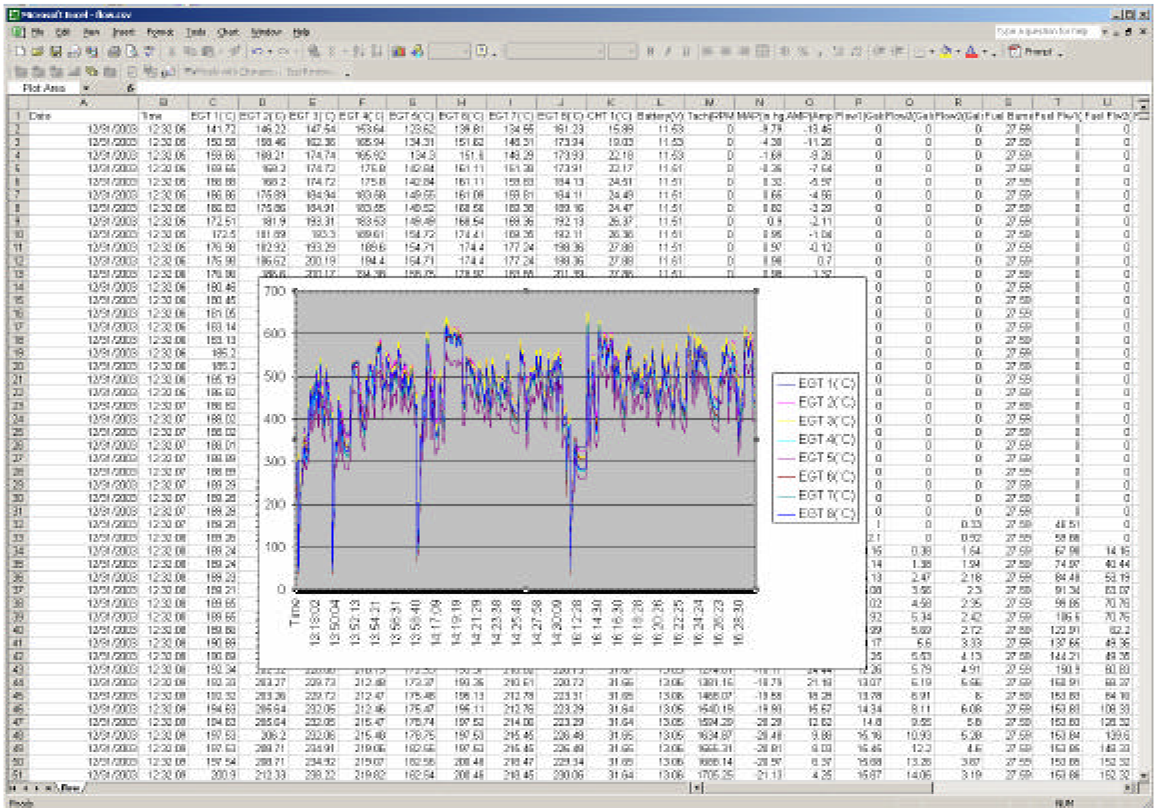


Figure 2-5: Logged Pulsar data graphed in an Excel spreadsheet

SECTION III – INSTALLATION

IMPORTANT NOTICE

The Pulsar has not been submitted to the FAA or any international aviation authorities for approval. The Pulsar is not intended for use in certified aircraft. The Pulsar is intended for use with home built, amateur built, and experimental aircraft.

Before installing the Pulsar it is your responsibility to familiarize yourself with the relevant aircraft equipment installation requirements and regulations of your country. Proceed only if you are certain that you are permitted to install the Pulsar. If you have any question where you may perform the installation of this instrument seek the approval from your required authorities.

Installation Planning

? Plan the location of the display such that it is easily visible by the pilot. Note that the Pulsar 200 provides wide horizontal (45 deg) and vertical (30 deg) viewing angles. However, it the viewing angles become too acute display contrast will be degraded. If at all possible test the planned location of the Pulsar 200 by powering it on and observing the display for acceptable visibility.

? Care should be given to provide sufficient depth allowance for harness and cable routing at the rear of the Pulsar 200. See the wire routing figure below.

? The harnesses should be positioned away from sources of high energy, such as the high frequency radio antennas.

? Other high energy signals that my need to be monitored by the Pulsar, such as P-leads or alternator should be properly shielded.

? See recommended wiring diagrams.

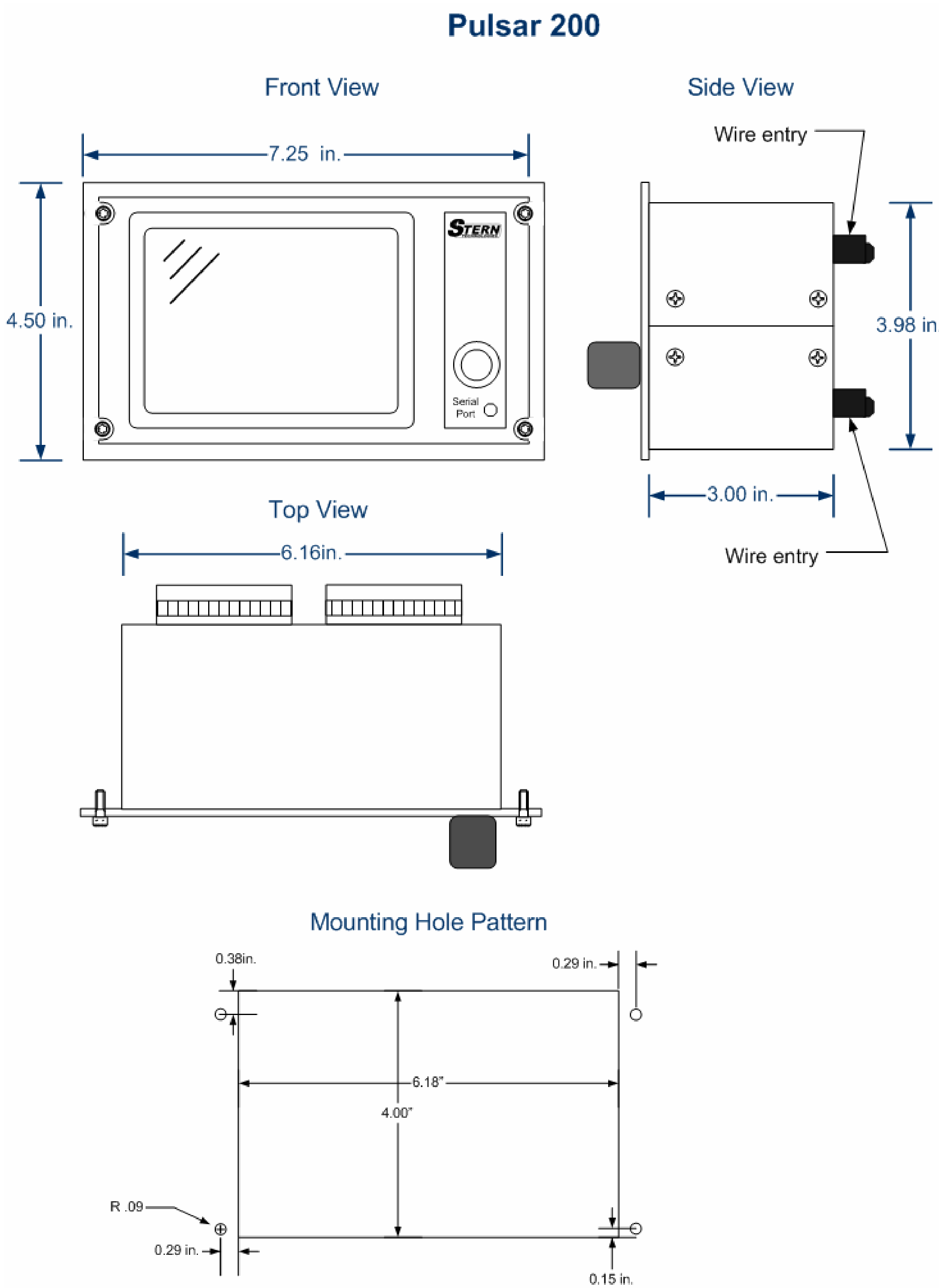
Tools and Materials Required

? Proper wire stripping and crimping tools, a small screw driver.

Pulsar 200 Panel Mounting

? The instrument panel cut out required for the Pulsar 200 is shown below. The Pulsar mounts to the instrument panel using four 8-32 screws (provided with the unit). The use of nut plates (available from Aircraft Spruce) are recommended to facilitate front panel mounting of the unit.

Figure 3-1: Pulsar 200 Instrument Panel Cut Out



- The width of the Pulsar 200 enclosure allows it to be mounted in a standard radio stack opening. If the Pulsar is mounted in a radio stack it would still need to be secured via its front bezel mounting holes or via side mounting screws.

Installing the Exhaust Gas Temperature (EGT) Probes

- The EGT probe is designed fit into a hole in each exhaust stack and be secured with an integral stainless steel clamp.
- It is important that each probe is mounted a uniform distance from the exhaust stack flange.
- A nominal distance of 3 to 4 inches from the flange is recommended.
- If the recommended distance is impractical because of obstructions, slip joints, or bends in he exhaust system, position all the probes a uniform distance from the flange as space permits.
- It is more important that all probes be positioned at a uniform distance from the flange rather than meeting the preferred dimension. Probe locations closer to the flange may result in slightly higher (inconsequential) temperature indications. Careful matching of probe position will provide best temperature readings.
- If the probe must be positioned in a slip joint the inner tube must have a clearance hole of at least 1/4" diameter to prevent it from shearing the probe. Be certain to locate all holes to allow straight-in insertion of the probe without bending or stressing the probe tip.
- Before drilling, ensure that nothing interferes with the probe, clamp, clamp screw or wire. Center punch and pilot drill each hole in the exhaust stack with a No. 28 or 9/64" drill bit.
- Use caution while drilling perpendicular to the stack to prevent an elongated hole.
- NOTE: Tighten the clamp screw with hand-torqued nut driver only.
- A right angle drill extension may be necessary in some locations. The probe will slip into a carefully drilled hole and make a tight seal.

Installing the Cylinder Head Temperature (CHT) Probes

- There are three types of CHT probes:
    - Spring Probe
    - Spark Plug Gasket Probe
    - Adapter Probes

- The Spring Probe screws into threaded thermo-wells in the cylinder head next to the lower spark plug (on top in some engines).
- The Spark Plug Gasket Probe replaces the copper 18 (14, 12) mm diameter spark plug washer.
- The Bayonet Adapter Probe screws directly into the temperature well.
- The Threaded Adapter Probe is similar except it is threaded on the inside.

Probe Characteristics

- The Spring Probe has a probe bushing with a screwdriver slot to facilitate tightening into place.
- A drop of anti-seizing lubricant on the threads before installation will ease installation, and subsequent removal.
- When installing Spring Probes be sure you have correctly identified the standard thermo-well. Some aircraft have fuel primer ports with the same thread size.

Thermocouple Wiring Harness

- The PULSAR series system is supplied with a factory-assembled wiring harness configured for the specified number of cylinders.
- Before installing, confirm that the factory fabricated harness connector matches your wiring diagram.
- Unlike most other EGT and CHT installations the probe wire length is not critical and may be trimmed to any length as required to fit each probe.
- Note: Plan your Installation to include a service loop in the PULSAR wiring harness to allow for future adjustments.

Installing Sensors

Included with your Pulsar unit is sensor application notes which contains information about installing, configuring and wiring various sensors. Please refer to these sensor notes for information about individual sensors.

Power and Ground Wiring

- Power Connections – The Pulsar 200 accommodates both 14 and 28 Volt electrical systems.
- Connect the “red” power lead to a separate trip-free, re-settable circuit breaker which receives power from the avionics or aircraft bus (5 amp circuit breaker).
- Grounding - Connect the ground wire directly, and only to the engine (No airframe connections) or connect the ground wire(s) (black) to a common avionics single-point (airframe) ground.

Routing the Wiring Harness

? It is essential to match the cylinder numbers on all the probes to display the proper information to the pilot. The probe/harness connections should be insulated with the high temperature fiber-glass sleeves provided and routed away from high temperature areas, e.g. exhaust stacks, turbochargers, etc.

? The probe wires must not be tied in with ignition, alternator or cabin heater ignition wires because of potential errors in temperature readings.

? All wires should be bundled and tied with nylon wire ties or lacing cord and attached to the airframe to prevent damage from vibration and wind buffeting.

? The probe wiring harnesses are made of special alloy wire which must not be substituted or extended with copper wire.

? The power and ground wires are copper and may be extended if necessary.

? When the installation is complete all wires should be secured using wire ties and carefully checked for interference, rubbing or chafing with flight control cables, or other moving parts.

Checking the Installation

? Verify the power and ground connections before applying power to the Pulsar.

? When power is initially applied, the Pulsar dislapy will illuminate to full brightness.

? Immediately upon power application the version number of the operating system software will appear in the display for approximately 2 seconds. After the version numbers extinguish, the Pulsar will reverts to normal operation mode.

? Check for possible interference with existing avionics by listening for audio interference on Com, Nav, DME, ADF, etc. Interference is uncommon, however, these characteristics should be tested.

? If interference is detected, remove power from the Pulsar to check if it is the emitter of the interference. If the Pulsar is the interference source, re-route the wiring harnesses away from affected equipment.

? Contact Stern Technologies customer support if further assistance is required.

Power on Menu

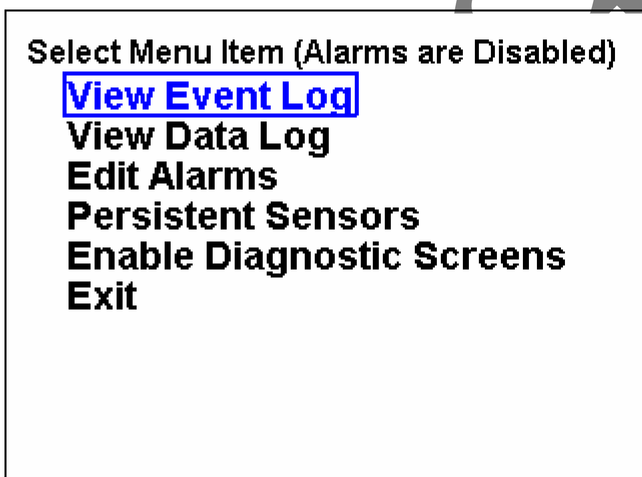
During power on, while splash screen is displayed, if the user presses the knob the unit will enter a menu where some limited configuration can be done. The menu allows the user to:

Set Clock – This allows user to set the clock's date and time.
Edit Alarms – This option allows the user to edit alarm levels
Persistent Sensors – This option allows the user to edit persistent data, like fuel burned and timers.

Set Baud Rate – This option allows the user to select the serial communication baud rate for the front serial port.

Diagnostic Screens and Menus

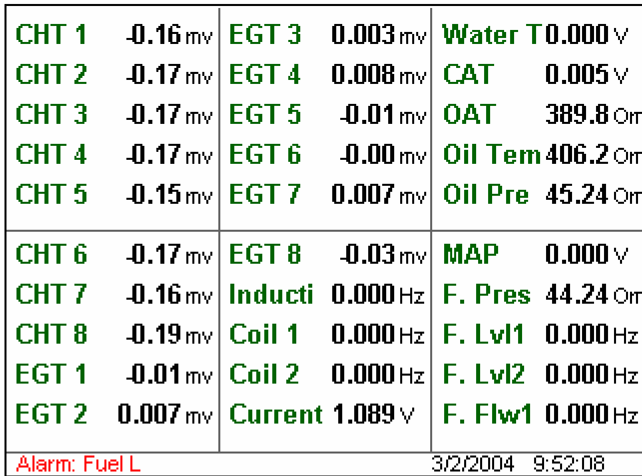
To aid in the diagnostics of sensor installations the Pulsar unit has the option of turning on diagnostic screens. The diagnostic screens show the electrical inputs on the pins. To enable the diagnostic screens push the knob twice, turn clockwise two clicks, push knob twice, turn clockwise two clicks, repeat as needed until the unit enters menu shown below.



Unit Diagnostic Menu

The menu has several diagnostic capabilities for the user.

View Event Log – This allows the user to view the log of any unit errors and events. This menu is mainly useful for manufacture troubleshooting.
View Data Log – This allows the user to view a graph of data that was recorded to the data log.
Edit Alarms – This option allows the user to edit alarm levels
Persistent Sensors – This option allows the user to edit persistent data, like fuel burned and timers.
Enable Diagnostic Screens – This allows the user to turn diagnostic screens on. The diagnostic screens will be available until they are turned off or the unit is turned off. A sample of the diagnostic screen is shown below.



CHT 1	-0.16 mv	EGT 3	0.003 mv	Water T	0.000 V
CHT 2	-0.17 mv	EGT 4	0.008 mv	CAT	0.005 V
CHT 3	-0.17 mv	EGT 5	-0.01 mv	OAT	389.8 Om
CHT 4	-0.17 mv	EGT 6	-0.00 mv	Oil Tem	406.2 Om
CHT 5	-0.15 mv	EGT 7	0.007 mv	Oil Pre	45.24 Om
CHT 6	-0.17 mv	EGT 8	-0.03 mv	MAP	0.000 V
CHT 7	-0.16 mv	Inducti	0.000 Hz	F. Pres	44.24 Om
CHT 8	-0.19 mv	Coil 1	0.000 Hz	F. Lvl1	0.000 Hz
EGT 1	-0.01 mv	Coil 2	0.000 Hz	F. Lvl2	0.000 Hz
EGT 2	0.007 mv	Current	1.089 V	F. Flw1	0.000 Hz

Alarm: Fuel L 3/2/2004 9:52:08

Sample of Diagnostic screen

SECTION IV - DESCRIPTION

Overview

Description of Pulsar 200

The Pulsar is an electronic data collection and display device designed specifically for use in experimental aircraft. The Pulsar 200 has a number of inputs specifically configured for tachometer and thermocouple inputs. The Pulsar 200 also provides 15 configurable general-purpose inputs suitable for monitoring a wide variety of engine related sensors. The general-purpose Pulsar inputs can also be used to monitoring non-engine related parameters.

The Pulsar is housed in a single module measuring 6.25” W x 4.0” H x 3.0” D. The color liquid crystal display (LCD) display uses active TFT technology. The LCD measures 4.0” W x 3.0” H and 5.0” diagonally. The Pulsar will fit into a standard radio stack. The Pulsar faceplate bezel mounts through the front of the panel.

The Pulsar will work with power inputs ranging from 8 VDC to 28 VDC. Its current draw is less than one amp at 12 VDC with the display at maximum intensity. The Pulsar provides an input for backup power system. It will detect a failure of the primary power input and automatically switch to the backup power. The backup power source is external to the Pulsar.

The user interfaces consists of the 5” diagonal LCD and a single control knob. As show below in figure 1-1, large digital readouts and color-coded gauges make the Pulsar display easy to read and comprehend. Control knob is the only input required during normal operation. This pilot-friendly design allows scanning of monitored parameters with minimal pilot distraction.

Figure 1-1

Full-scale values and alarm levels for each monitored parameter may be set during configuration. The gauge formats and grouping of information on each display screen are also configurable.

Users configure the Pulsar by editing a formatted text file and downloading the edited file from a personal computer (PC) to the Pulsar. The Pulsar's front panel serial port connects to the PC via a serial cable provided by Stern Technologies. Chapter xx describes the configuration process in detail. Users may update the Pulsar configuration as often as required.

Inputs

The Pulsar directly monitors 36 inputs. Table 1-1 lists the Pulsar 200 inputs. In many applications not all of the inputs will be used.

Some Pulsar inputs work with specific types of signals such as thermocouple voltages or the signals from magneto P leads. The configurable general-purpose inputs can handle signals from a variety of senders.

Table 1-1

Number	System Pin Name	Input Connector Pins	Input Type
0	PIN_CHT_1	J2-9 (-), J2-10 (+)	thermocouple
1	PIN_CHT_2	J2-11 (-), J2-12 (+)	thermocouple
2	PIN_CHT_3	J2-13 (-), J2-14 (+)	thermocouple
3	PIN_CHT_4	J2-15 (-), J2-16 (+)	thermocouple
4	PIN_CHT_5	J3-9 (-), J3-10 (+)	thermocouple
5	PIN_CHT_6	J3-11 (-), J3-12 (+)	thermocouple
6	PIN_CHT_7	J3-13 (-), J3- (+)	thermocouple
7	PIN_CHT_8	J3-15 (-), J3-8 (+)	thermocouple
8	PIN_EGT_1	J2-1 (-), J2-2 (+)	thermocouple
9	PIN_EGT_2	J2-3 (-), J2-4 (+)	thermocouple
10	PIN_EGT_3	J2-5 (-), J2-6 (+)	thermocouple
11	PIN_EGT_4	J2-7 (-), J2-8 (+)	thermocouple
12	PIN_EGT_5	J3-1 (-), J3-2 (+)	thermocouple
13	PIN_EGT_6	J3-3 (-), J3-4 (+)	thermocouple
14	PIN_EGT_7	J3-5 (-), J3-6 (+)	thermocouple
15	PIN_EGT_8	J3-7 (-), J3-8 (+)	thermocouple
16	PIN_INDUCT	J4-15 (+), J4-16 (-)	Inductive input
17	PIN_COIL1	J5-1	AC voltage (coil, magneto, alternator)
18	PIN_COIL2	J4-1	AC voltage (coil, magneto, alternator)
19	PIN_CURRENT	J5-15	Configurable
20	PIN_WATER_TEMP	J4-11	Configurable
21	PIN_CAT	J5-13	Configurable
22	PIN_OAT	J5-14	Configurable
23	PIN_OIL_TEMP	J5-11	Configurable
24	PIN_OIL_PRES	J5-12	Configurable
25	PIN_MAP	J5-6	Configurable
26	PIN_FUEL_PRES	J4-6	Configurable

27	PIN_FUEL_LVL1	J5-3	Configurable
28	PIN_FUEL_LVL2	J4-3	Configurable
29	PIN_FUEL_FLW1	J5-9	Configurable
30	PIN_FUEL_FLW2	J4-9	Configurable
31	PIN_AUX1	J4-14	Configurable
32	PIN_AUX2	J4-13	Configurable
33	PIN_AUX3	J4-12	Configurable
34	PIN_BATTERY	J1-1 (+), J1-2 (-)	Voltage
35	PIN_BACKUP	J1-3 (+), J1-4 (-)	Voltage
36	PIN_INT_TEMP	Internal	Voltage
37	PIN_ALARM	J1-6(+), J1-5(-)	Output

Configurable inputs will accurately measure resistive, voltage or frequency output senders.

? The input range for resistive senders is from 10 ohms to 12,000 ohms
? The input range for voltage senders is from 0.4V DC to 4.5V DC
? The input range for frequency senders is 5 Hz to 10,000 Hz.

Figure 1.2 shows the rear panel connections for the Pulsar. J1 through J5 are printed circuit board mounted connectors. Input signals are terminated to cable plugs with a screw down latch (figure 1.3). These connections are gas tight and provide long-term reliability.

Figure 1-2: Pulsar Rear Panel Connections

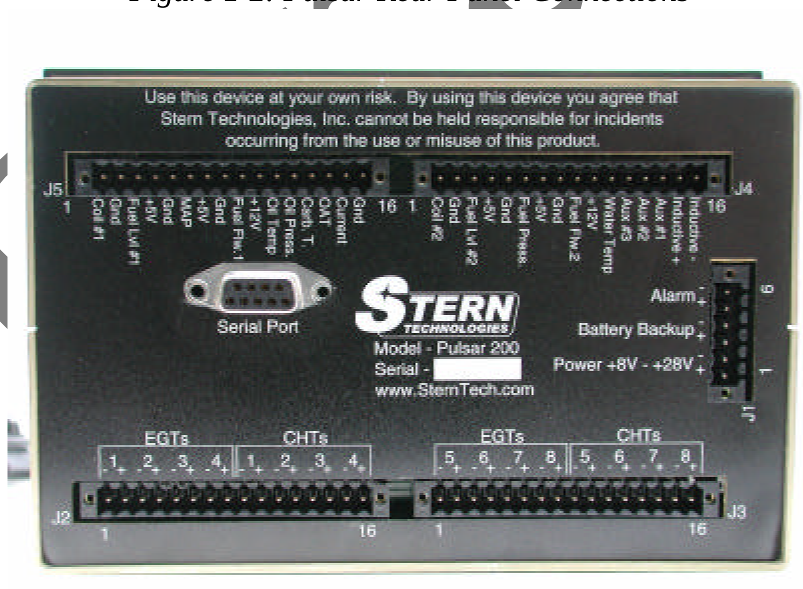


Figure 1.2: Cable harness plug

Operation Mode

Display Pages

During normal operation, the Pulsar display divides into six blocks.

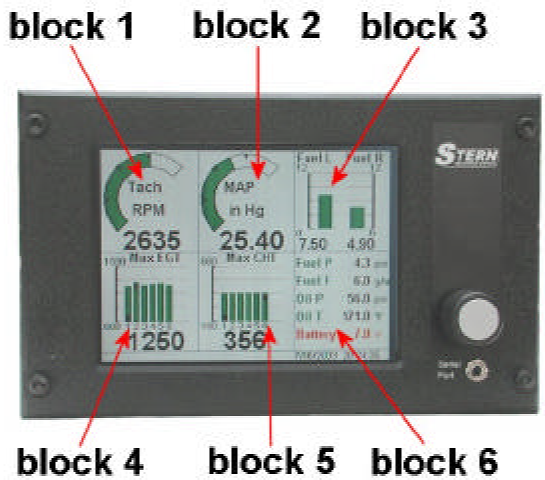


Figure 1.3: Each normal operation display page has six blocks

This display of six blocks is called a "***page***." The Pulsar is not limited to a single display page. Each page can present different information, using different types of gauges. The number, layout and order of display pages are all under user control.

During normal operation the rotary switch is used to scroll between pages. Figure 1-4 shows several typical display pages. Turning the rotary switch counter-clockwise will scroll up to the first (top) display page. Turning the rotary switch clockwise will scroll down to the last (bottom) display page. The scrolling will stop once the first or last display pages are reached.

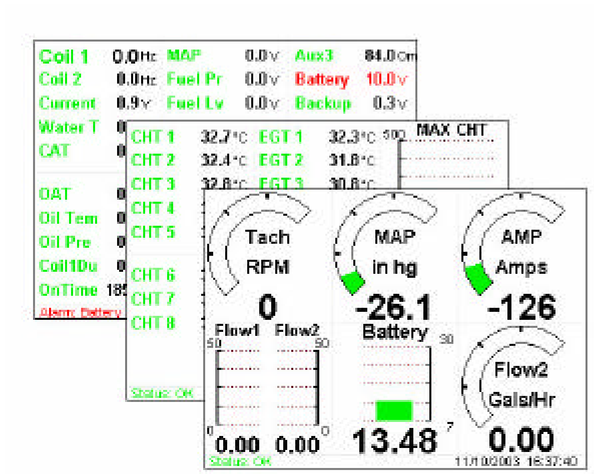


Figure 1-4: Examples of display pages

Specifications

General Specifications

Size and panel mounting:

Front mounting bezel: 7.25” wide x 4.50” high x 0.125” thick
The Pulsar is designed for mounting from the front of the panel using the bezel mounting holes.

Panel cut out: 6.17” wide x 4.00” high
The Pulsar will fit in a standard radio rack width

Depth behind panel – Pulsar only: 3.0”
Depth behind panel – Pulsar with connectors: 3.6”
Depth behind panel – Pulsar with connectors and cable harness: ~4.6”

Figure 1-4: Pulsar Mounting Dimensions

Weight:

1.5 pounds

Primary Power and Backup Power Specifications

Nominal: 12 VDC
Range: 8VDC to 28VDC
Power voltage reverse polarity protected

Current consumption typical @ 12VDC with backlight at maximum: < 1.0 amp
Current consumption maximum: < 1.5 amps
Maximum power dissipation: < 12 amps

Circuit breaker recommendation: 5 amps

Alarm output:

1 Khz 1V p-p waveform with 20 mA drive capability to produce alarm tone for intercom system.

Serial data port 1 (front panel):
Connector type: 3.5mm audio stereo jack
Data protocol: RS232 (EIA 232)
Data Rate: adjustable from 9600 bits per second (bps) to 115,200 bps

Serial data port 2 (back panel):
Connector type: DB9 female
Data protocol: RS232 (EIA 232)
Data Rate: adjustable from 9600 bits per second (bps) to 115,200 bps

Data logging:
Number of parameters monitored: configurable from 1 to xxx
Rate of sampling: configurable from x seconds to xxx seconds
Storage capacity: 16 Mbits (2 Mbytes)
Download format: selectable binary or ASCII delimited

Common mode rejection:
DC common mode rejection: +/- 4V > 80 dB
AC common mode rejection: +/- 4V > 80 dB

Output power (+5VDC and +12VDC) protection:
All power output from the Pulsar will be internally fused (automatically resetable fuse).

Output power short circuit duration:
Any power pin to ground: continuous
Any power pin to +12V: continuous
Any power pin to -12V: continuous

Temperature range:
Operational temperature range: -20 C to 70 C
Survival temperature range: -30 C to 80 C

Electrostatic discharge (ESD) protection: 15,000 V, 100 us on all inputs

Display:
Screen size: 4.0" W x 3.0: H x 5.0" diagonal
Resolution: 240 x 234
Contrast ratio: 150 typical
Brightness: 450 cd/m^2 typical.

Thermocouple Inputs:
16 thermocouple inputs, standard calibration: 8 J-type thermocouples inputs and 8 K-type thermocouple inputs.
Thermocouple input calibration can be changed in the configuration.

Technical Specifications

EGT (K) Thermocouple inputs

Range: 0 to 1700 (ºF)
Resolution: 12 bit ADC

CHT (J) Thermocouple inputs
Range: 0 to 700 (ºF)
Resolution: 12 bit ADC

Resistive inputs

- Range: 10 ohms to 12K ohms
- Resolution: 10 bit ADC
-

Voltage inputs

- Range: 0.4 to 4.5 VDC
- Resolution: 10 bit ADC

Frequency inputs

- Range: 5 to 10,000 Hz
- Resolution: 1 Hz

Tachometer inputs

- Range: 10 to 10,000 RPM
- Resolution: 1 RPM

Display Update Rate: > 10 times per second

Sample Update Rate: >10 times per second

SECTION IV – CONFIGURING THE PULSAR 200

CONFIGURATION OVERVIEW

The Pulsar 200 is a state of the art data monitor, with extensive capabilities for user configuration. This chapter explains the basic operation of the Pulsar configuration system.

Methods of Pulsar Configuration

The Pulsar provides two methods of configuration:

1) Using Windows based software
2) Manual Editing a text file on a PC

Both methods require the user to use a PC for configuring the unit.

If the user has purchased a pre-configured Pulsar and sensor package from Stern Technologies there may be no need to perform any configurations. Alternatively, the user may only need to perform minor configurations, such as adjusting alarm levels, which can be done on the unit.

SENSOR OVERVIEW

What is a Sensor?

A sensor is a device that measures some physical aspect of a system in a quantitative way. Typical examples of physical quantities measured are level, temperature and pressure.

Many types of sensors have been developed for different measurement applications. One way of classifying sensors is by the different types of electrical outputs they produce. The following three categories of sensor outputs are quite common:

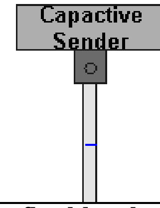
? Resistive

? DC voltage

? AC voltage

Figure x: Examples of common sensors

Resistive output	DC voltage output	Frequency output

		
As the level in the tank changes, the float moves up or down and the resistance of the sensor output changes.	Temperature differences between the thermocouple sensor junction and the reference point generate low level DC voltages	As the fluid level in the tube of a capacitive sensor changes the frequency (AC voltage) of the output changes.

What type of Sensors Can the Pulsar Use?

The Pulsar is compatible with a wide range of sensors:

Resistive sensors **–** These sensors usually have one wire (case ground) or two wires (isolated ground). The resistance of the sensors changes based on physical input. Examples include thermisitors, float level sensors and generic pressure sensors.

DC voltage sensors **–** Some DC voltage output sensors, such as a manifold air pressure (MAP) sensor have three wires: power, ground and signal. Other voltage output sensors, such as thermocouples provide a differential voltage across two wires. The voltage measured at the signal output changes based on the physical input.

Frequency sensors **–** Frequency sensors usually have three wires: power, ground and signal. They output an alternating voltage. The frequency of the output signal changes based on the physical input. Examples include some strain gauges, fuel flow sensors and electronic ignitions.

The Pulsar provides fifteen configurable inputs that accept resistive, DC voltage or AC voltage sensors. Sixteen inputs are exclusively for thermocouple measurements , two inputs are dedicated to coil measurements and one input is dedicated to inductive measurements. The table below shows the capabilities for all Pulsar inputs.

Table x : Pulsar Inputs

Input Connector Pins	Input Label	Input Type
J2-1 (-), J2-2 (+)	EGT 1	thermocouple
J2-3 (-), J2-4 (+)	EGT 2	thermocouple
J2-5 (-), J2-6 (+)	EGT 3	thermocouple
J2-7 (-), J2-8 (+)	EGT 4	thermocouple
J2-9 (-), J2-10 (+)	CHT 1	thermocouple
J2-11 (-), J2-12 (+)	CHT 2	thermocouple
J2-13 (-), J2-14 (+)	CHT 3	thermocouple
J2-15 (-), J2-16 (+)	CHT 4	thermocouple
J3-1 (-), J3-2 (+)	EGT 5	thermocouple
J3-3 (-), J3-4 (+)	EGT 6	thermocouple

J3-5 (-), J3-6 (+)	EGT 7	thermocouple
J3-7 (-), J3-8 (+)	EGT 8	thermocouple
J3-9 (-), J3-10 (+)	CHT 5	thermocouple
J3-11 (-), J3-12 (+)	CHT 6	thermocouple
J3-13 (-), J3- (+)	CHT 7	thermocouple
J3-15 (-), J3-8 (+)	CHT 8	thermocouple
J4-15 (+), J4-16 (-)	Inductive	AC voltage (inductive)
J5-1	Coil 1	AC voltage (coil, magneto, alternator)
J4-1	Coil 2	AC voltage (coil, magneto, alternator)
J4-3	Fuel level #2	Configurable
J4-6	Fuel pressure	Configurable
J4-9	Fuel flow #2	Configurable
J4-11	Water temp	Configurable
J4-12	Aux #3	Configurable
J4-13	Aux #2	Configurable
J4-14	Aux #1	Configurable
J5-3	Fuel level #1	Configurable
J5-6	Manifold air pressure	Configurable
J5-9	Fuel flow #1	Configurable
J5-11	Oil temperature	Configurable
J5-12	Oil pressure	Configurable
J5-13	Carburetor air temp	Configurable
J5-14	Outside air temp	Configurable
J5-15	Current	Configurable

Configurable inputs will accurately measure resistive, DC voltage or AC voltage.

- ? The input range for resistance is from 10 ohms to 12,000 ohms
- ? The input range for DC voltage is from 0.4V DC to 4.5V DC
- ? The input range for AC voltage is 5 Hz to 10,000 Hz.

The *Input Labels* are for convenience with typical setups. Obviously, the configurable inputs can be used for measurements other than those indicated by their labels.

CONFIGURATION EDITOR

The Pulsar configuration editor was created to help the user in configuring the Pulsar 200 for their specific application. The utility is an application which runs under the windows operating system. It is used to edit a configuration file which then through using the Pulsar connection utility can be download to the unit.

When starting the configuration editor it will open a blank configuration, as shown below.

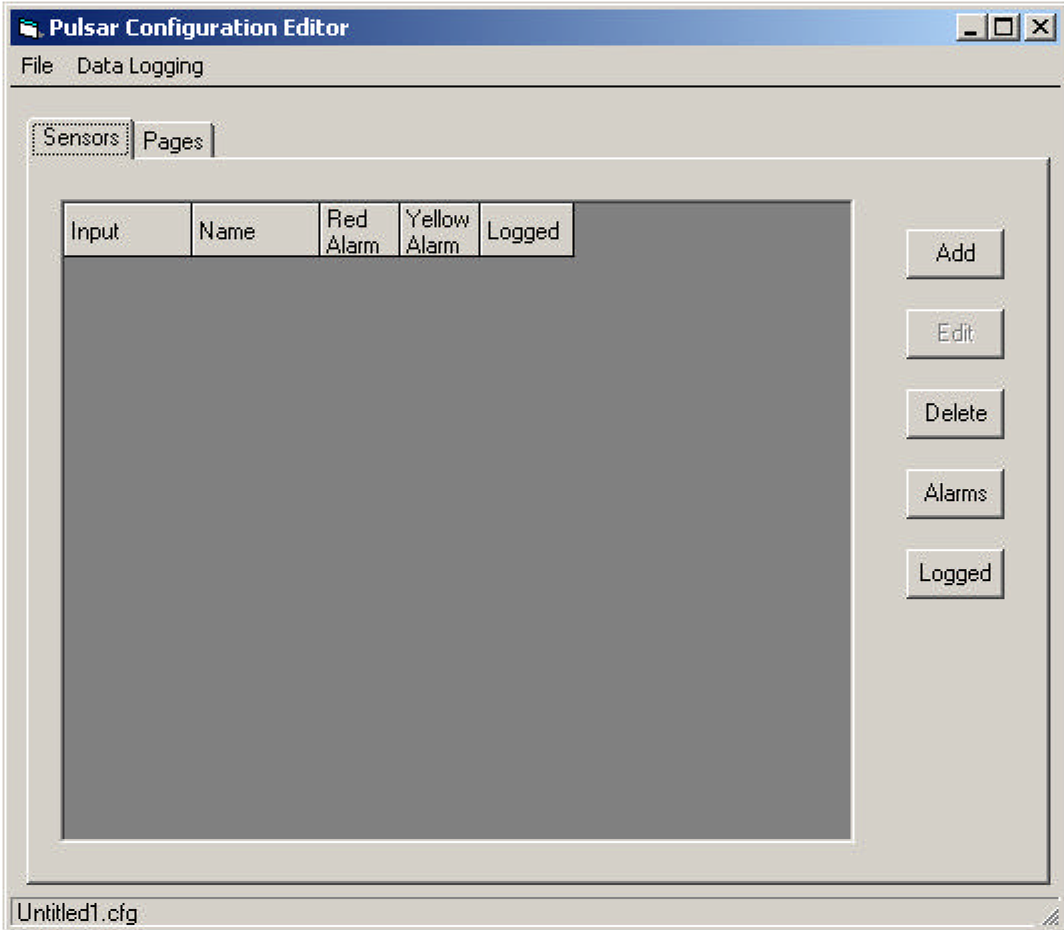


Figure 1.

Notice that in Figure 1, at the bottom left of the screen is the current file name. Also notice that the main screen has two tabs near the top, Sensors and Pages. The window defaults to the sensor tab.

Before going into too much detail about the application lets discuss what a Sensor is. To do this look at figure 2 below

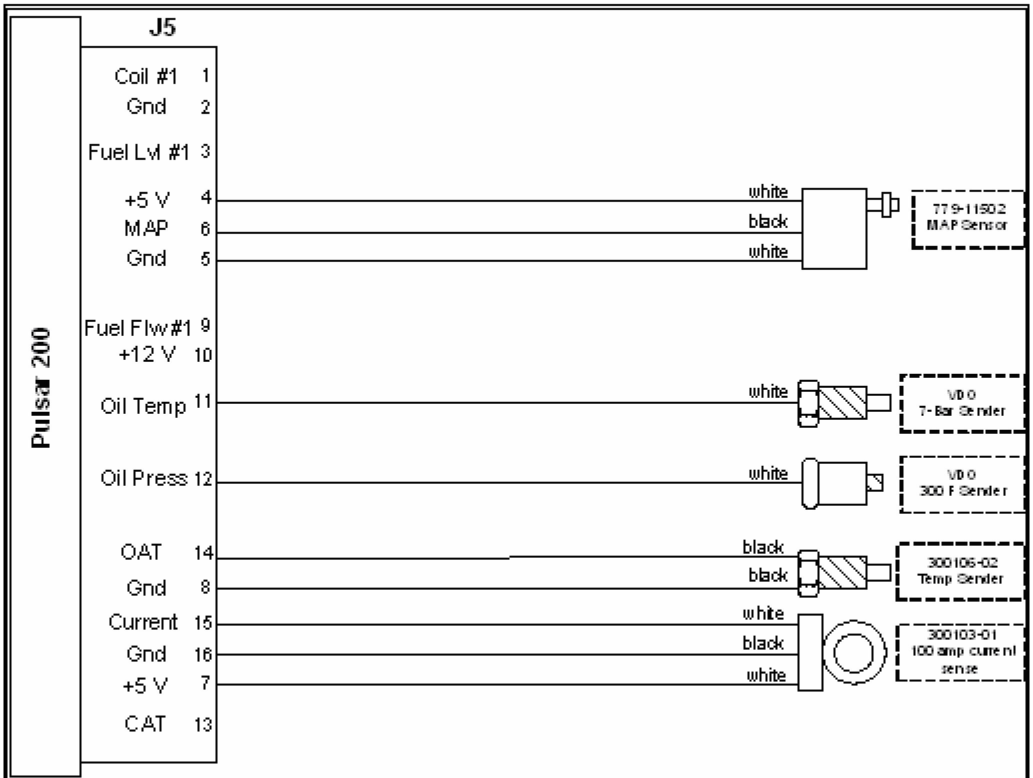


Figure 2.

Notice that Figure 2 shows a sample wiring diagram for the Pulsar 200. Notice that on the right side is some transducers which are connected to the Pulsar unit. A Transducer is a device which converts a physical parameter to an electrical signal. For example the MAP sensor above converts the manifold vacuum to voltage that is proportion to the vacuum. Some times people call transducers sensors as they sense a physical parameter. Also some people even call transducers probes as that they probe something to get a measurement, aka temperature probe.

In the Pulsar 200 we take more generic view of Sensors and say that Sensors can be Transducers however not all sensors are transducers. To understand this point a little further consider an example where you have 4 cylinder head temperature (CHTs) transducers connected to the Pulsar 200. Then you can display each temperature in a gauge, however sometimes you would like to have the maximum value of all the CHTs. Therefore the maximum of all the CHTs is considered a calculated Sensor to the Pulsar. Thus in the pulsar a sensor can be a transducer or it can be the result of a mathematical computation based on other sensors.

So if we go back to the application what we would want to do is define what transducers are connected to the unit. After we have defined our transducers we can then define some calculated sensors if we desire.

In figure 1 you can see on the sensor tab there are 5 buttons on the right side. These buttons are used to manipulated the sensors.

Add – Adds a sensor to the configuration
Delete – Removes the highlighted sensor from the configuration
Edit – Edits the selected sensor
Alarms – Add alarm levels to the sensor
Logging – Toggles whither the sensor is logged, or recorded in the memory for latter downloads.

Since there are no sensors defined our first step would be to add a new transducer to the configuration. To do this we will click the Add button, after which we get a screen as shown in figure 3.

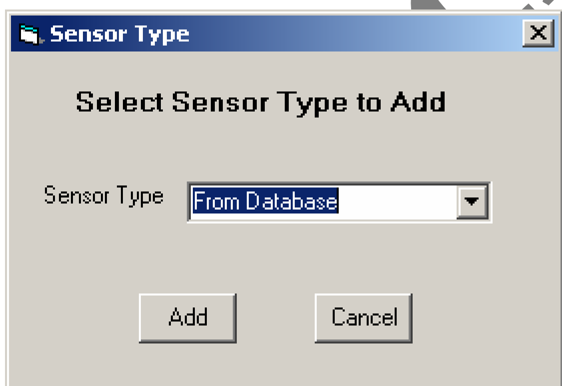


Figure 3.

This dialog allows us to select what type of sensor we want to add to our unit, the types of sensors are shown below:

From Database – The configuration editor has a database of common sensors. These sensors are predefined such that it is easy to add to your unit.
Tach – Since the tachometer inputs for engines vary widely the utility allows us to configure the tach based on our engine.
EGT – Not everyone uses the same number of EGTs. Therefore selecting the EGT type allows you to add a EGT probe to your configuration.
CHT – Just like the EGT, the CHT type will allow you to add a CHT probe to the configuration.
Timer – Some times you want to have timers for how long the engine has been running, commonly referred to as a Hobb's timer. Other times you may want a flight timer. Selecting the Timer option allows you to configure these and other timers.
Calculated - Based on the current sensors you have defined for your configuration the application will recommend some calculated sensors which you can add to the configuration.
User Defined – Well sometimes the transducer you are using is not listed or in the database, in these cases you can create your own sensor. We do not recommend doing this unless you have to, as that it can be complicated.

We recommend that you start configuring your Pulsar unit by first configuring your CHTs, EGTs, then Tachometer input(s), and then add the other Transducers from the database. After you have all your transducers configured then we recommend adding the timers and calculated sensors.

When you select to add an EGT or CHT you will get a screen like shown in figure 4.

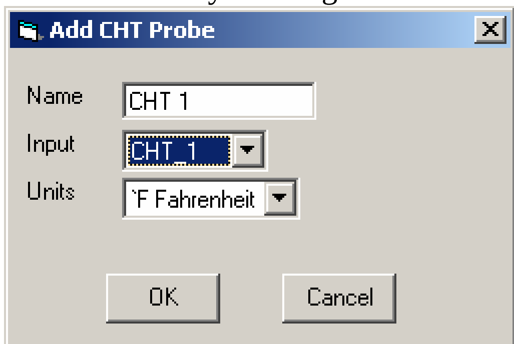


Figure 4.

In figure 4 you will notice the first thing it asks you far is the Name of the sensor. This is the name the gauge will show, if the sensor is shown in a gauge. If we put the sensor from figure 4 in a gauge it would be labeled “CHT 1” and have units of Fahrenheit. Next you will notice the input, this is the pin which the your probe is connected to, in this example our “CHT 1” probe is connected to the pin on the back of the unit labeled CHT 1.

Using the CHT and EGT types we can add all our CHTs and EGTs probes as shown in figure 5, also note that I save the configuration as “D:\temp.cfg” in bottom left corner.

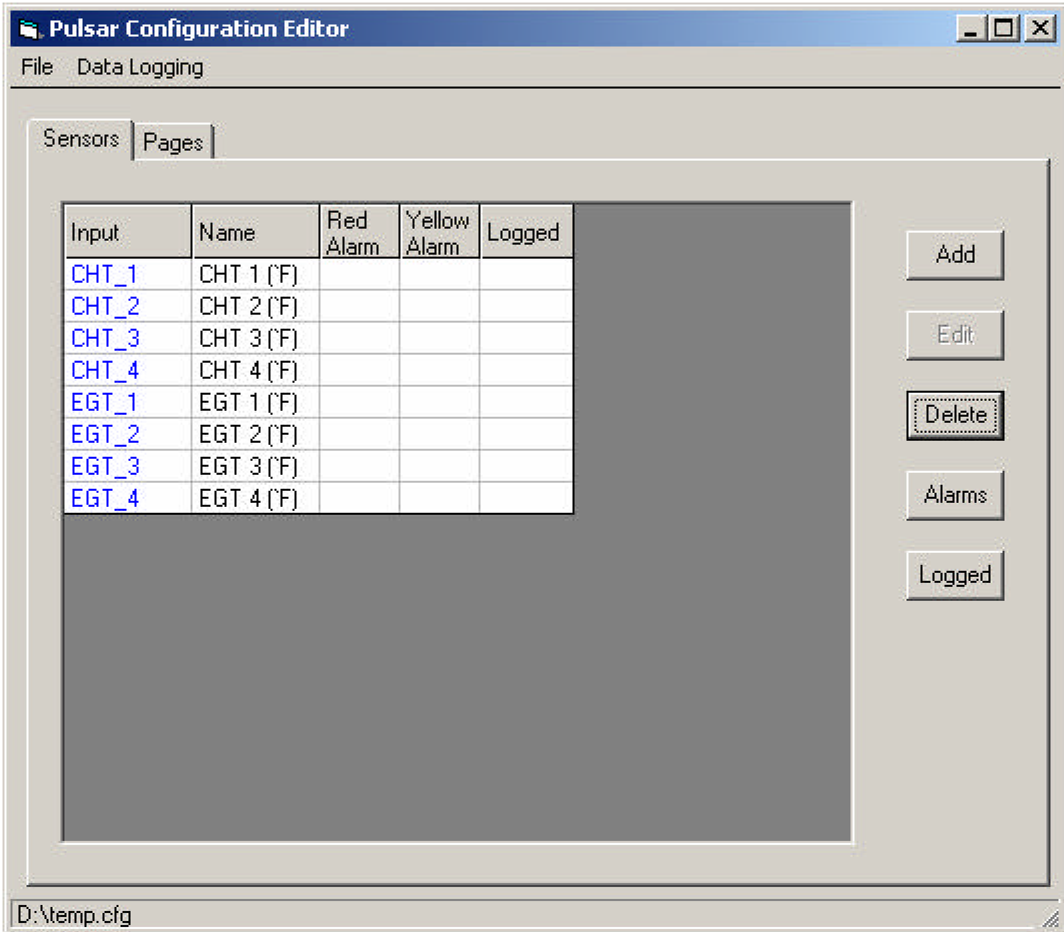


Figure 5.

As you may have noticed while adding the CHT and EGT probes, you can connect a EGT probe to a CHT pin. That is the labels on back of the Pulsar unit are just for reference, that is you have 16 thermocouple inputs on the Pulsar 200 which you can use for 8 EGTs and 8 CHTs or use all 16 for CHTs.

Now that we have defined our EGT and CHT probes we can add a tachometer input. Most people will use the P-leads off of their magnetos as the input for the tachometer. However the Pulsar unit has the capability to use an inductive pick up or a pulsed input from electronic ignition systems.

If you plan to use an electronic ignition system please consult your ignition module documentation and the Pulsar's pin specifications in Appendix A to be sure the signals are compatible.

If you are using a dual ignition system the Pulsar unit has the ability to accept a tachometer input from multiple sources. This was done such that when you test your magnetos during pre-flight checks you can configure the unit such that it will not lose the tachometer signal when a magneto is disabled. Also it allows you to be notified in flight if a magneto signal is lost.

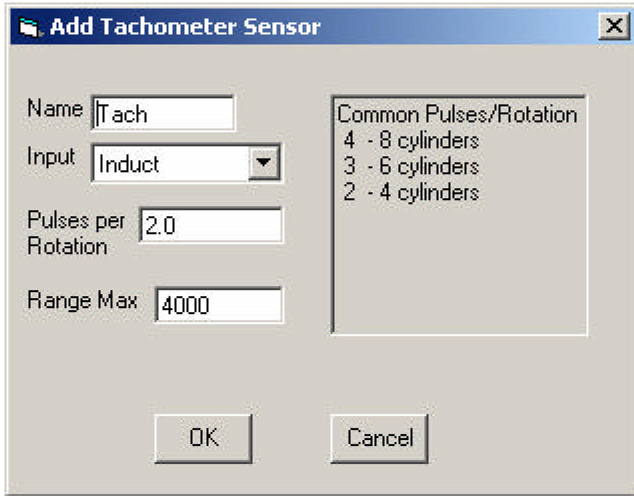


Figure 6.

Figure 6 shows the configuration screen for a tachometer input. As before the first thing you configure is the name, we recommend that if you use dual ignition systems you name the sensors “Tach L” and “Tach R” such that you do not confuse the two signals.

Next is selection is the input, here again like the thermocouples you have the option to use multiple inputs. However again you need to select the input that corresponds with signal you are using. For example P-leads from a magneto should only be connected to the “Coil 1” and “Coil 2” inputs.

After you have selected the input you can select the calibration factor. This calibration is the pulses per revolution. For example if you are using P-leads a four cylinder engine will pulse the P-lead twice per revolution. While if you are using an inductive pick up off of the flywheel the pulses will be equal to the number of teeth on the flywheel. Note that once your unit is configured you will want to verify the tachometer speed using a propeller tachometer or via some other source.

Finally you are able to select the maximum range for the tachometer. This will be the top of scale of the gauge when a tachometer is shown. This is not the red line, rather it should be greater than the red line amount.

Now to configure the rest of our transducers we are going to first to see if the sensor is in our database.

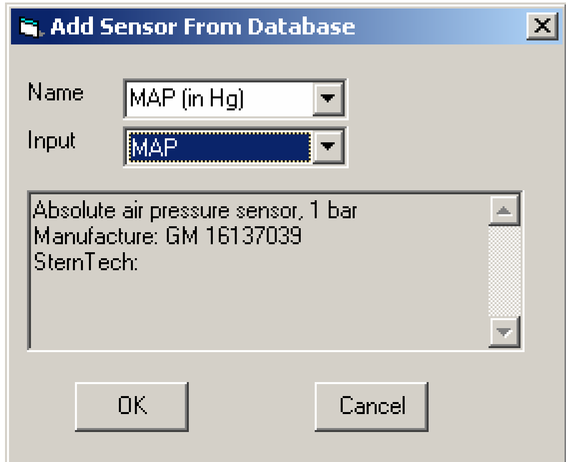


Figure 7.

Figure 7 shows the screen for adding a database sensor. Here again the first thing is the name of the sensor, however instead of allowing you to enter a name you select the sensor name from the database. As that some sensors will be defined multiple times with different units the drop down list for the name also shows the units. Also as that there may be several oil pressure sensors in the database, the box at the bottom of the screen shows some additional information to help you be sure to select the correct sensor.

After you have found the sensor you want, the next step is to select the input pin which the sensor will be connected to. For our example we have selected a MAP sensor and of course we will connect it to the MAP pin on the unit.

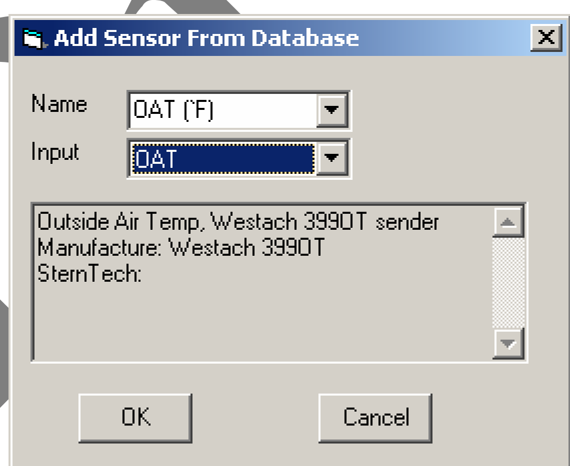


Figure 8.

There may be cases where you find the sensor you want in the database but the units are not what you want. For example in figure 8 we show an outside air temperature (OAT) sensor, but it is in Fahrenheit and for this example lets assume we wanted it in Celsius. To put in Celsius we will go ahead and add it to our configuration in Fahrenheit. After we have added it to our configuration we will then add a sensor which does the conversion using the user defined sensor type. However before we do this we need to know how to convert Fahrenheit to Celsius. As you may recall from the conversion is:

Celisus=(Fahrenheit-32)/1.8

Or

Celisus=0.55555*(Fahrenheit) -17.77777

So after we have added the OAT in Fahrenheit we can then add a user defined sensor as shown in figure 9.

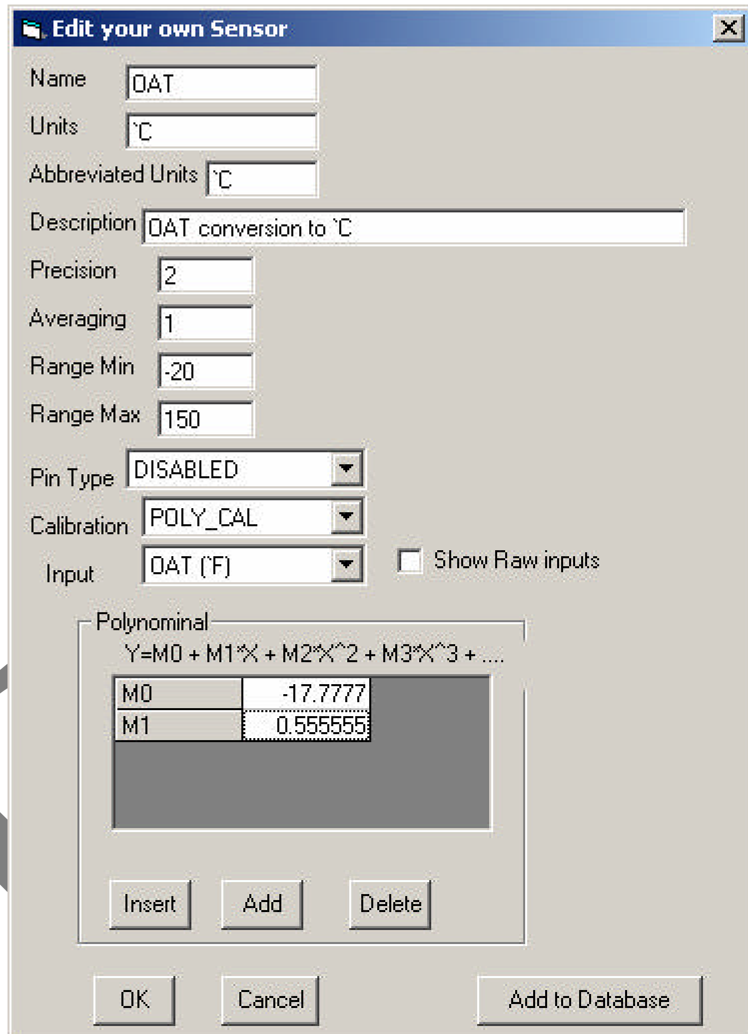


Figure 9.

In figure 9 we took and inserted the equation from above to convert degrees C to degrees F.

Name – this is the name of the sensor
Units – This is the units we want to show on gauge. Note that the " ` " is the degree symbol, this is the usually the key below the escape key on your keyboard.

Abbreviated Units – As that some gauges, like the text list are space limited we sometimes will show the abbreviated units.
Description – This is a description of the sensor
Precision – When this sensor is show on a gauge the precision sets the number of digits shown after the decimal point.
Averaging – As that the Pulsar unit measures the inputs at over 10 times a second, the numbers on the gauge might change so fast the user can not read them. Thus setting the averaging high slows down these changes.
Range Min and Max – This is the bottom and top limit of the gauge. Some transducers like our OAT sensor is only good for specific range, thus we will limit it this range to prevent confusing the pilot.
Pin Type – The pins on the back of the Pulsar unit are kind of like a voltmeter, that is they can measure resistance, voltage, frequency, etc. The pin type configures the pin as to what it measures, since we are using another sensor for the input we set it to disabled.
Calibration – The Pulsar allows us to select the calibration type to a table and or a polynomial. The equation above is a type of polynomial, if you need more information about polynomials we suggest consulting an algebra book.
Input – Since we a converting the OAT to degrees C we want the reading in degrees F as the input. That is the input is the X variable in the polynomial equation.

Once we have this configured we can hit OK to add it to our configuration file.

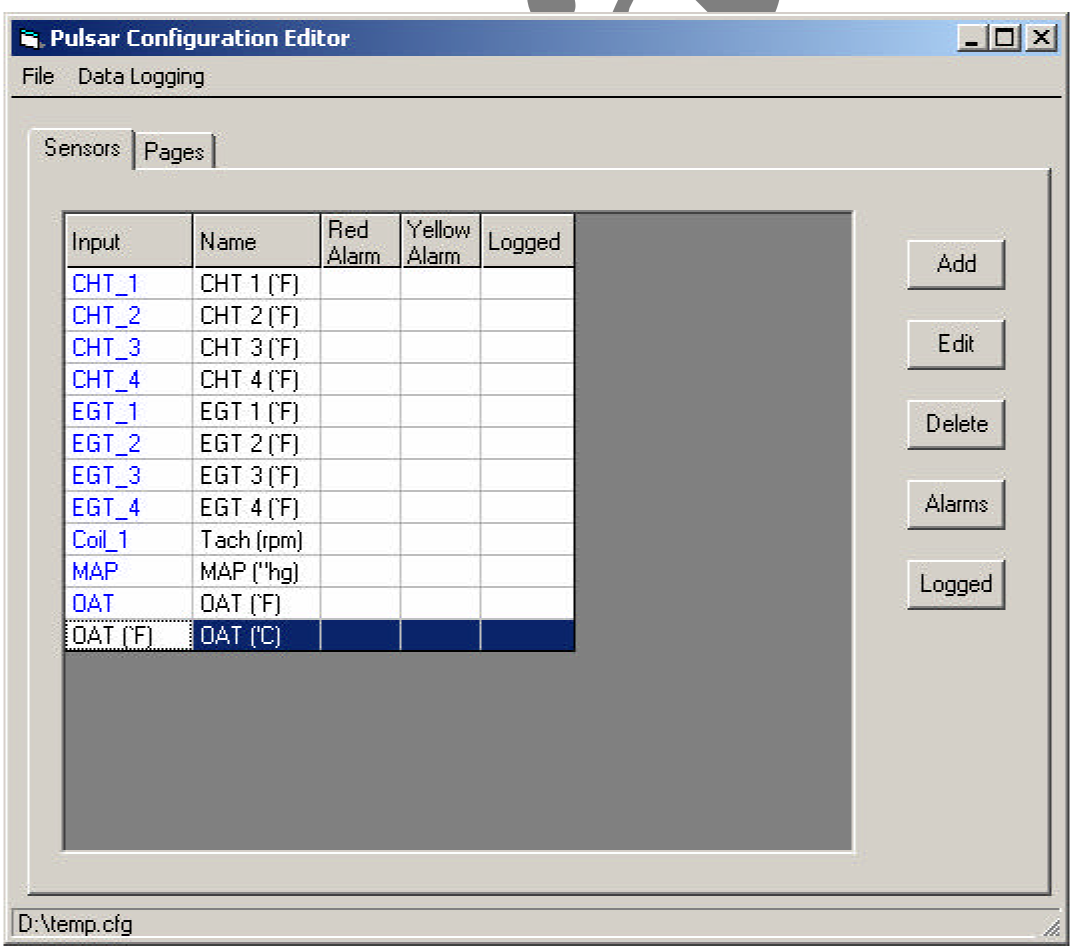


Figure 10.

As you see in figure 10, the newly add sensor uses the OAT (`F) as the input. As you will also notice the inputs that are pins or “raw inputs” are colored blue, while the sensors we have added are black.

Lets now add a timer to the unit, for this example we will assume that we want to have a Hobb’s type of timer to measure the engine time. Hobb’s timer are traditionally timers which operate off a oil pressure switch such that the timer increments only when the engine is running. Since in our example we do not have a oil pressure sensor installed, we will configure our timer to increment when the tachometer is over 100 RPM.

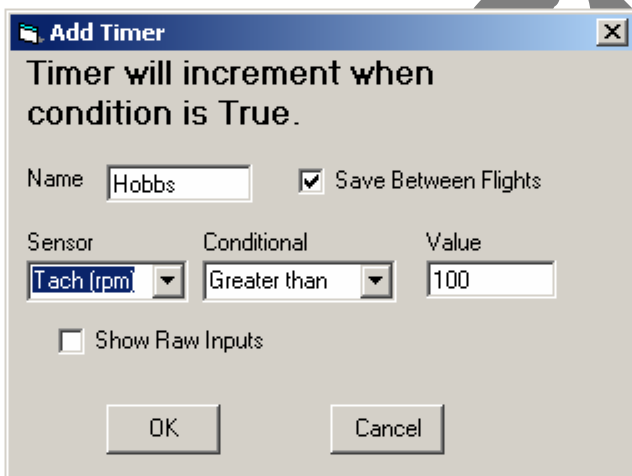


Figure 10a.

In figure 10a we have the configuration of the timer.

Name – Name of timer, will be shown on gauges
Save Between Flights – When this is checked the timer will be saved between flights. Since our timer is often used for maintenance timing, we want the value save and updated for all flights. Thus it saved and can be reset or preset by entering menu on unit when powered on.
Sensor – is the conditional sensor for the timer.
Condition – The timer can be updated when with “greater than” or “less than” condition
Value – This is the value used for comparison
Show Raw Inputs – This allows you to select a raw input instead of one of your defined sensors.

Now assuming that we have added all the transducers we wanted to add we can add the calculated sensors.

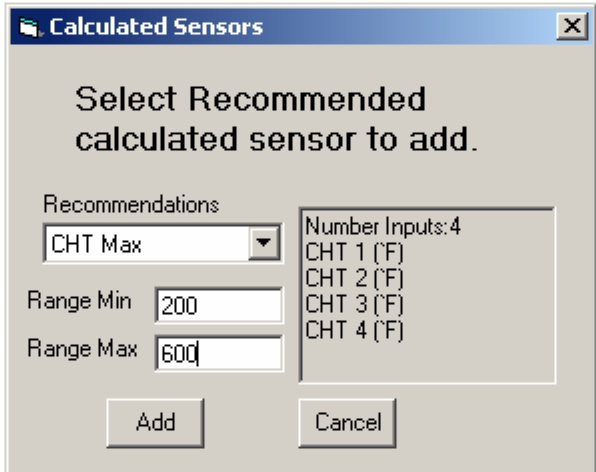


Figure 11.

The application looks at the sensors we have defined and recommends calculated sensors. In our case we defined multiple EGTs and CHTs so it recommends we add Max CHTs and Max EGTs as well as the span. These calculated sensors are usually based on one or more sensors we defined, as such on the right side of the screen we show the sensors used for the calculation.

As that you may want different ranges on the calculated sensors, the screen allows you to set the min and max ranges for the gauge.

For our example we set the CHT Max to 200-600 degree range, which we will see later. We will also add a EGT max to our configuration file.

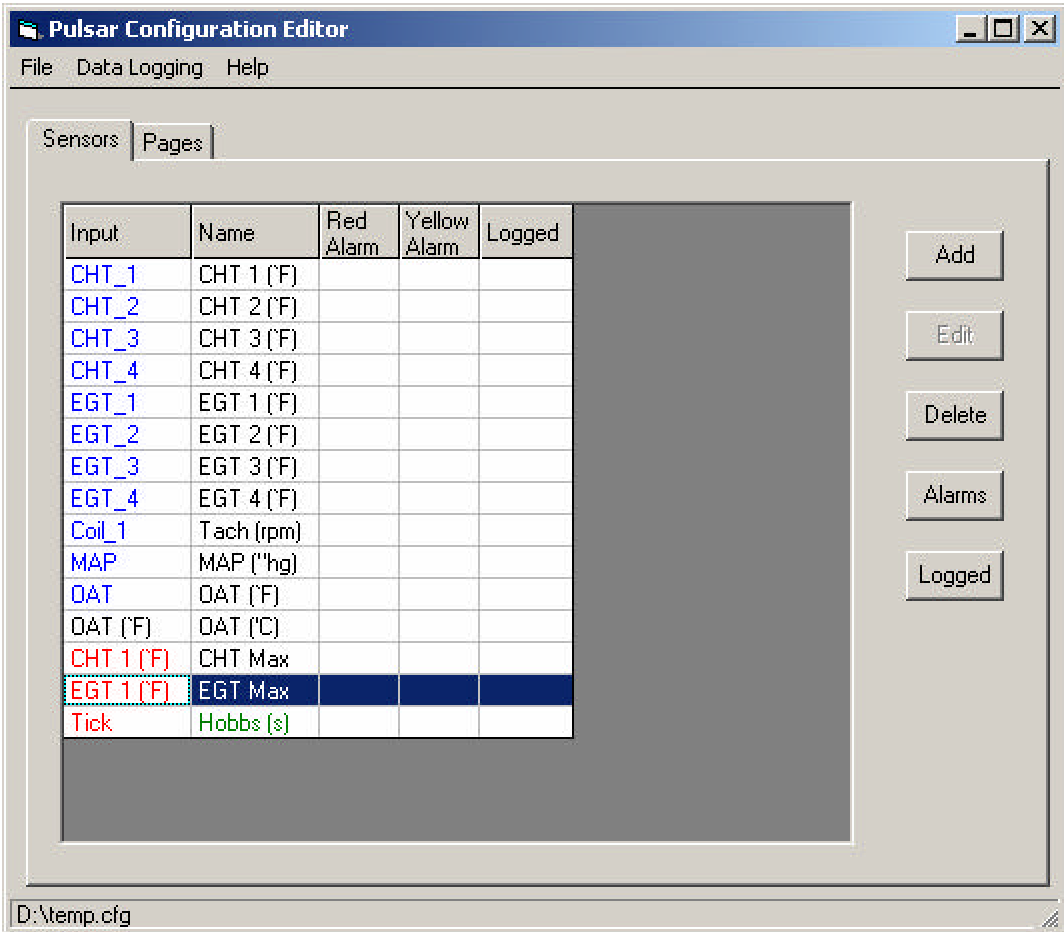


Figure 12.

In figure 12 you will notice that our calculated sensors inputs are shown in red to signify they have more than one input. Also notice that the Hobbs timer is shown in green to indicate that it is a saved between flights or power cycles.

Now that we have defined the Sensors for our configuration file we will want to configure the pages. A page is a group of gauges, the Pulsar 200 allows the user to configure up to 10 pages of gauges. To start configuring the pages we click on the Pages tab as shown in figure 13.

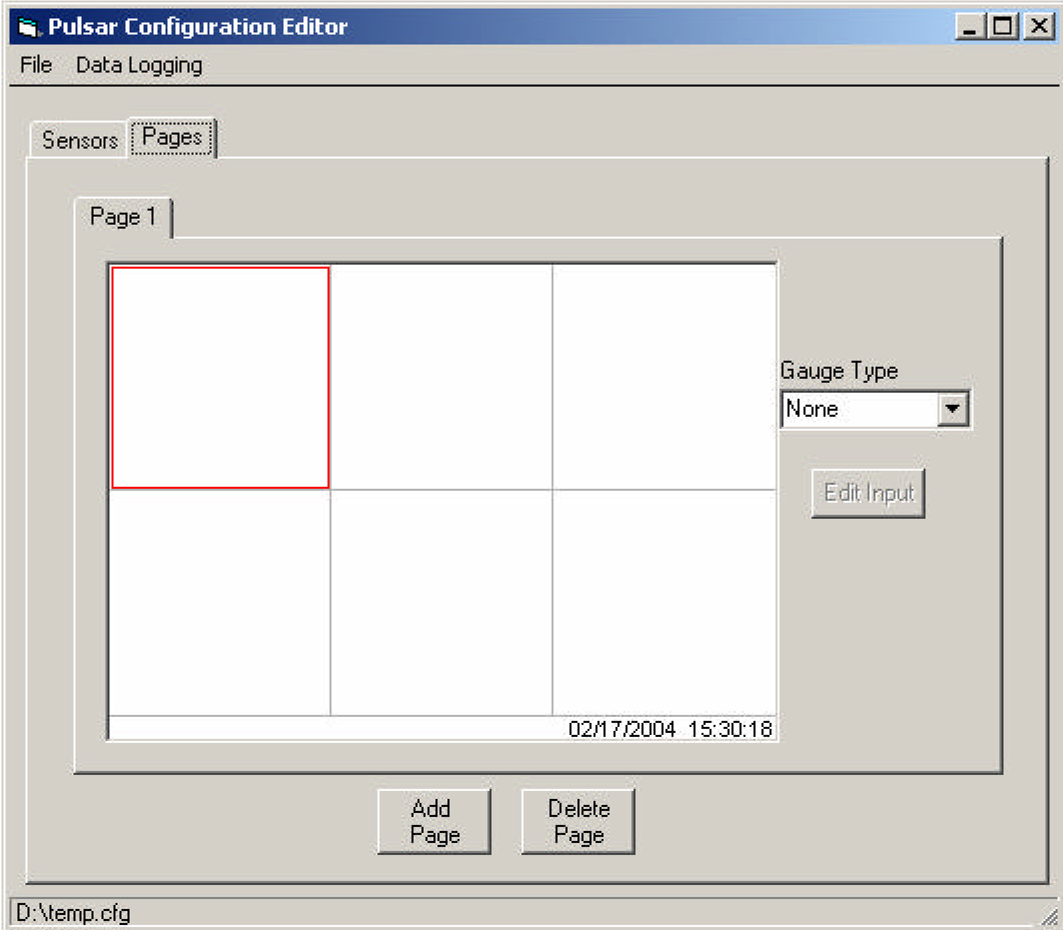


Figure 13.

Figure 13 shows a blank screen with no gauges to define. To define a gauge we click on the block we want to add a gauge to then we select the type of gauge from the drop down list box on the right. After we have put a gauge on the screen as shown in figure 14, we can click on the edit input button to edit which sensor to show on gauge.

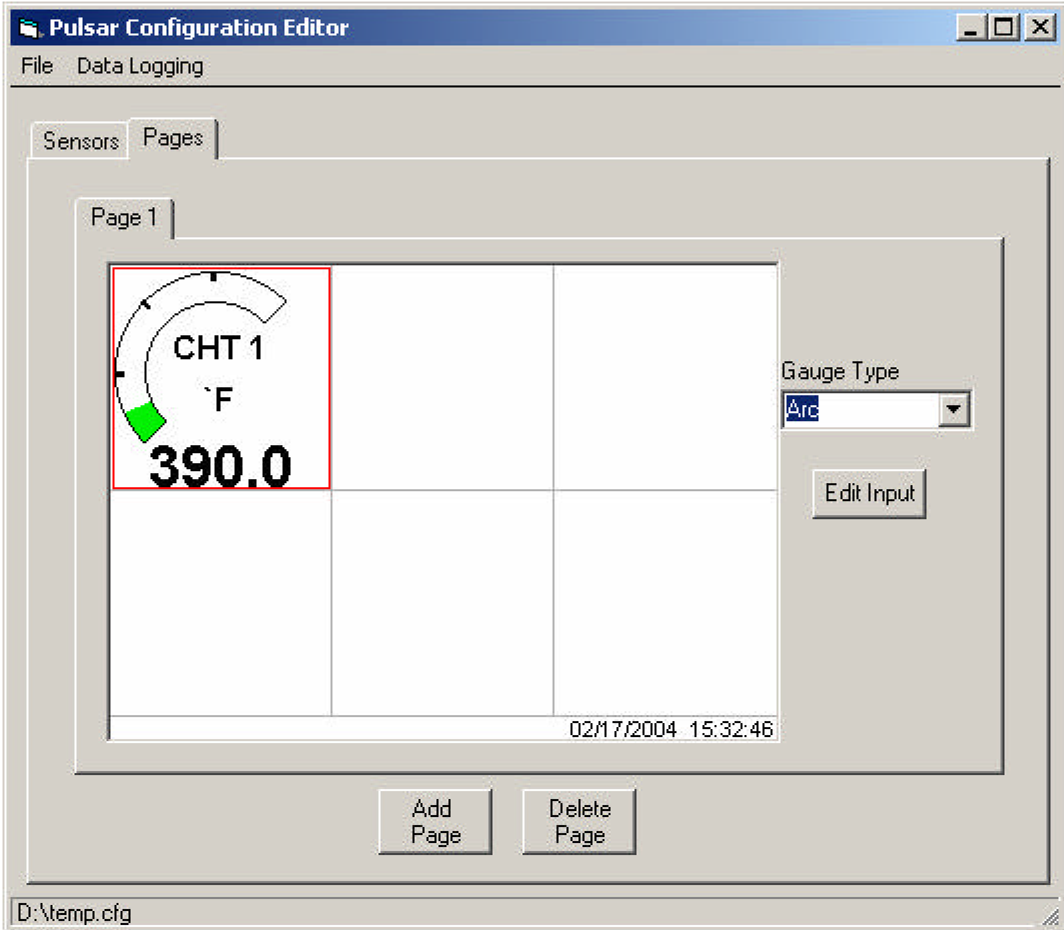


Figure 14.

For example we select the edit input box and select the "Tach" as the sensor to show on gauge. Notice that the gauge will show a random number, this number is not significant. After we have done the tachometer gauge we can add more gauges as shown in figure 15.

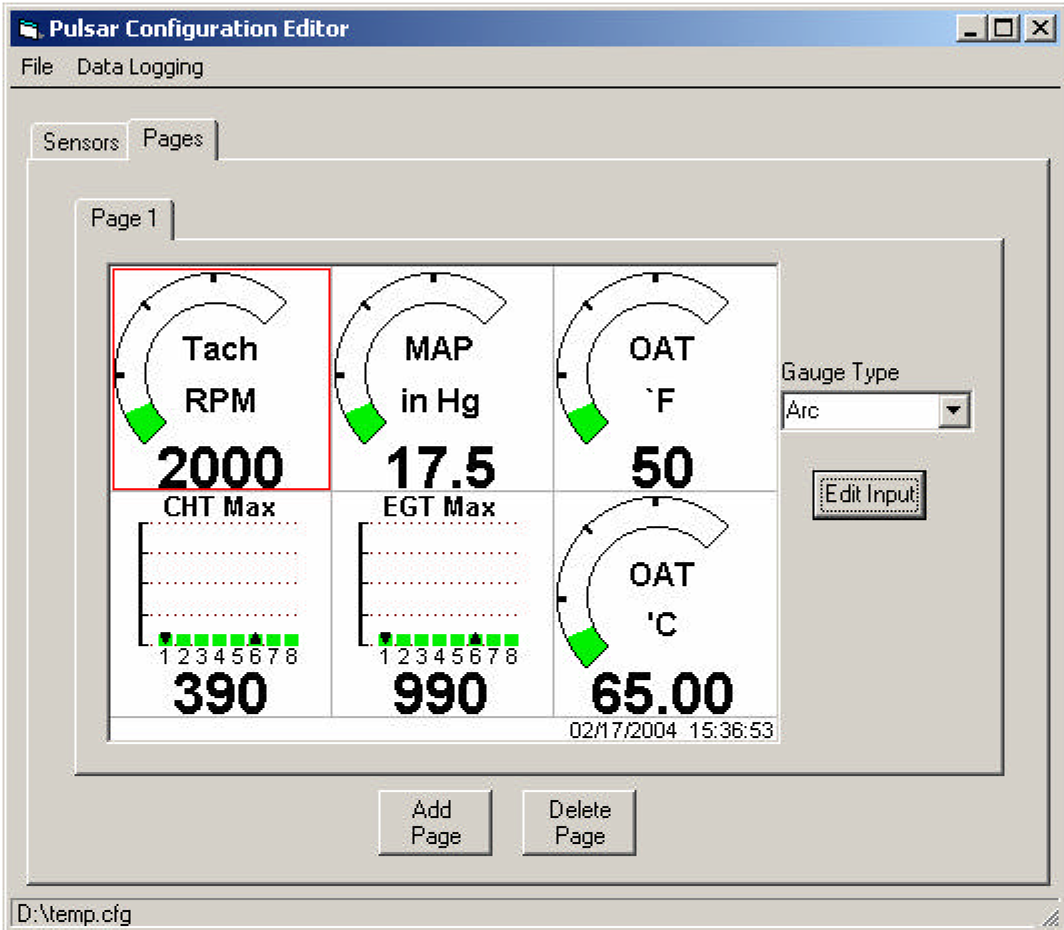


Figure 15.

Now that we have set up the gauges we want we can return to the sensors and configure the alarms.

The configuration utility allows the user to configure red and yellow alarms. Red alarms are usually used for when a value is out of the range of acceptable parameters and needs attention. Yellow alarms are usually when a parameter is approaching a condition that needs attention.

To configure the alarms we return to the sensor tab and select the sensor we want add an alarm to. For example we will add a red alarm to the tachometer, so we click on the tach line and hit the alarms button.

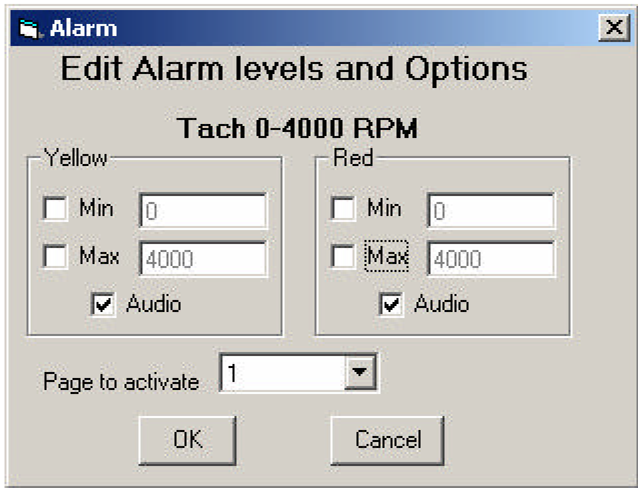


Figure 16.

Then the alarm box will open showing the settings for the yellow and red alarm levels. Since as shown at the top of the screen the tachometer has a range of 0-4000 RPMs we our alarms will have to be with in that range. So we look at the specifications for our engine and find that we have a red line of 2800 for this engine. So we will now add a red alarm for 2800. If we exceed this alarm level we will want to get an audio notice, so we leave the audio box checked. Also since we may have multiple pages with tachometer gauges we will want to select which page we will go to when the alarm becomes active.

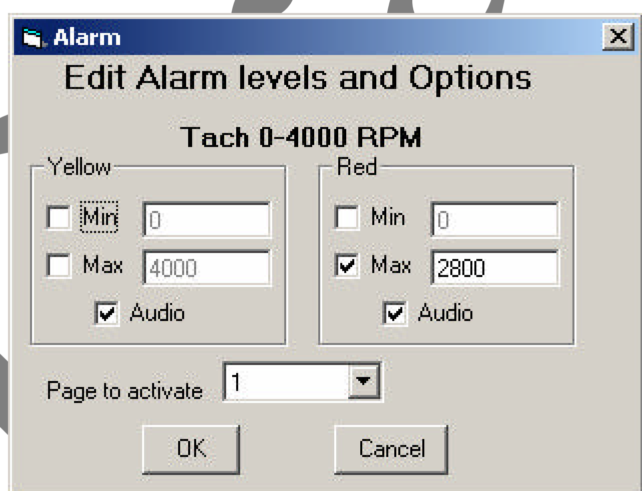


Figure 17.

According to figure 17 when the tachometer is above 2800 we will get an alarm, with audio and the unit will switch to page 1. Once we hit OK we will return to the main screen and we see that now our sensor has a red alarm, see figure 18.

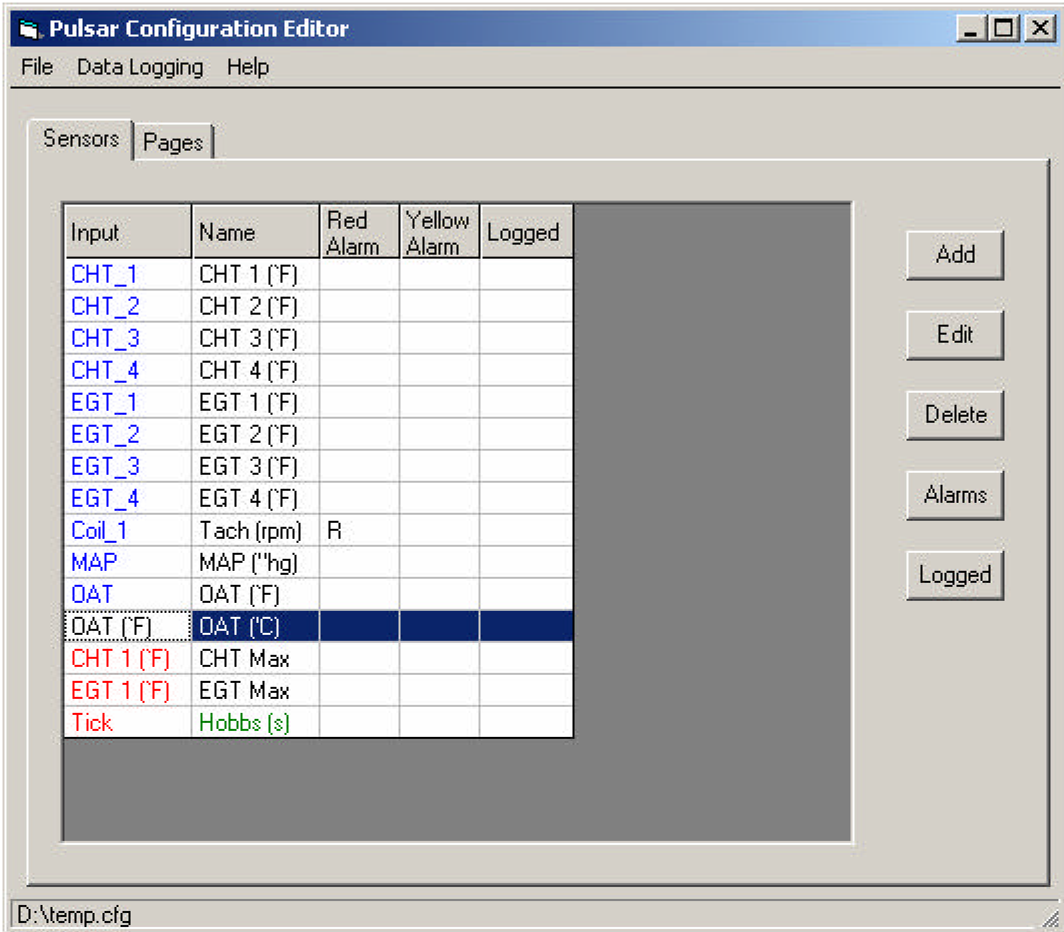


Figure 18.

We can now add more alarms to other sensors as we want.

The Pulsar 200 also has a built in data recorder. The data recorder or logger will record the sensors we choose at a rate we choose, the rate applies to all sensors. To select sensors to log we highlight the sensor and then click the logged button until the screen shows an "L" under the Logged column. To configure the logging rate select the "Data Logging" menu and then rate.

Once you have your configuration the way you want and have saved it you can exit the configuration utility and start the connection utility.

PULSAR CONNECTION UTILITY

The Pulsar connection utility was created to make it easy for the user to connect to the Pulsar unit and apply updates and download data logs from the unit. The application runs under windows operating system and requires the Pulsar 200 to be connected to a serial port and the unit to be powered on.

When starting the connection utility at start up the screen is shown below.

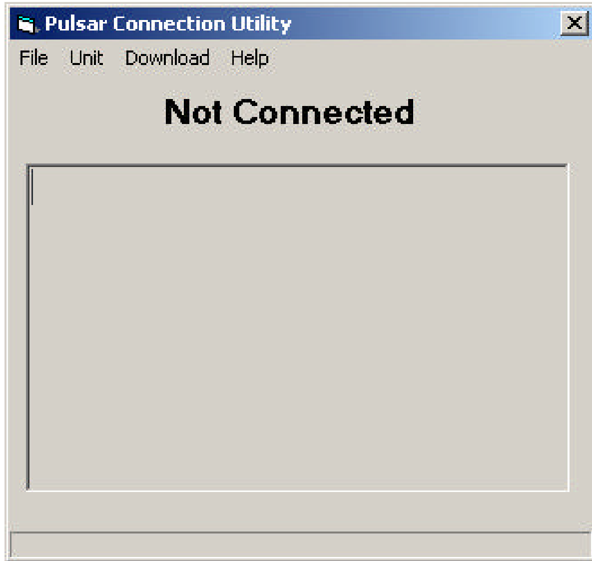


Figure 1 start up screen.

The screen in figure 1 shows that the unit is not connected. After the serial cable is connect and the unit is powered on the user can connect to the unit by going to file menu then connect.

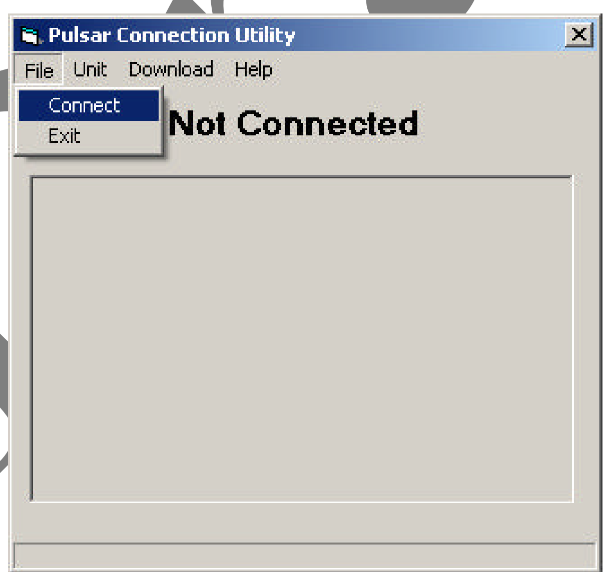


Figure 2 File -> Connect selection

If the application has problems finding the unit then it will recommend restarting the unit and trying again. If the program can not find the unit after power cycling unit then we recommend checking the serial cable and rebooting the PC and trying again. If you continue to have problems then try another PC, then if problems persist contact Stern Technologies.

Once the utility has found the unit you will get a screen similar to the one in figure 3.

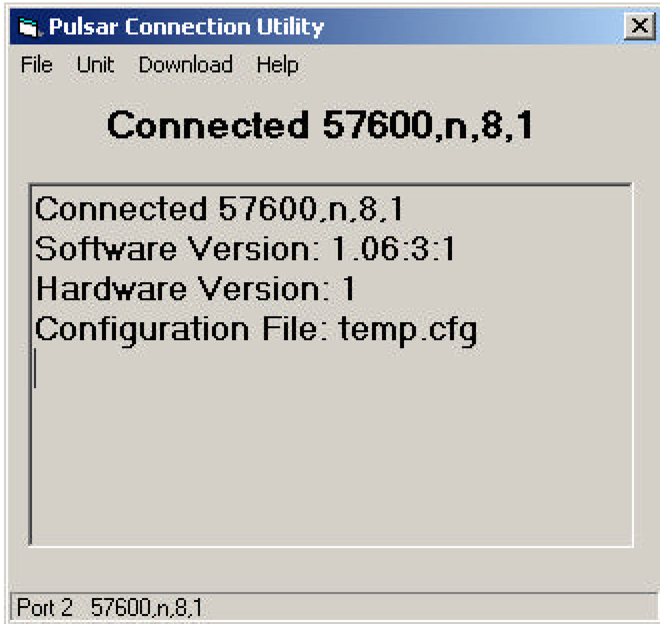


Figure 3, post connection screen

At this point the unit is connected and the utility shows the firmware and hardware revision numbers as well as the name of the current configuration file loaded.

The configuration file contains all the information that defines how your unit operates. That is the configuration file contains all the information about which transducers are connected to your unit and what gauges you have shown as well as the alarm levels.

Once you have connected to the unit you have several operations you can perform on the unit. These operations are selected through the menus and defined below:

File Menu Items

Connect – Searches for unit on serial, aka communication ports.
Exit – exits the utility

Unit Menu Items

Restart – Restarts the unit as if the power was turned off and on
Set Clock – Sets the date and time based on the current time on PC
Front Baud – Sets the communication speed of the front serial port.
Erase Data Log – Erases all the data the unit has recorded in data log
Update Configuration – Updates the configuration on the unit
Update Firmware – Allows the updating of the firmware

Download

Screen Capture – This will download to a bitmap file what is currently shown on unit's screen.

Data Log – This will download the recorded data from the unit to a file that can be read by spread sheet applications.

Help

Get Log File – The Pulsar unit keeps an event log which can be download to the PC using this menu option. This log file is only useful for diagnosing problems by Stern Technologies.
About – This shows an about dialog box which contains the software version number

The main purpose of this utility is the updating of the configuration and downloading the data log.

Configuration Update

To update the configuration, first connect to the unit as described above, then select Unit->Update configuration. The application will then open a dialog box asking for the new configuration file you want download to the unit. After you select the file a black “dos” window will pop up as that configuration is processed. After which a window will open that shows the data being updated on the unit. After the update is done the unit **will erase the data log** and reboot.

Note that every attempt has been made to prevent the unit from becoming non functional, as such if the update fails the unit should be restarted and the unit will repair it’s self.