VTM-99-001

VEDAS II USER'S MANUAL

V ALCOM

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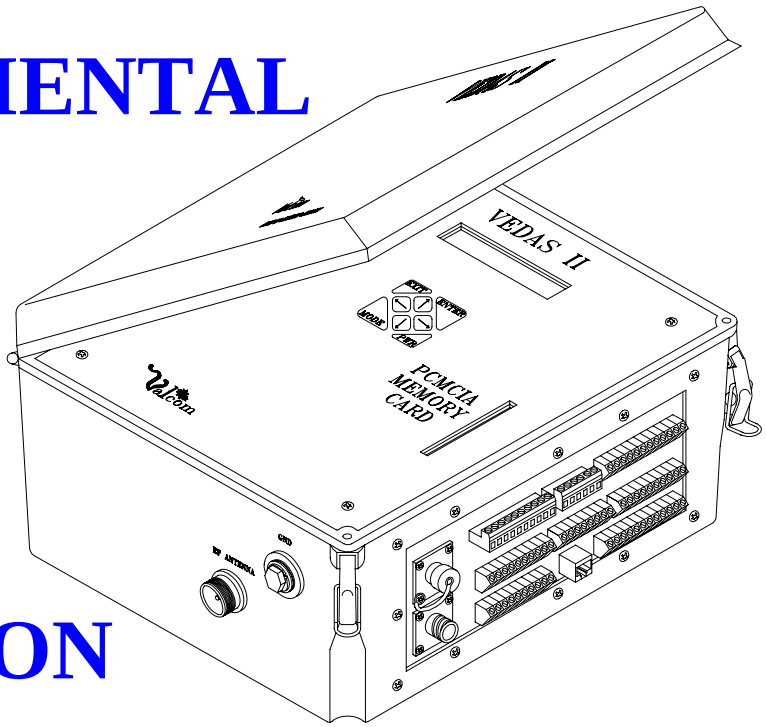

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REVISION SHEET

REVISION LEVEL	PAGES AFFECTED	DESCRIPTION OF CHANGE	DATE	APPROVED
--	--	Original Issue	14/01/99	
A	Various	Minor grammatical corrections and additions	27/01/00	
B	Various	Added sections for Campbell Scientific SAT HDR GOES Transmitter. Various minor format and grammar changes.	18/03/02	
C	Various	Added VGOES option for HDR GOES Transmitter and updated chapter 10, Entering Acquisition Formulas.	27/02/06	
D	Various	Increased the address range for SDI-12 inputs and updated section 5.2.1 Direct RF Transmitter Communication	12/06/06	

SAFETY

This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual, must be heeded.

CERTIFICATION

Valcom certifies that this product met its published specifications at the time of shipment from the factory. Valcom further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Valcom product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Valcom will, at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Valcom.

The warranty service for products installed by Valcom and certain other products designated by Valcom could however, be performed at the Buyer's facility at no charge within the Valcom service travel area.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. VALCOM SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

CUSTOMER INQUIRIES

Inquiries regarding the Vedas II system may be made to Valcom Limited in Guelph by either phone, Fax, or mail.

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EQUIPMENT ATTACHMENT LIMITATIONS

RE: VEDAS TELEPHONE INTERFACE OPTION

NOTICE: The Canadian Department of Communications label identifies certified equipment. This certification means that equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to disconnect the equipment.

Users should ensure, for their own protection, that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority or electrician.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of Load Numbers of all the devices does not exceed 100.

SOFTWARE DISCLAIMER

WARNING: Users should not attempt to upgrade earlier versions of VEDAS II units with later versions of software than what was originally installed.

As a result of continual improvements to the resident software on the VEDAS II units, trying to install later versions of software than what was originally released with the unit may cause damage to the memory locations storing pertinent information about the VEDAS II unit. This includes the calibration data (in the case of Level 2 units) and archived information.

Valcom can not guarantee the reliable operation of the VEDAS II unit should such a software upgrade be attempted by anyone other than a Valcom employee.

If software upgrades are requested or required, the VEDAS II units should be returned to Valcom to perform the work.

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SECTION 1.0
INTRODUCTION

1.1 **Purpose and Scope of Manual**

This User's manual is written for the Vedas II (Valcom Environmental Data Acquisition System) manufactured by Valcom Limited. It provides descriptions regarding the specifications and operation of the unit.

The manual is organized to optimize the time of the first time user as well as the fully seasoned operator. Seasoned operators of the previous Vedas unit should notice distinct differences in the Vedas II. It is also assumed that the operator has an understanding of electrical concepts like voltage, resistance, and current. Information contained within the manual may appear more than once to maintain flow and prevent excessive cross-referencing.

Chapter 1. The “Introduction” details the system capabilities, specifications, and the procurement options. It provides an overview of the Vedas II's abilities and requirements.

Chapter 2. The “Hardware Connections” section details the external electrical connections to the Vedas II. Electrical connections include power and operator communications, as well as sensor connections. Also detailed are the internal hardware jumper options.

Chapter 3. The “System Configuration” section details the initial set-up of the Vedas II system. This section describes the Vedas II menu system and its uses. Topics covered are the set-up of the RF transmitter and telephone modem interfaces, as well as various internal options such as terminal baud rate, etc.

Chapter 4. The “Acquisition Programming” section details the programmable parameters that accompany the various types of data acquisition tasks and data output tasks. The section first deals with common elements that are found in each task and then deals with elements that are task specific.

Chapter 5. The “System Utilities and Diagnostics” section details the built-in system utilities and internal diagnostics which provide the operator with the tools necessary to set up and verify the operation of the connected sensors and/or peripheral devices. The diagnostics is a powerful tool to test internal hardware operation.

Chapter 6. The “Keypad and LCD Display” section details the use of the internal keypad and display. It also describes the layout and uses of its own menu system.

Chapter 7. The “Installation” section details a site installation and helps the operator set up the Vedas II system in a step by step manner with the goal of obtaining a fully operational site.

Chapter 8. The “Telephone Interface” section provides a detailed description of the internal modem interface and the external modem interfaces available with the Vedas II system.

Chapter 9. The “RF Transmitter Installation” section contains detailed instructions for the requirements and procedures for installing an RF transmitter in the field.

Chapter 10. The “Entering Acquisition Formula” section details the procedure for entering and using new acquisition Formulas. The formulas can be used by any of the acquisition tasks to process the raw data into user specific formats.

Chapter 11. The “Operational Theory” section describes how the unit operates and details the actions of the acquisition task and how they function.

Chapter 12. The “Upgrading System Hardware” section details the optional hardware of the Vedas II and if it can be added in field. It also details the procedure for added an internal modem to the system.

Chapter 13. The “Programming Examples” section contains examples of how an acquisition task may be programmed.

1.2 **System Description/Capabilities**

The Vedas II is a multi faceted self contained data acquisition platform. It is user configurable and is fully capable of meeting single and multiple real time data acquisition requirements. Packaging is both rugged and compact and is ideal for use in harsh environments. The Vedas II is suitable for use in military, avionic, industrial, hydrological, and meteorological applications.

The Vedas II, when equipped with a Valcom GOES transmitter and a solar panel, is ideally suited for data collection in remote areas for extended periods. The integrated PCMCIA memory card containing 1, 2, 4 or 8 Megabytes of memory is also well suited for long term data collection or even software upgrades.

The Vedas II system is supervised and managed by the software contained in the Flash memory. Flash memory does not lose its data when power goes down. All acquisition/communication requirements are entered via the operator's terminal. The software formulates an acquisition task timetable to schedule and perform each acquisition in real time. All acquisition parameters are stored in Flash memory. This allows complete system recovery from power loss over extended periods.

The Vedas II provides several serial ports for communication and is capable of communicating with many different types of sensor interfaces. A battery backed up real time clock standard maintains the correct date and time during power failure conditions.

An Analog Interface section provides the conversion of -5 to +5 volt analog signals into a 20 bit digital format which is interpreted by the Vedas II software. Each of the nine external analog input channels may be accessed through the analog terminal strips. All inputs are filtered against signal noise and protected against unwanted transients.

The digital inputs provide up to 13 bits of digital information to the Vedas II. Additionally, 5 of the bit(s) may be configured as either a slow speed event counter, or inputs for an incremental shaft encoder. Digital information can input through the side mounted terminal connectors. All inputs are filtered against signal noise and protected against unwanted transients.

A versatile, low cost, direct connect, communication link is provided via the Vedas II telephone interface. This telephone jack can be used to access an internally mounted modem. This may be configured to retrieve data and/or provide remote programming of the Vedas II system. All operator terminal menu operations are available to the dial-in user under a password protection scheme.

In addition to the above telephone interface, the Vedas II is able to configure one of its RS-232 ports to be a Hayes compatible modem interface. This allows the user to connect a standard off-the-shelf modem to the Vedas II.

Each Vedas II provides 512 K (>50,000 entries) of Flash memory. Operator selected acquisition data, along with the label and the time, are stored in the archive memory section of the Flash. The contents may be dumped via the operator/telephone interface or the PCMCIA memory card, for processing at a central site. The Vedas II software calculates the memory archive capacity and displays the memory full date using the current acquisition schedule.

The Vedas II software has been designed with flexibility in mind in order to satisfy diverse data collection requirements. Using an RS-232C terminal, the operator is able to program and retrieve information from the Vedas II via built-in menu based operations. The built-in menu easily facilitates the initiation and completion of all operator based tasks.

Each acquisition is fully independent of other acquisitions and may consist of one or more raw data samples. acquisition timing is determined by the start time, the interval of acquisition, and the period of acquisition. Sample processing includes maximum, minimum, average, and last options.

The Vedas II supports alarm activated tasks, whereby if an acquisition exceeds a programmable alarm level, a second acquisition is activated. Supported alarm types are fixed level, fixed rate of change, and fixed interval. The alarmed task can be any existing task within the system including the GOES or telephone output tasks. The event activated task system provides the tools to create a DCP with real time alarm reporting.

Each acquisition task allows the manipulation of the acquired raw data by providing inputs for basic slope and offset parameters. This facilitates the conversion from raw data to engineering units, and/or compensation for site offsets. Additional formula conversions may be added to the Vedas II system at any time by requesting and obtaining a new binary formula file from Valcom Limited.

The contents of the Satellite output message is fully programmable. The operator selects the time and the number of acquisitions from each sensor that are to be transmitted via satellite link.

1.3 System Requirements

The Vedas II system requires a power input of 11-15 volts DC. This is usually provided by a +12 volt automotive style deep cycle battery. If long periods of unattended operation are required an auxiliary charging system will be required, such as a solar panel or 120 VAC charging circuit.

Battery selection depends on the contents of the Vedas II and the number and type of sensors connected to the unit. A fully loaded Vedas II draws approximately 1.5 mA during sleep mode, 50 mA while active and 65 mA during A/D conversion (Add 10 mA if equipped with a GOES transmitter). The Goes transmitter will require about 4 amps during transmission. The Goes transmitter plus the sensor load determines the discharge rate of the battery.

1.4 System Specifications

The table below lists the individual options of equipment supplied with the Vedas II and outlines the equipment specifications. The equipment listed is for the basic unit and all available options.

Table 1-1 **Individual Equipment Specifications**

EQUIPMENT	NOMENCLATURE	DESCRIPTION
Vedas II	Processor	MC68HC16Z1CFC16 microcontroller, Motorola
	Memory	1 Meg Flash, 131K bytes SRAM
	Communications	RS-232C (300 to 57.6K baud) Ch.0 SDI-12 Ch.1 SDI-12 RS-485 port
	Clock	Real time clock, battery backed up Accuracy ± 50 ppm (tunable).
	Strobe Output	2 strobe outputs, 12 volts @ 1 A 1 controlled 5 volt output @ 100 mA
	Quiescent Current	1.5 mA (sleep mode)

EQUIPMENT	NOMENCLATURE	DESCRIPTION
Analog Interface	Inputs	7 differential inputs (or 14 single ended or combination) 7 single ended inputs 1 battery voltage input 1 system temperature input 1 ground reference input
	Input Filtering	Surge protected. EMI protection optional First order low-pass filter -3dB @ 1 kHz
	Input Voltage	-5 to +5 volts DC
	Accuracy	0.01% of full scale (0.05% at 100X Gain), -40° to +50°C
	Sample Time	50 ms with 60 Hz rejection.
	Gain	1, 10, 100, 1000 (programmable)
	Conversion	20 Bit resolution. Software corrected
	Reference Voltage Output	4 programmable 0 to 5 volts strobe outputs load compensated
	Quiescent Current	zero, analog section deactivated during sleep.
Digital Interface	Inputs	13 programmable CMOS/TTL bits
	Outputs	6 programmable +5 volt outputs @ 1mA
	Input Filtering	Surge protected, EMI protection optional First order low-pass filter -3dB @ 1kHz
	Lo Speed Event	100 Hz max counter
	Shaft Encoder	100 counts/second maximum
	Strobe Output	Individually switched (x2) +12 volts @ 1 A
Telephone Interface	Modes of Operation	300 - 14,400baud, full duplex channel Auto answer, auto dial Originate and answer mode
	Modulation	Frequency shift keying
Memory Archive	Capacity	Up to 512K bytes
	Battery life	1 year fully configured
High Speed Counter	Frequency	1 Hz to 200 KHz
	Input	20 m$\mathbf{V}_{rms}$ to 20 $\mathbf{V}_{rms}$

EQUIPMENT	NOMENCLATURE	DESCRIPTION
General	Operating Temperature	-40°C to +50°C
	Humidity	100% non-condensing
	Shock	15 g, 11 ms
	Vibration	5 Hz - 45 Hz @ 1 g 45 Hz - 100 Hz @ 0.01 in. 100 Hz- 1000 Hz @ 5 g
	Input Voltage	11 to 15 VDC, with reverse, under, and over voltage protection
	Quiescent Current	less than 12 mA (fully loaded)
Packaging	Weight	6 lbs
	Nema Enclosure Size	14.0 in. long 11.0 in. wide 7.0 in. high
	Weight	10.5 lbs. with GOES transmitter and battery

1.5 **System Procurement Options**

The Vedas II basic configuration includes: NEMA enclosure, +12 volts strobed outputs,+5 volt controlled output, digital inputs and outputs, PCMCIA memory card connections, pulse counter, SDI inputs and RS-232 interfaces. The selection of the base configuration is dependant on the site resources and sensor requirements. Each option is easily installed at Valcom. Future upgrades are available at Valcom.

Table 1-2 **Procurement Options**

VEDAS II PROCUREMENT ITEMS	LEVEL 1	LEVEL 2
NEMA Enclosure	Standard	Standard
Lightning Protection	Standard	Standard
Reverse/Over/Under Voltage Protection	Standard	Standard
Environmental Protection	Standard	Standard
Power Cable	Standard	Standard
Program Terminal Cable	Standard	Standard
Flash Memory	Standard	Standard
PCMCIA Card Connections	Standard	Standard
Internal Clock, Power Outage Protected	Standard	Standard
+12 Volts Programmable outputs	Standard	Standard
+5 Volt Controlled output	Standard	Standard
RS-232 Interfaces	Standard	Standard
Digital Interface	Standard	Standard
Pulse Counters	Standard	Standard
SDI Interfaces	Standard	Standard
Keypad and LCD Display	Standard	Standard
Analog Interface	Option	Standard
High Speed Interface	Option	Standard
Internal Modem	Option	Option
Goes Transmitter	Option	Option
Orbcomm Transmitter	Option	Option
RS-485 Interface	Option	Option
Internal Shaft Encoder	Option	Option
Internal Battery Backup and Charging Circuits	Option	Option

1.6 System Limitations

The initial release of Vedas II limits the operator to 50 acquisition tasks. Tasks 48 and 50 are reserved for internal temperature and diagnostics respectively. Task 49 is reserved for an RF transmitter, GOES or Orbcomm.

Timing resolution for the activation of tasks and acquisition samples, etc. are limited to 1 second increments. The minimum acquisition or output task rate is limited to one per day.

The internal timing resolution of the software is set at 10 ms. This timing resolution creates a limitation on the maximum speed of the digital event counter (100 Hz) and digital shaft encoder (100 pulses/sec) connected to the Vedas II system.

Both the RS-232 ports on the controller card are multi-purpose. The operator may select which option is to be used. RS-232 port 0 may be used either as a sensor input port or a high speed telephone modem interface port using a Hayes compatible telephone modem. RS-232 port 1 is dedicated for program terminal communications, however, when the program terminal is disconnected, port 1 may be connected to a sensor input or a serial interface to a telephone modem. Please note that the serial sensor or the serial telephone interface must be disconnected when using the program terminal function or a signal contention will result.

The Vedas II software has been designed to fully regenerate itself each day at midnight. This process insures that software errors which may have developed due to external influences are corrected at the end of the day. Due to the regenerative process, any task that is acquisition active during the midnight cross over is terminated and the results discarded. Vedas II programmers should be aware of the process when programming the system and adjust the acquisition timing to prevent midnight violations.

1.7 VEDAS II Utility Program

The Vedas II utility program runs on an IBM personal computer or equivalent and has been designed to interface with the Vedas II (Valcom Environmental Data Acquisition System) serially via the program terminal port or the telephone interface.

The Vedas II utility program allows the operator to manage a number of remote sites via a modem or to communicate directly (ie. at a site) with a local Vedas II system.

Once connected to the Vedas II the Vedas II utility program allows the operator to communicate with the unit using the built-in communication package. In addition to having file upload/download capabilities, the program will automatically retrieve archive data and arrange it in tabular form for easier viewing. The operator is also able to instantly graph the data for simple interpretation of trends, maximums, minimums, etc.

With the full screen programming package (VEDAS_U.OV1, VEDAS_U.OV3) the operator is able to enter either individual acquisition tasks, or load the current acquisition program directly from the Vedas II. It is then possible to adjust the tasks with full screen editing, save the program back to the Vedas II utility program and download the new task parameters into the Vedas II system using a program load routine.

In summary, the Vedas II utility program allows the operator to:

Access Mode

- access a site (either remote (via modem hookup), or local) directly, putting the operator in contact with the Vedas II main menu.
- provide up to 9 screens of scrolled data for re-viewing.
- upload/download files to/from the Vedas II.

- upload a Vedas II program file.
- download a Vedas II configuration file.
- view archive data directly, and then optionally save the data to the site data file. SEE DATA MODE.
- provide on-line Help for the Vedas II system

Data Mode

- view a set time frame of past data uploaded from the site, archiving old data to a separate file.
- present the data in a user definable column format.
- graphically plot the retrieved data from the site with either a fixed or floating scale.
- write operator specified data labels in a comma delimited format for input into databases and spreadsheet programs.
- write a specified data time span into a Vedas II dump format file.
- delete a label from the site data file.
- provide on-line help to assist the operator in this mode of operation.

Polling Mode

- set up a polling schedule whereby at a programmed interval, the program will poll the specified site and retrieve the current or archived data (since the last recorded data element) and append it to the site data file.

System Configuration Mode

- read a Vedas II detailed task display file and create a configuration file.
- read a configuration file and display the Vedas II task parameters to the operator for viewing/editing.
- provide full screen editing capabilities for Vedas II task parameters.
- create a Vedas II program file, which when uploaded to the Vedas II via the access screen will reprogram the Vedas II with the current program parameters.
- calculate and display the acquisition schedule for a single task or all tasks in the system simulating the acquisition process in the field.
- provides on-line help to assist the operator in the programming functions.

SECTION 2.0

HARDWARE CONNECTIONS

2.1 System Grounding

A good system chassis ground is required by the lightning, transient, and EMI protection circuitry in the Vedas II system. An acceptable earth ground usually consists of a steel rod driven (approximately three feet) into the earth's surface. The earth ground connection is made to the Vedas II via a 3/8 in. lid mounted chassis stud (refer to Figure 2-1). When laying out the grounding conductors (conductor size should be greater than 18 AWG) at the site, the operator should ensure that only a single path to the earth ground exists. This single ground path prevents transients which develop due to differences in electrical potential in the grounding system.

2.2 Terminal Strip

The Vedas II has a connector board mounted on the side of the unit. It provides input and output connections to sensors and other peripheral equipment. Many of these connections have more than one function. They can act as input and output and be used by several types of acquisition tasks. The RS-232 and SDI connectors are removable and the remaining connectors are simple terminal strips for easy connection to any sensor system.

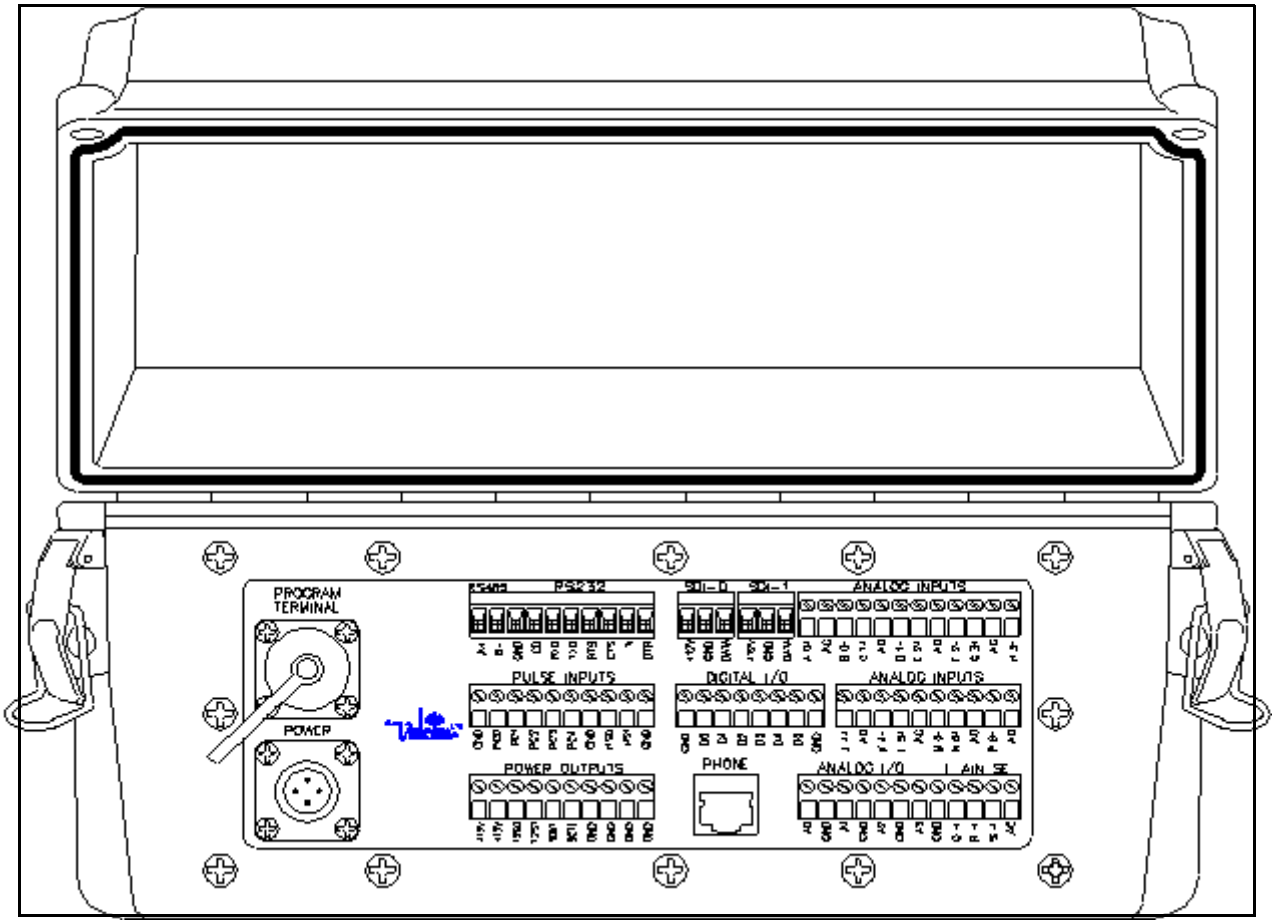


Figure 2-1 Terminal Strip Layout

2.2.1 Shield Connections

The shield connections should be made to ground. The shield connections are used to minimize the amount of induced current in the sensor cables by providing a ground potential to the cable shield. It is recommended that shielded cables be used for all sensors.

2.2.2 Ground Connections

The +12 volt ground connections on the terminal strip interface are marked as GND, and are a direct connection to the negative potential of the power source (ie. Battery negative terminal).

2.2.2.1 Power Connector (+12 volts)

The +12 volt input connector on the connector board provides reverse voltage and over voltage protection. It can handle inputs from 10.75 volts to 17 volts. The Vedas II will reject a low voltage.

2.2.2.2 Program Terminal Connector

This is an RS-232 interface designed to be used with a computer's serial port or other serial terminal device. It has a terminal sense line that will bring the unit out of power down mode when it is connected. The unit should re-enter power down mode when disconnected unless it is performing a task. Serial communication is done with 8 bits, 1 stop bit, no parity and an autobaud feature that matches the input baud rate from 300 to 57600. The program terminal connector is intended to be used with the supplied program terminal cable but can be used as an RS-232 port.

2.2.2.3 12 Volt Outputs

The +12 volts output connections on the terminal strip have the capacity to supply 1 amp each, however, there is NO current limit protection circuitry used to enforce this limitation. The outputs are limited to a maximum of 14 volts output and will be slightly less than the input voltage.

High current switching, or inductive loads should not be sourced from the Vedas II +12 volt connections as they could cause transients to occur in the Vedas II system. These connections should be made directly to the power source (ie. battery).

!! CAUTION !!

The +12 volts terminal connection should NEVER be used to supply +12 volts into the Vedas II system. These connections are for output power only. The connector marked POWER is for input power and should only be used with the Vedas II power cable for supplying power to the Vedas II.

2.2.2.4 12 Volt Switched Outputs

The +12 volt switched output connections are used to provide a switched +12 volt potential to a connected sensor under acquisition control. This switched output allows the Vedas II system to energize a sensor only when a reading is required, otherwise maintaining the sensor in a power off state. This feature conserves a considerable amount of power as some sensors require a significant amount of current. The option of using the 12 volt switched output is available to most acquisition tasks. Each +12 volt strobe has circuitry to limit the current to 1 amp and are short-circuit protected.

2.2.2.5 5 Volt Controlled Output

The Vedas II has one connection marked "5CTL", and one marked "5OUT". The 5CTL is an input for the 5OUT terminal. If the 5CTL is connected to the 12 volt output then 5 volts will appear on the 5OUT terminal. This can be used in conjunction with one of the 12 volt switched outputs to create a 5 volt strobe with 100 mA output.

2.2.2.6 Phone Jack

The Vedas II has a phone jack mounted on the connector board. It is for use with the internal modem only. The TIP and RING are connected directly to the internal modem and can be used for outgoing or incoming calls. The internal modem will connect to a standard phone plug. Do not connect an external modem to this connector.

2.2.2.7 RS-232 Serial Port

The RS-232 port may be accessed via terminal strip connections on the connector board. Another RS-232 port is also accessible via the program terminal connector and is dedicated toward terminal interface. As the RS-232 port has been designed with dual purposes, the operator must ensure that a port violation/contention does not occur. RS-232 port may

be used as either a sensor input connection or as a serial interface to an external telephone Hayes compatible modem. The internal modem uses the same internal hardware so only one of these can be used at a time. The operator must ensure that neither an external sensor or a modem is connected to the RS-232 terminal strip when the program terminal is connected.

2.2.2.8 **RS-485 Serial Port**

The RS-485 serial port is part of the RS-232 connector. The pins are marked "A+", "B-", with the ground pin next to it if required. This form the RS-485 interface protocol is for communications to any part of the world. Since the RS-485 shares hardware with SDI-0, internal hardwired jumpers allow use of only one of these at a time.

2.2.2.9 **SDI-12**

The Vedas II supports two independent SDI-12 communication ports. Both SDI-12 inputs are accessible by removable connectors on the terminal strip. These ports each contain three connections, 12 volts, ground and the data pin. Each of the SDI ports can support sensors with addresses ranged from 0 to 9, a to z, and A to Z. These ports can also serve as digital inputs/outputs and pulse counter inputs. The pulse counters must be driven with + 5 volts input.

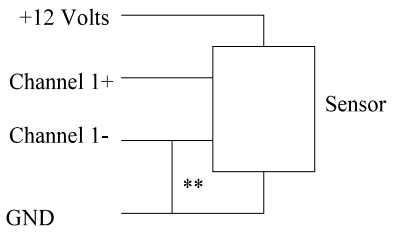
SDI-0 may not be used if the RS-485 circuitry is installed. SDI-1 is also connected to an internal connector for use with an internal SDI shaft encoder if required. Refer to Appendix A.10 for a further description regarding the SDI-12 interface.

2.2.3 **Analog Interface Connections**

The Vedas II analog interface is used to convert an analog signal produced by a sensor into a digital format which can then be processed by a computer. These ports can control the sensor and measure the sensor, by using the Vedas II Task programming menu. All of these ports are normally powered down when not being used. The Vedas II will power up the analog section just before an analog acquisition task is to begin. The warm up time for powering up the outputs can be specified when programming an acquisition task. Refer to Chapter 4 for Programming instructions.

2.2.3.1 **Analog Input Channels**

The analog inputs channels consist of 7 differential input channels (0 thru 6) and 7 single ended input channels (Q, R, S, A0, A1, A2 and A3) located on all three of the analog terminal strips. The 7 differential channels can also be used as 14 single ended channels (A, B, C, D, E, F, G, H, J, K, L, M, N and P). Both the differential and single ended channels have a voltage input range of -5 to +5 volts with respect to the ground potential. The input resistance at time of measurement is 10 giga-ohms. The accuracy of each channel is +/- 0.2 mV. The differential input channels have a high noise immunity and are good for measuring low voltage signals. To achieve this, the user must ALWAYS connect both the + and the - terminals. The single ended channels do not have good noise immunity and should not be used with a 10x, 100x or 1000x gain setting. The negative connection, however, is not required if the sensor signal output is provided with respect to the sensor ground potential.



** This connection must be provided if the sensor does not provide a (-) signal connection

Figure 2-2 **Example Analog Sensor Connection Guide, Differential Channel**

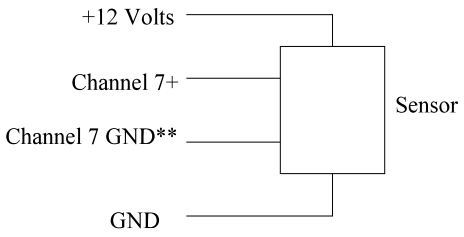


Figure 2-3 **Example Analog Sensor Connection Guide, Single Ended Channel**

2.2.3.2 **Reference Voltage Channels**

Four reference outputs (A0, A1, A2 and A3) are provided for use by the analog acquisition process. Each reference output has a range from 0 to +5 volts with an approximate 20 mA capacity. The accuracy of the output is +/- 2 mV. The reference outputs are used to provide an excitation or energizing voltage to a sensor in order to provide an output signal. Each output is short circuit protected.

2.2.4 **Digital Interface Connections**

The Vedas II digital interface is used to convert a digital signal produced by a sensor into a format which can then be processed by the Vedas II system.

2.2.4.1 **Digital Inputs**

There are a maximum of 13 digital input bits. All bits have an input range of zero (0) to +5 volts (1) with respect to the GND terminal connection. Some of these bits may be arranged as parallel, low speed events, or shaft encoder inputs. Parallel inputs may start at any bit, the number of bits used must be consecutive in ascending order with the LSB having the lowest bit number. Low speed inputs may use any unused bit and must have an activation rate of less than 50 Hz. Shaft encoder inputs may be arranged as any two consecutive bits from PC0 through PC4.

2.2.4.2 **Digital Outputs**

There are a maximum of 8 digital outputs available. Bits D0 through D5 can be used for inputs or outputs or both. Bits 6 and 7 are specified as SDI-0 and SDI-1 respectively, and they can function in the same manner. They have the following specifications:

Input Level	3.5 V	HIGH	5.0 V,	LOW	1.0 V
Output Level @ 1mA	4.5 V	HIGH	5.0 V,	LOW	0.2 V
Input Resistance	200 Kilo-ohms				
Output Resistance	465 ohms				

2.2.4.3 **High Speed Event**

There are two high speed digital inputs marked HS0 and HS1. The high speed input has a voltage input range of 20 mV_{rms} to 20 V_{rms}. The high speed input has a frequency range of 1 Hz to 200 KHz.

2.2.4.4 **Pulse Counter Inputs, PC0 - PC4**

There are five pulse counter inputs on the pulse inputs terminal strip. These can be used for any pulse counting type of acquisition. PC0 - PC4 are designations for pulse counter acquisitions or shaft encoder inputs. Any two in series can be used for the LSBit and MSBit of a shaft encoder. PC0 and PC1 are also connected to the internal shaft encoder connector and are used when the the internal shaft encoder is present. PC0 - PC4 are also designated as digital inputs D8 through D12.

The Pulse counters allow inputs of 5 Hz to 100 Hz with:

Input Level	3.5 V	HIGH	5.0 V,	LOW	1.0 V

2.2.4.5 **Connection Examples**

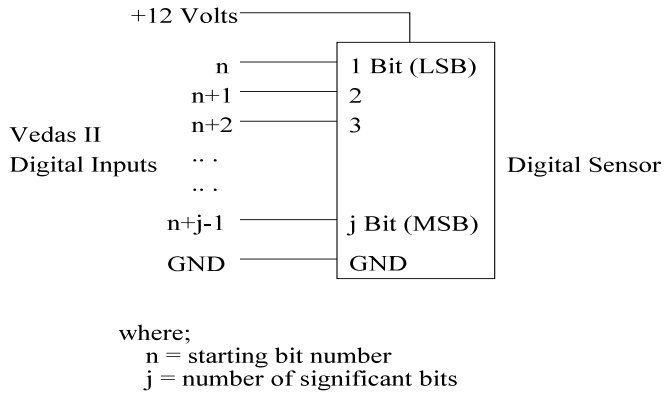


Figure 2-4 **Example Digital Sensor Connection Guide, Parallel Input**

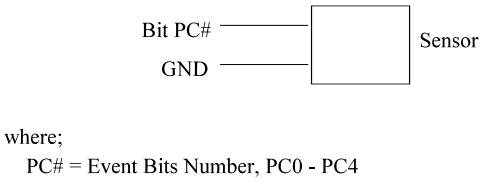


Figure 2-5 **Example Digital Sensor Connection Guide, Event Counter**

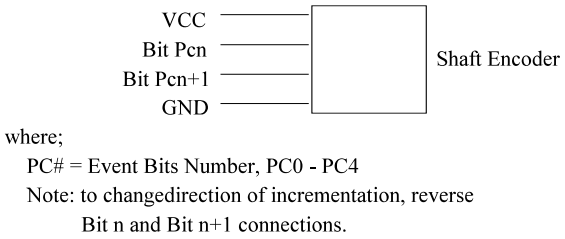


Figure 2-6 **Example Digital Sensor Connection Guide, Shaft Encoder**

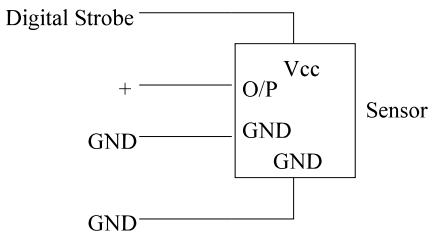
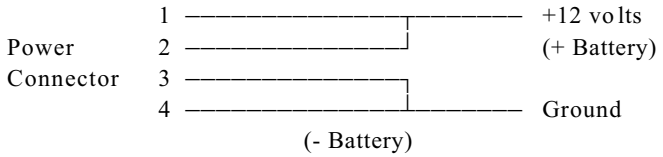


Figure 2-7 **Example Digital Sensor Connection Guide, High Speed Event**

2.2.5 **Power (battery)**

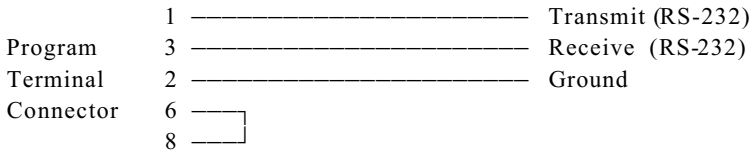
The following cabling diagrams show the pin configuration of each of the feed through connectors found on the side panel of the Vedas II enclosure.

Figure 2-8 **Power Cable Configuration**



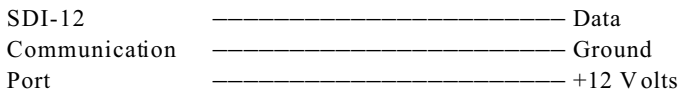
2.2.6 **Program Terminal**

Figure 2-9 **Program Terminal Cable Configuration**



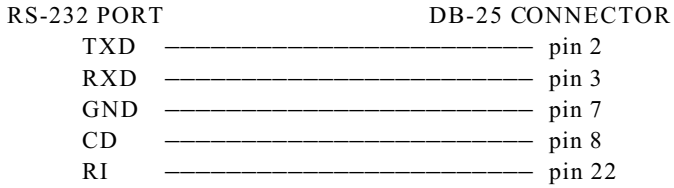
2.2.7 **SDI-12 Channels**

Figure 2-10 **SDI-12 Communication Port Connector**



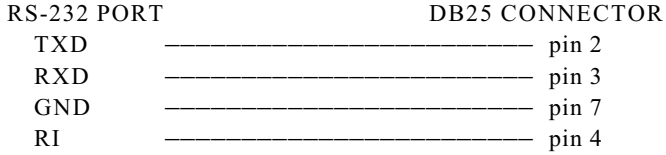
2.2.8 **RS-232 Port to Modem**

Figure 2-11 **RS-232 Communication Port Connector**



2.2.9 **RS-232 Port to Terminal**

Figure 2-12 **SDI-12 Expansion Box Connector**



2.2.10 **Telephone/Modem Interface**

Figure 2-13 **Telephone Port Cable Configuration**

Telephone	4	————————————	Tip
Port	5	————————————	Ring

2.2.11 **UHF Antenna**

The unit has a GOES transmitter connector installed on the case of the Vedas II. The UHF Antenna connector is an N-type, the GOES antenna cable has a mating connector. The GOES transmitter is located under the Display/Keypad Panel and is connected internally. The GOES transmitter should never be used without an antenna connected to the output or a calibrated 50 dummy load. Caution should be used when working near the UHF Antenna output as there will be RF energy present during transmission.

2.2.12 **RF TX Power Monitor**

If an optional GOES transmitter is included with the Vedas II system the operator does not need to access the forward and reflected power signals from the transmitter via the terminal strip connection. These functions are now built in to the acquisition menu structure. Refer to Chapter 4 for further instructions.

2.3 Internal Configurations

2.3.1 Clock Battery

Contained within the Vedas II is an RTC (Real Time Clock) device. This component allows the Vedas II to maintain the correct time if a power down, or sanity timer trip condition occurs. In order to maintain the time in a power down condition a printed wiring board mounted battery is used as a backup power source to the clock.

2.3.2 Internal Jumper Settings

The Vedas II has some configuration jumpers on the main printed wiring board. These are configured at the factory according the hardware specifications and procurement options at the time of purchase. Many of the jumpers will be a jumper wire and some may be a removable shorting strap on a 2 or 3 pin header. Each one of these jumper settings can have an effect on the operation of the unit. Each jumper must have one or the other of these settings or the unit may not function properly. It is suggested that these are **Not** user serviceable.

Jumper	Connection	Function
JP1	None 1 - 2	Internal Modem Only RS-232 Interface / External Modem / Orbcomm
JP2	None 1 - 2	Internal Modem Only RS-232 Interface / External Modem / Orbcomm
JP3	None 1 - 2	Internal Modem Only RS-232 Interface / External Modem / Orbcomm
JP4	None 1 - 2	Internal Modem Only RS-232 Interface / External Modem / Orbcomm
JP13	None 1 - 2	Internal Modem Only RS-232 Interface / External Modem / Orbcomm
JP5	1 - 2 2 - 3	RS-232 Interface / External Modem (Default) Orbcomm
JP6	1 - 2 2 - 3	RS-232 Interface / External Modem (Default) Orbcomm
JP7	1 - 2 2 - 3	RS-232 Interface / External Modem (Default) Orbcomm
JP8	1 - 2 2 - 3	RS-232 Interface / External Modem (Default) Orbcomm
JP9	2 - 3	Analog Ouput Control (Default)
JP10	1 - 2 2 - 3	RS-485 is Operational (SDI-0 Not available) SDI-0 is Operational (RS-485 Not available) (Default)
JP11	None	Reserved
JP12	None	Reserved

Table 2-1 **Hardwired Jumper Configurations**

SECTION 3.0
SYSTEM CONFIGURATION

3.1 System Hookup

The Vedas II unit will be shipped as a ready to use assembly with all internal components tested and approved. All internal contents should be as specified at the time of procurement. This can be checked as soon as the unit is powered up. To install the unit only the external connections are required. The GOES(Orbcomm) transmitter, if so equipped, is mounted internally. All that remains to be done is to connect the appropriate cables to their corresponding connectors on the Vedas II enclosure. Refer to section 7.0, installation for further information.

3.2 AutoBaud Mode

If the program terminal baud rate has not been set, the Vedas II will enter the autobaud detection sequence upon power-up. Wait an initial two seconds after the power is applied to insure the autobaud mode is in effect. The autobaud detects sequence expects the operator to enter a <space> bar, after which hardware-based counters measure the pulse width of the break character to determine and match the input baud rate. Refer to section 3.4 for start up procedures.

The following lists the supported baud rates for the program terminal; 300, 600, 1200, 2400, 9600, 19200, 38400 and 57600. It uses eight data bits, no parity, 1 stop bit.

3.3 VEDAS II Program Monitor System

The Vedas II system contains a program monitor routine to handle the upgrades of the Vedas II software package. Portions of the monitor routine are first executed upon start-up of the Vedas II unit and are responsible for the power-up autobaud sequence and the initial Flash check. The monitor routine then passes control to the Vedas II software. The monitor routine contains several diagnostic routines to initialize the Vedas II if unknown problems develop. Refer to Appendix A9 for further information regarding the Vedas II Program, monitor system.

3.4 VEDAS II Start-Up Sequence

The following is the preferred Vedas II start-up routine.

a. If a computer is being used as a program terminal device, ensure that the appropriately configured. The Vedas II uses a baud rate between 300 and 57600, 8 data bits, 1 stop bit, no parity. Acceptable communication software is V2UP.EXE supplied by Valcom or Procomm. Load the software and have it running.

b. Connect the battery or power supply to Vedas II power cable observing marked polarity.
The voltage should be 11-15 volts.

c. Connect the program terminal cable to both the terminal device and to the Vedas II.

d. Connect the Vedas power cable to the Vedas II.

e. Press the <SPACE> bar on the terminal and *"FLASH Check ..."* Should appear. The Vedas II sign-on *"VEDAS X.XX"* should appear which is followed by a request to verify the date.

f. No message will appear until the <SPACE> bar is pressed to invoke the automatic baud matching feature of the Vedas II. If a different key is pressed, the Vedas II may interpret this as a different baud rate. If this occurs, disconnect the program terminal cable, wait a few seconds then reconnect it and press <SPACE> again.

g. If the text *"FLASH Check ..."* appears but the Vedas II sign-on *"VEDAS X.XX"* does not appear and the system never prompts for the date, press the <SPACE> bar again.

h. If there is still a problem performing a memory initialization, refer to the procedure as detailed in Appendix A-9. The watch dog timer may have tripped and caused a "Watch Dog Error". This is not a problem. Pressing <SPACE> will reinitialize the unit.

i. If no message appears, remove the power connector, check all electrical connections, and repeat steps "d" through "g".

j. If no message appears, remove the program terminal connector, wait 30 seconds, replace the connector and repeat steps "e" through "g".

k. If, at this point still no message appears, mark the unit as unserviceable and return for repair.

3.5 **Menu System**

The Vedas II is set up with a menu system to access all functions. The following section describes the function of each menu selection. Refer to Appendix A-1 for a complete menu map.

Throughout the design of the Vedas II menu system, efforts were made to maintain common keys or constructs for particular functions. Therefore, throughout the menu system the following keys will always perform the designated functions listed in table 3-1.

KEY STROKE	FUNCTION
ESC (Escape Key)	Will always abort the current procedure and return the operator to the calling menu. If the operator is in the main menu when the escape key is struck, a system initialization procedure will be invoked.
BS (Back space)	Will always delete the previous key stroke if one exists.
DEL (Delete)	Will always delete the previous key stroke if one exists.
^	When the ^ character is placed at the beginning of an operator input all subsequent output to the screen is bypassed until the next operator input is required. This mode is used when down loading the Vedas II program requirements from a laptop or similar device.
CTRL-Y	When prompted to enter a string (ie. task label) the CTRL-Y combination erases the default string and prompts the operator with an empty line.
<default>	Upon prompting for an entry from the operator all numeric default or previous data will be located between less than and greater than signs. To accept the default condition the operator need only strike the <ENTER> key.

Table 3-1 **Common Key Functions**

3.5.1 **Main Menu**

The main menu is the core of the Vedas II menu system. From here, the operator can manipulate the task acquisition system, configure the Vedas II system, perform operator requested functions, perform a diagnostic checkout, enter the calibration mode and save the acquisition parameters of the Vedas II system and attached sensors.

These menus can be accessed from the program terminal interface, or the RS-232 interface, or the RS-485 interface or the modem. The keypad and display have their own menu selections. Refer to chapter 6 for information on the keypad menu system. This is a list of the main menu options.

```
  MAIN MENU
  =========
 1. Add Task
 2. Edit Task
 3. Delete Task
 4. Display VEDAS II Schedule
 5. Detailed Task Display
 6. VEDAS II Configuration Menu
 7. Operator Mode Menu
 8. Diagnostic Menu
 9. Calibrate Task
10. Archive Program Parameters
```

3.5.1.1 **Main Menu Selection 1. Add Task**

This selection allows the operator to add various task types to the Vedas II task system. Each one of these selections will start the programming sequence of the acquisition or output task specified. Use <ESC> to exit the sequence without saving it. When the acquisition task is programmed and the unit is initialized, the task will start collecting data. Refer to chapter 4 for a complete description of the programming sequences. The hardware must be present in the unit to support the task or the task will not be entered.

```
ADD TASK MENU
=============
 1. Add Analog Acquisition
 2. Add Digital Acquisition
 3. Add Pulse Counter Acquisition
 4. Add Shaft Encoder Acquisition
 5. Add High Speed Acquisition
 6. Add Serial Acquisition
 7. Add SDI-12 Acquisition
 8. Add Linked Acquisition
 9. Add Goes Power Acquisition
10. Add RF Transmitter Output
11. Add Modem Output
12. Add Radio Modem Output
```

3.5.1.2 **Main Menu Selection 2. Edit Task**

This selection displays a list of all valid tasks and prompts the operator for a task priority number. It then allows the operator to edit the programming of the specified task in the Vedas II task system. Refer to chapter 4 for a complete description of the programming sequences.

3.5.1.3 **Main Menu Selection 3. Delete Task**

This selection displays a list of all valid tasks and prompts the operator for a task priority number. The system will request confirmation of the delete order and then delete the specified task in the Vedas II task system. A response of "0" to the task ID prompt will delete all tasks after the operator confirms the request verification prompt. Task 50, the diagnostic task cannot be deleted.

3.5.1.4 **Main Menu Selection 4. Display Vedas II Schedule**

This selection displays all existing tasks in the Vedas II system. Information shown includes the system time, task priority, task type, the resource used, the number of Medium archives (ie. GOES/ARGOS archives), the time of the next acquisition, the acquisition interval, and the last data gathered which includes the task label, the data, and the time of the acquisition.

Heading	Description
P#	Task priority number
Task Type	Acquisition task type
Ch	Channel used
Op	Number of transmit memory archives used
Next Acq	Time of next acquisition (local time)
Acq Intvl	Acquisition interval rate (programmed value)
Latest Data	Label/data/time of last acquired value

Table 3-2 **Condensed Task Heading Descriptions**

```
Archive Capacity -> System Uninitialized
P#    Task Type    Ch    Op  Next Acq    Acq Intvl                          Latest Data
================================================================================
 2 -  HIGH SPEED   PC0   1   00:00:00    01:00:00   <Label>         / UNINITIALIZED
 3 -  SERIAL       232   1   00:00:00    01:00:00   <Label>         / UNINITIALIZED
 5 -  SDI-12       1-0   2   00:00:00    01:00:00   <Label>         / UNINITIALIZED
49 -  GOES OUTPUT  123   0   00:01:00    03:00:00   <Label>         / UNINITIALIZED
50 -  DIAGNOSTIC         0   48:00:00    01:00:00   <Label>         / UNINITIALIZED
12:27:06

Archive Capacity -> System Uninitialized
P#    Task Type    Ch    Op  Next Acq    Acq Intvl                          Latest Data
================================================================================
 1 -  ANALOG       +0-   1   00:00:00    01:00:00    Level          / UNINITIALIZED
 2 -  DIGITAL      D0    0   00:00:00    01:00:00   switches        / UNINITIALIZED
48 -  ANALOG       TMP   0   15:03:42    01:00:00   Card Temp.      /2.1035e+01/14:03:42
49 -  GOES OUTPUT  123   0   00:01:00    03:00:00   12345678        / UNINITIALIZED
50 -  DIAGNOSTIC         0   15:03:43    01:00:00                   / No Errors /14:03:43
14:04:09

Archive Capacity -> 1992.07.20
P# Task Type       Ch    Op  Next Acq    Acq Intvl                          Latest Data
================================================================================
 1 -  ANALOG       +2-   1   15:00:00    01:00:00    Level          / INITIALIZED
 2 -  DIGITAL      D0    0   15:00:00    01:00:00   switches        / INITIALIZED
 4 -  SDI-12       1-0   0   16:00:00    02:00:00   1-416-885-3220  / INITIALIZED
48 -  ANALOG       TMP   0   15:19:27    01:00:00   Card Temp.      / 2.1035e+01/14:19:33
49 -  GOES OUTPUT  123   0   16:00:00    03:00:00   12345678        / INITIALIZED
50 -  DIAGNOSTIC         0   15:19:34    01:00:00                   / No Errors /14:19:34
14:19:06
```

Figure 3-1 **Condensed Task Display**

The archive capacity line item indicates (in the case of an initialized system) the date at which the Flash memory archive will be full based on the current acquisition parameters. The archive memory can be set to overwrite the oldest data or to discard the new data.

The condensed display command may be refreshed by striking the <SPACE> bar.

3.5.1.5 **Main Menu Selection 5. Detailed Task Display**

This selection displays a list of all valid tasks and prompts the operator for a task priority number. This detailed task display will shows the acquisition parameters of the specified task. Entering a priority of zero (0) causes all the system parameters and tasks currently in the system to be displayed in detailed format. Below is an example of an analog task.

```
Task Priority  -> 1
Task Type -> Analog Acquisition
Input Type -> Differential
Analog Input Channel -> +2-
Measurement Type -> Voltage
Analog Output Voltage -> 3.000 Volts
Analog Output Channel -> A0
Switched 12 Volt Output -> None
Output Settling Time -> 00:00:01
Amp Gain -> 1
Task Label -> USER LABEL      (10 Digits Maximum)
Start of Acquisition -> 00:00:00
Interval of Acquisition -> 01:00:00
Number of Samples -> 1
Sample Option -> Last
Output Data Format -> 5 Digits
Archive Acquisition Data -> Y
Number of Output Archives -> 0
Formula Number -> 31
Calibration Gain -> 1.000000
Calibration Offset -> 0.000000
Alarm Limit -> None
--END--
```

Figure 3-2 **Detailed Task Display**

3.5.1.6 **Main Menu Selection 6. Vedas II Configuration Menu**

Selections from this menu include modifications of the software operating configurations. The Vedas II configuration menu is shown below. Further explanations are available in section 3.5.2.

```
   SYSTEM CONFIGURATION
   ====================
 1. Setup Program Terminal Interface
 2. Set Station Number/Name
 3. Set Date/Time/GMT
 4. Set Date Format
 5. Set Error Log Modes
 6. Set Archive Memory Modes
 7. Set Power Down Voltage
 8. Setup Modem Interface
 9. Enter Formula
10. Send Program Parameters
11. Overwrite Program Parameters
12. Set Menu Language
```

3.5.1.7 **Main Menu Selection 7. Operator Mode Menu**

Selections from this menu include operator control functions and inputs. The operator mode menu is shown below. Further explanations are available in section 3.5.3.

```
 OPERATOR MODE MENU
 ==================
 1. Immediate Task Execution
 2. View Archived Data
 3. Send Archived Data
 4. Display Current Output Message
 5. Create Emergency Message For RF Transmitter
 6. Display Formula List
 7. Test Formula
 8. Display Resident Task List
 9. Display PCMCIA Card Information
10. Erase/Format PCMCIA Card
11. Update VEDAS II Software From PCMCIA Card
```

3.5.1.8 **Main Menu Selection 8. Diagnostic Menu**

Selections from this menu include the direct communications with RF transmitters and serial or SDI-12 device(s). The menu also displays diagnostic tools for error detection and correction. The diagnostic menu is shown below. Further explanations are available in section 3.5.4.

```
 DIAGNOSTIC MENU
 ===============
1. Direct RF Transmitter Communication
2. Direct SDI-12 Communication
3. Direct Serial Communication
4. SDI-12 Communication Loopback Test
5. Test Display and Keypad
6. Test FASH
7. Clear Archive Memory
8. Display Error Log
9. Display VEDAS II Information
```

3.5.1.9 **Main Menu Selection 9. Calibrate Task**

To ease the process of setting the Vedas II output levels to the gauged level, a site calibration screen option has been incorporated into the Vedas II system. Refer to section 7.11 for a detailed description.

In summary this feature scrolls through each of the tasks displaying the task label and the current value. At each entry, the user has the option of entering a new (gauged/calibrated) value at which time the Vedas II will immediately perform a single sample of the sensor, compare the entered value against the value acquired from the sensor, and adjust the calibration offset accordingly. Subsequent sensor output values will reflect the new datum point entered by the user. The calibration offset of the task may be altered to bring the sensor into calibration.

3.5.1.10 **Main Menu Selection 10. Archive Program Parameters**

Selecting this option causes the current acquisition parameters to be stored in non-volatile memory. The program parameters consist of the acquisition tasks and the user entered formulas. Normally this process is performed automatically when the program terminal cable is removed. If the Vedas II unit loses power before the acquisition parameters are stored in non-volatile memory, all changes to the system will be lost.

3.5.2 VEDAS II Configuration Menu

The VEDAS II configuration menu allows the operator to set up, verify, or probe the system configuration status.

3.5.2.1 VEDAS II Configuration Menu Selection 1. Setup Program Terminal Interface

This option allows the user to set the program terminal baud rate and the password. The set-up program will prompt the user for a program terminal baud rate. The default is "0" which is the autobaud setting. If the unit is in autobaud mode it will sample an input space bar entry from the keyboard and set itself to match the baud rate of the terminal being used. The available baud rates for input are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600.

The set-up will then ask if the unit is to be password protected. If the unit is to be password protected, it will request the old password and a new password. The default password of a new unit is the space bar. If a password cannot be remembered, contact Valcom for assistance.

3.5.2.2 VEDAS II Configuration Menu Selection 2. Set Station Number/Name

This selection allows the operator to edit the current station number and the station name. Note that the station number and name, may also be entered during the Vedas II start-up procedure. If not set already, the station number is limited to an alphanumeric string of ten (10) characters. The station number is used to identify the station in the GOES output message, the start of day header in the archive memory storage and in the output message for the modem interface.

The station name is used to further describe the site location. The description is limited to 30 characters. Both the station number and station name are displayed in the Vedas II sign on message.

3.5.2.3 VEDAS II Configuration Menu Selection 3. Set Date/Time/GMT

This selection allows the operator to edit the current date, time and GMT (Greenwich Mean Time). Note that the system date and time may also be entered during the Vedas II start-up procedure. The date format consists of the year, month, and day separated by forward slashes (date example, October 21, 1994 would be represented as 1994/10/21). The time prompt refreshes the system time display until the operator hits either the <ENTER> key to accept the displayed value, or enters in new time. The time format consists of the hours, minutes, and seconds separated by colons in 24 hour format (time example, 03:21:30 pm would be represented as 15:21:30). The GMT is the offset, in hours, from the location of the Vedas II to zero degrees longitude in Greenwich England.

3.5.2.4 VEDAS II Configuration Menu Selection 4. Set Date Format

This option allows the user to select Y/M/D or M/D/Y or D/M/Y. The default is Y/M/D (Year/Month/Day).

3.5.2.5 VEDAS II Configuration Menu Selection 5. Set Error Log Modes

This selection allows the operator to force the Vedas II to reset the non-critical error log at midnight. The default setting of NO has the error log being cumulative over time. It also specifies whether or not it should record an error if it does reset the log.

3.5.2.6 VEDAS II Configuration Menu Selection 6. Set Archive Memory Modes

This selection allows the operator to edit the default memory archive mode of operation. When the archive memory becomes full, the ring option determines whether the Vedas II will start to overwrite the oldest archived data "Y" or whether no further data will be archived "N" and new data will be discarded. The default is YES.

3.5.2.7 VEDAS II configuration Menu Selection 7. Set Power Down Voltage

This is the minimum input voltage level that the Vedas II will permit as normal input voltage. It can be set between 9.5 volts and 11.5 volts. If the input voltage drops below the specified level, the Vedas II will go into power down mode and stop operating. The Vedas II will test the input voltage every ten seconds. If the voltage has increased above the set level, then the Vedas II will reactivate and re-initialize. The default is 10.75 volts.

3.5.2.8 **VEDAS II Configuration Menu Selection 8. Setup Modem Interface**

This selection allows the operator to set a password and select the type of modem interface required. It will first ask if the password is to be changed. It then offers the user four modem interface options: none, internal, external or other. If none is selected, it will be set for no modem interface. If any of the other three are selected the Vedas II unit will request inputs for the set-up of the device selected. The list is shown below and the current settings of the unit are shown in brackets. This list shows the defaults. If the current settings are correct simply hit <ENTER> or input a new setting.

```
Modem Baud Rate <9600> ->
Number of Bits (7 or 8) <8> ->
Number of Stop Bits (1 or 2) <1> ->
No Parity Bit
Tone Dial ? <Y> ->
Hang-Up Delay (1-10 min) <1> ->
Archive Modem Access Time ? <N> ->
Initial Data Dump ? <Y> ->
Modem Answer Message -> USER DEFINED (Up To 34 Characters)
```

Note: The Vedas II may reject a new modem setting if it conflicts with internal hardware. Selection of a different modem interface may require modification of shorting jumpers on the main printed wiring board inside the unit. Refer to section 2.3.2 internal jumper settings.

3.5.2.9 **VEDAS II Configuration Menu Selection 9. Enter Formula**

This selection will allow the user to input formulas for use by an acquisition task. There are 30 user defined formulas available, numbered 0 through 29. The Vedas II will display instructions for entering formulas and then display all of the formulas available for the user to enter or edit. Please refer to chapter 10 for detailed instructions on the use of formulas.

3.5.2.10 **VEDAS II Configuration Menu Selection 10. Send Program Parameters**

This option allows the operator to send the archived program parameters from the Vedas II, to either a PC (personal computer) or to the PCMCIA card. The program parameters are the acquisition tasks the unit has been programmed to perform. Storing them in a file will allow the operator to easily reload them if they are erased, or to program other units with exactly the same tasks.

3.5.2.11 **VEDAS II Configuration Menu Selection 11. Overwrite Program Parameters**

This option allows the operator to load new program parameters from either a PC or the PCMCIA card to the Vedas II unit. It can also reload all of the default configuration settings into the Vedas II.

3.5.2.12 **VEDAS II Configuration Menu Selection 12. Set Menu Language**

This option allows the user to select English or French when interfacing with the Vedas II menu system. The default is English.

3.5.3 Operator Mode Menu

The operator mode menu allows the operator to verify the operation of the connected sensors, and to perform archive memory operations.

3.5.3.1 **Operator Menu Selection 1. Immediate Task Execution**

This option allows the operator to immediately execute a data acquisition task and send the acquired data to the programmers terminal. This local acquisition does not place any information in the archive memory nor will it update the RF transmitter archive buffer. Simply enter the priority number of the task to be executed. Refer to section 5.1 for more information.

3.5.3.2 **Operator Menu Selection 2. View Archived Data**

This option allows the operator to view the acquired data in the Flash memory. Enter the date and time of the data to be viewed. The operator is prompted to enter the labels of the data required. If no labels are entered, (strike <ENTER> at first label request) all labels will be dumped. During the archive dump the operator may use the <ESC> key to abort the listing or alternately use the space key to stop the listing for observation. Any subsequent key will continue the archive dump.

3.5.3.3 **Operator Menu Selection 3. Send Archived Data**

This option allows the operator to transmit the acquired data from the Flash memory to a PC or the PCMCIA card. It operates similarly to viewing archive data, except this is done in binary. If you are using the PCMCIA card the unit will prompt the user for a file name. The Vedas II will store the archived data on to the PCMCIA card as if it were a floppy disk.

The second option is to dump the data directly to the personal computer. The Vedas II will send the data to the screen in binary format. If the operator is using procomm they can open a file and capture the data in a file. If the opertor is using V2UP.EXE then the Vedas II will ask if it should store the data directly to a file. The Vedas II will then prompt for a file name.

The personal computer option interfaces with the V2UP.EXE program to store the data into a file. The function being used is <CTRL-PGDN> in the V2UP program. The data is written directly to disk in binary format. The function <ALT-A> will do the conversion to ASCII code from the binary file. Press <ALT-A> and then input the binary file name and then a text file name.V2UP.EXE will prompt the user to do the conversion automatically The Vedas II will store the ASCII text data in a file that can be read by most text editors.

3.5.3.4 **Operator Menu Selection 4. Display Current Output Message**

This option displays the current output message that has been loaded into modem or the RF transmitter.

3.5.3.5 **Operator Menu Selection 5. Create Emergency Message**

The Vedas II system supports the entry of an emergency message which will be transmitted via the modem or RF transmitter option. Refer to section 5.2 for further details regarding this option.

3.5.3.6 **Operator Menu Selection 6. Display Formula List**

This feature produces a listing of the acquisition formulas currently contained in the system. The listing will display all of the user input formulas, 0 through 29, and all of the predefined formulas, 30 though 43. Refer to chapter 10 entering new formulas. A sample formula listing is shown below.

```
VEDAS II Formula List
==================              (where x = Current Task's Acquisition Value)

30/even = (x + Calibration Offset) * Calibration Gain
31/odd  = (x * Calibration Gain  ) + Calibration Offset
32/23 = x * x
34/35 = 1 / x
36/37 = Lakewood Temp. Probe (10 KOhm, 5 V Exite) 0-5 Volt Output to Deg. C
38/39 = Campbell Scientific Temp. Probe (HMP 35C) 0-5 Volt Output to Deg. C
40/41 = Converts 4 Bit 77C Wing Sensor Direction into Degrees
42/43 = GOES TGT-1 Power Output Conversion to dbm
-- End of List --
```

Figure 3-3 **Vedas II Formula Listing**

3.5.3.7 **Operator Menu Selection 7. Test Formula**

This option can be used to test any of the formulas entered in the memory. Input a gain, an offset and a value for the acquisition input and compare the answer to an expected value. All newly entered formulas should be tested for accuracy.

3.5.3.8 **Operator Menu Selection 8. Display Resident Task List**

This option produces a listing of the resident tasks that are available on the system. These tasks are designed to be used as alarm tasks activated by another acquisition task. There are currently eight "Resident Tasks" that can be executed as "Alarm Activated Tasks" or by "Immediate Task Execution". They are as follows:

```
P#    Resident Task Description
===   ========================
100 = Disable RF Transmitter
101 = Enable  RF Transmitter
102 = Disable Switched 12V Output 12S0
103 = Enable  Switched 12V Output 12S0
104 = Disable Switched 12V Output 12S1
105 = Enable  Switched 12V Output 12S1
106 = Display Greenwich Mean Time (GMT)
107 = Beep Program Terminal Bell
-- End of List --
```

3.5.3.9 **Operator Menu Selection 9. Display PCMCIA Information**

This option displays information about the PCMCIA card that has been inserted into the PCMCIA memory card slot. The card must be present. It will display the number of free bytes, the write protection status and the manufacturer's information about the card itself.

3.5.3.10 **Operator Menu Selection 10. Erase/Format PCMCIA Card**

This option will erase and format the PCMCIA card. When the formatting is completed, the card will be empty and ready to store archived data.

3.5.3.11 **Operator Menu Selection 11. Upgrade Vedas II Software From PCMCIA Card**

This option allows the operator to load new Vedas II Software from the PCMCIA memory card. The card must contain a new version of Vedas II Software.

3.5.4 **Diagnostic Menu**

The diagnostic menu allows the operator to verify the integrity of the Vedas II unit and connected peripherals and to perform set-up procedures on serial sensors prior to acquisitions (ie. set SDI-12 device address, etc.). Refer to section 5.0, system utilities and diagnostics for further information on the topics discussed below.

3.5.4.1 **Diagnostic Menu Selection 1. Direct RF Transmitter Communication**

This option allows direct communication with the RF transmitter.

3.5.4.2 **Diagnostic Menu Selection 2. Direct SDI-12 Communication**

This option allows direct communication with an SDI-12 channel.

3.5.4.3 **Diagnostic Menu Selection 3. Direct Serial Communication**

This option allows direct communication with a serial port.

3.5.4.4 **Diagnostic Menu Selection 4. SDI-12 Communication Loopback Test**

This option allows the operator to verify the integrity of the SDI-12 communication ports.

3.5.4.5 **Diagnostic Menu Selection 5. Test Display and Keypad**

This option allows the operator to test the operation of the display and the keypad if they are present on the unit.

3.5.4.6 **Diagnostic Menu Selection 6. Test FLASH**

This option allows the operator to perform a checksum calculation on the Flash memory to verify system integrity.

3.5.4.7 **Diagnostic Menu Selection 7. Clear Archive Memory**

This option allows the operator to erase all of the Archive Memory contained in the system. Each memory bank, “0" through “9" will be erased to clear old data.

3.5.4.8 **Diagnostic Menu Selection 8. Display Error Log**

This option allows the operator to view and subsequently clear the system error log. Refer to Appendix A.3 for a description of Vedas II errors.

3.5.4.9 **Diagnostic Menu Selection 9. Display Vedas II Information**

This option will display information about the Vedas II unit. The information includes recent usage and the hardware options that are installed.

3.5.5 **Calibrate Task**

This option eases the task of matching the Vedas II acquired value to the actual gauged site value. The procedure requires the operator to measure and enter the gauged value. The Vedas II then performs a single acquisition, compares the two values, and adjusts the calibration offset parameter by the compared difference. The site calibration option is further described in section 7.11, site calibration.

Section 4.0

ACQUISITION PROGRAMMING

4.1 **Introduction**

The Vedas II unit is designed to activate and read data for a wide variety of weather sensors. Each Vedas II sensor reading is performed by an acquisition task. Tasks must be programmed by the operator to perform data input and control. The Vedas II unit has an easy to use programming procedure. The programming procedure will request the information it needs to set up an acquisition task. It offers default settings and other choices, the defaults are often the best setting. The Vedas II system contains eight types of acquisition tasks, two types of data output tasks and a diagnostic task. Each acquisition task type is dedicated to obtaining data from a particular type of interface, such as an analog task which can take temperature readings or an SDI task for polling a shaft encoder. Each different type of sensor has different interface requirements. Therefore each acquisition task will contain specific parameters for dealing with the type of interface to which it is dedicated. All acquisitions tasks have some program parameters in common. The Vedas II unit will query the operator for each parameter it requires to do a specific job while the task is being set up. Any parameter the Vedas II does not require is not requested.

This section deals with the actual programming parameters, their options, and defaults for each type of acquisition and data output tasks. The general information section contains points which the acquisition programmer should keep in mind during the programming procedure. It should also be noted that the Vedas II has two programming menu options: 1. Add task menu for entering new acquisition tasks and 2. Edit task which can be used to modify the task parameters. The program parameters can be easily changed if they are not initially correct.

4.2 **General Information**

4.2.1 **Parameter Defaults**

The Vedas II software provides the programmer with default entries for most of the program parameters. Simply press <RETURN> to accept the default choice offered. The default is shown in brackets at the end of the line <Default>. When in doubt, the programmer can use the defaults provided.

4.2.2 **GOES Update Time**

The GOES transmitter (RF transmitter) output task gathers and formats all data to be transmitted and sends it to the GOES transmitter for transmission. The programmer should be aware that the data gathering process starts one (1) minute before the scheduled time of transmission. In other words, all acquisitions with data to be transmitted should be completed before the data gather process begins. Acquisitions that finish after the data gathering process will be queued for the next transmission slot.

4.2.3 **Midnight Violations**

To increase the reliability of the Vedas II system it has been designed to re-generate itself at midnight (local time). The regeneration process will, at midnight, cancel any acquisition task in process and regenerate the task time table for the new day. The programmer must be aware that if an acquisition process transverses midnight, the acquisition will be terminated and the data lost. It is up to the programmer to insure that all acquisition procedures are finished before midnight occurs.

4.2.4 **Hardware Contentions**

For those instances where two or more acquisitions require the same piece of Vedas II hardware, the hardware is allocated on a time based priority system. The first acquisition scheduled will use the hardware until it is finished. The subsequent requests for hardware are then run. If a task requests use of hardware that is allocated, it is queued and waits until the hardware is free. If two acquisitions have the same time then the one with the lower priority number is taken first. The resulting time stamp associated with each acquisition will exhibit any delays encountered due to hardware contentions. The TX archive allocation determination is on the programmed start time and is not affected by hardware contentions.

4.2.5 **Sensor Warmup**

For acquisitions that have a sensor warm up time, it should be noted that the activation of the strobe or voltage reference signal will occur at the acquisition start time minus the specified warm up time. The acquisition will start at the scheduled time.

4.3 **Data Acquisition Tasks**

4.3.1 **Common Task Elements**

All acquisition tasks involve several common parameters for each task. These parameters are prompted for during each task addition/edit and are completely specific to each task. A list and description of the common task elements follow.

4.3.1.1 **Task Priority** . . . . . No Default

This parameter determines the relative position the acquired data will occupy in the telephone and GOES output messages. As it is also the value used to index/reference each task entered into the system, there may be only one task per priority number. Priority values 1 to 47 have been dedicated to user entered tasks. The analog temperature calibration, RF transmitter output and diagnostic tasks are located from 48 to 50.

4.3.1.2 **Task Label** . . . . . No Default

The Task Label may consist of up to 10 alphanumeric characters. The task label will precede the processed acquisition values in the output message(s). If the Vedas II is equipped with a GOES transmitter the NESDIS authority has predetermined what task labels must accompany standard sensors.

4.3.1.3 **Start Of Acquisition** . . . . . Default (00:00:00)

The start of acquisition time is the time of the first acquisition after midnight. Format is in hours, minutes, and seconds (ie. 1 hour = 01:00:00). If the entered task is to be alarm activated only, a start time of 24:00:00 must be used.

4.3.1.4 **Interval Of Acquisition** . . . . . Default (01:00:00)

The interval of acquisition is the time lapsed between sensor acquisitions. Format is in hours, minutes, and seconds. (ie. 1 hour = 01:00:00).

Examples:

Start Of Acquisition	Interval of Acquisition	Acquisition Times
00:00:00	01:00:00	00:00:00, 01:00:00, 02:00:00, 03:00:00, 04:00:00, ...
00:00:15	00:20:00	00:00:15, 00:20:15, 00:40:15, 01:00:15, 01:20:15, ...
00:01:00	00:05:00	00:01:00, 00:06:00, 00:11:00, 00:16:00, 00:21:00, ...
06:00:00	01:00:00	06:00:00, 07:00:00, 08:00:00, ... 23:00:00, 06:00:00, ...

Table 4-1 **Example, Acquisition Intervals**

4.3.1.5 **Number Of Samples** . . . . . Default (1)

The number of samples parameter allows the operator to specify the number of samples to be taken during each acquisition period. The samples may then be processed as selected by the operator.

4.3.1.6 **Period Of Acquisition** . . . . . Default (1/second)

When more than one sample is chosen, the period of acquisition determines the time period over which the specified samples will be taken. The software divides the specified number of samples into the period of acquisition to determine the time interval between each sample. The software limits the operator to a maximum of 1 sample per second. The formula below determines the time interval between respective samples.

interval between samples = period of acquisition / (# samples - 1)

Examples

Sampling Description	Number of Samples	Period of Acquisition	Sample Times
Hourly Average of 4 samples	4	0:45:00	00:00:00, 00:15:00, 00:30:00, 00:45:00
Acquisition to consist of 10 samples over 20 seconds	10	0:0:18	00:00:00, 00:00:02, 00:00:04, ...00:00:18
Acquisition to consist of 5 minute samples over 24 hours	288	23:55:00	00:00:00, 00:05:00, 00:10:00, ... 23:55:00
Start of Acq : 00:03:00 Interval of Acq : 01:00:00	12	00:55:00	00:03:00, 00:08:00, 00:13:00 .... 00:58:00

Table 4-2 **Example, Sample Intervals**

4.3.1.7 **Sample Option** . . . . . Default (average)

When more than one sample is chosen, the sample option allows the operator to find the maximum sample, find the minimum sample, record the last sample, average all samples or find a total of all of the samples. The following lists the operator input value and the corresponding sample options.

0 = MINIMUM
1 = MAXIMUM
2 = LAST
3 = AVERAGE
4 = TOTALIZE

Normally the time stamp associated with an acquisition is the programmed start time of the acquisition. Sampling option 0 (minimum) and 1 (maximum), however, do **NOT** use the start time as the time stamp, instead, they use the acquisition time of the sample that represents the maximum or minimum value respectively. In this manner, the acquisition time stamp notifies the operator of the time the minimum or maximum event occurred. The RF archive allocation method does **NOT** change with the sample option.

4.3.1.8 **Archive Acquisition** . . . . . Default (yes)

The archive acquisition option allows the operator to select whether the processed acquisition value is to be stored in archive memory.

4.3.1.9 **Number Of TX Archives** . . . . . Default (0)

The number of TX archives option determines the number of acquisitions to be stored for RF transmittal. This entry allows the operator to program for full data redundancy for critical acquisitions and send no data (0 TX archives) for acquisitions of minor importance. The maximum number of archives permitted by the system depends on the RF transmitter used. If the transmission exceeds the maximum transmission length, the output message will be automatically truncated at transmission time.

4.3.1.10 **TX Archive Offset** . . . . . Default (00:00)
The TX archive offset is the time offset in hours and minutes from midnight to the first sensor acquisition that is to be placed in a TX archive buffer. This offset should correspond to the time stamp of the first acquisition of the day that is to be transferred to the RF transmitter.

4.3.1.11 **TX Archive Interval** . . . . . Default (01:00)
The TX archive interval is the time in hours and minutes between successive acquisitions that are to be placed in the TX archive buffer. See table 4-3 and table 4-4 for examples regarding RF data transmission settings.

Examples:

Start Of Acquisition	Interval of Acquisition	TX Archive Offset	TX Archive Interval	Acquisition Archival Times
00:00:00	01:00:00	00:00	01:00	00:00:00, 01:00:00, 02:00:00 ..
00:00:00	00:20:00	00:20	01:00	00:20:00, 01:20:00, 02:20:00 ..
00:01:30	00:05:00	00:01	00:30	00:01:30, 00:31:30, 01:01:30 ..
06:00:00	01:00:00	06:00	04:00	06:00:00, 10:00:00, 14:00:00 ..

Table 4-3 **Example, TX Archive Settings**

Number of TX Archives	TX Archive Offset	Tx Archive Interval	TX Archive Time stamps at the end of the day
6	00:00	01:00	23:00, 22:00, 21:00, 20:00, 19:00, 18:00
6	00:05	00:20	23:45, 23:25, 23:05, 22:45, 22:25, 22:05
8	00:10	00:30	23:40, 23:10, 22:40, 22:10, 21:40, 21:10, 20:40, 20:10
2	23:55	24:00	23:55, 23:55 (of previous day)

Table 4-4 **Example, TX Archive Contents**

4.3.1.12 **Formula Number** . . . . . Default (31)
The formula number allows the operator to specify that the acquired data value is to be post-processed by a pre-determined formula/transform. Formula numbers from 0 to 29 are for user specified transformation formulas. The formula number also determines the method by which the calibration slope and offset will be applied to the acquired data. An even formula number will add the offset before multiplying by the slope while an odd formula number will multiply the slope and then add the offset. Refer to the formula listing option in the operator mode menu. Use default formula 31 if no preprocessing is desired.

ie. Formula = EVEN -> result = slope x (value + offset)
Formula = ODD -> result = (slope x value) + offset

4.3.1.13 **Calibration Gain** . . . . . Default (1.00)
The calibration gain parameter allows the operator to apply a linear conversion factor, or slope, to transform raw acquisition data into engineering units. The formula number determines the method in which this parameter is applied.

4.3.1.14 **Calibration Offset** . . . . . Default (0.00)

The calibration offset parameter allows the operator to apply an offset factor to transform raw acquisition data into engineering units, which may also be used to compensate for site abnormalities or offsets. The formula number determines the method in which this parameter is applied.

4.3.1.15 **Alarm Limit** . . . . . Default (0.00)

The alarm limit allows the operator to specify an alarm limit which when equal to, or exceeded by the acquired data, will cause an alarm task to be activated. An alarmed task can be any entered task in the Vedas II system. Tasks may also be set up as an alarm only task (ie. set start of acquisition to 24:00:00) which is then only activated in an alarm condition. The Vedas II supports three types of alarm modes: fixed level, rate of change, and fixed interval. Refer to table 4-5 for the entry format of each type of alarm. Refer to Appendix A-8 for a detailed description of each alarm type.

Alarm Type	Entry Format	Example
Fixed Level	>(value) <(value)	>5.50 <2.40
Rate of Change	@(value)	@2.2
Fixed Interval	#(start)+(interval) #(start)-(interval)	#20+2 #10-5

Table 4-5 **Alarm Entry Formats**

4.3.1.16 **Attach Alarm To Task**

This option allows the operator to specify the priority number of the tasks to be invoked by alarm activation. The operator may specify a maximum of 5 tasks. The tasks must currently exist in the system. Selecting a task priority of 0 terminates the selection.

The Vedas II supports several “resident tasks” which may be invoked as an alarmed task. These resident tasks can be used to stop certain functions from occurring, such as disabling the GOES transmitter if the VSWR becomes too high. The following documents the currently existing resident tasks:

Task Priority	Resident Task Function
100	Disable RF Transmitter
101	Enable RF Transmitter.
102	Disable Switched 12 V Output 12S0
103	Enable Switched 12 V Output 12S0
104	Disable Switched 12 V Output 12S1
105	Enable Switched 12 V Output 12S1
106	Display Greenwich Mean Time (GMT)
107	Beep Program Terminal Bell

Table 4-6 **Priority Numbers, Resident Tasks**

4.3.2 **Analog Sensor Task**

The analog task requires that a supporting analog section be present in the system. The analog task converts a voltage present at the specified channel input to a digital representation. The operator has the option of applying a pre-amp signal gain factor of 1, 10, 100 or 1000 before the conversion is made. The operator also has the option of attaching a reference voltage and/or a +12 volt strobe to the acquisition in order to fulfil the voltage excitation/power requirements of the sensor. The sensor warm up time (ie. time that the reference voltage/strobe is to be present before the acquisition is performed) is programmable by the operator.

An analog temperature task is created automatically. The temperature task measures an onboard temperature sensor to determine the ambient conditions of the board components. The board ambient temperature is then used to reference a correction factor contained in the Vedas II program. The correction factor compensates for component error due to temperature.

4.3.2.1 **Analog Inputs**

The analog inputs consist of 7 differential input channels (0 thru 6) and 7 single ended input channels (Q+, R+, S+, A0, A1, A2 and A3). The 7 differential inputs can also be used as 14 single ended input channels (A to P) or any combination using each channel only once. Both the differential and single ended channels have a voltage input range of -5 to +5 volts with respect to the ground potential.

4.3.2.1.1 **Differential**

The differential input channels have a high noise immunity and are good for measuring low voltage signals. However to achieve this, the user must ALWAYS connect both the + and the - terminals.

4.3.2.1.2 **Single Ended**

The single ended channels do not have good noise immunity and should not be used with a 10x or 100x or x 1000 gain settings. However the negative connection is not required if the sensor signal output is with respect to the sensor ground potential.

4.3.2.1.3 **Using Reference Voltage**

To create an acquisition for a sensor that requires an external biasing voltage (range 0-5 volts), the operator must input the required bias voltage, select a reference voltage channel to connect the sensor to, and determine the required warm up time delay required by the sensor.

4.3.2.1.4 **Using +12 Volt Strobe**

To create an acquisition for a sensor that requires a +12 volts strobe the operator must select the +12 volt option and determine the required warm up time delay required by the sensor.

4.3.2.2 **Battery Voltage Measurement**

Creating a battery voltage acquisition task requires the operator to select an analog acquisition, choose a priority and then select input type “3 = Battery” and continue with the task as required. This selection will measure the battery voltage and automatically display it in volts.

4.3.2.3 **Temperature, Internal**

When an analog section is included in the system, a temperature task is allocated in order to provide a temperature compensated correction to subsequent analog acquisitions. The Vedas II automatically accesses the internal temperature sensor and an analog acquisition task reads the existing temperature.

The temperature task created by the addition of an analog section in the system has a start time of 25:00:00. The Vedas II software converts a specified start time of 25:00:00 to indicate an immediate start. This time indication insures the Vedas II software will perform a temperature task acquisition immediately after the system is initialized. This in turn causes the temperature compensated correction data to be loaded for subsequent analog tasks. If the operator changes the start time of the temperature task, all data acquired by analog acquisitions performed before the temperature task will be calculated with incorrect temperature compensation coefficients.

4.3.2.4 **Analog Acquisition Task Programming**

4.3.2.4.1 **Task Priority** . . . . . No Default
This is a value from 1 to 47. Please refer to the section on common task elements for more information.

4.3.2.4.2 **Input Type** . . . . . Default (0 = Differential)
This allows the operator to select the type of analog task required. There are four alternatives (0=Differential, 1=Single Ended, 2=Battery, 3=Temperature). The default is a differential analog input. The user can also select single ended analog inputs or internal measurements of the battery voltage or the temperature.

4.3.2.4.3 **Analog Input Channel** . . . . . Default (0 or A)
The channel number allows the operator to select the analog input channel from which the analog measurement will be made. Differential from 0 (+ and -) to 6 (+ and -), or A through S and A0 - A3 for single ended inputs. The Vedas II will prompt the operator appropriately depending on the input type selected.

4.3.2.4.4 **Measurement Type** . . . . . Default (0 = Volts)
The Vedas II unit can measure voltage, frequency or determine resistance. The default is to measure voltage and convert it into a digital value for storage and calculation. Vedas II also measures the frequency of an input signal (refer to section 4.3.3.4). It operates similarly to the high speed input. An analog acquisition can also be used to determine the resistance of a sensor or unknown resistor, (Refer to section 4.4.3). The Vedas II will prompt the operator appropriately depending on the measurement type required.

4.3.2.4.5 **Analog Output Voltage** . . . . . Default (0.000)
The reference voltage input allows the operator to specify if a reference voltage is required by the sensor. If an excitation voltage is not required, a value of "0" (default) is entered. If an excitation voltage is required, the user enters the appropriate voltage (0.000 through +5.000 volts) at the prompt.

4.3.2.4.6 **Analog Output Channel** . . . . . Default (2=None)
If an analog output reference voltage is specified, the operator will be prompted to select an output channel. There are four output channels available, (A0 to A3). The Vedas II unit will monitor usage of these outputs and alert the operator if a channel is being used by more than one task. It is the responsibility of the operator to make sure that if an output channel is being used by two different tasks it will not affect the sensor readings.

4.3.2.4.7 **Switched 12 Volt Output** . . . . . Default (0)
The switched 12 volt output allows the operator to attach a +12 volt strobe to the task. If a +12 volt strobe is not required, an input of "2 = None" is specified when programming the task. Strobes 12S0 and 12S1 refer to the +12 volt strobes outputs attached to the power outputs on the connector board on the side of the unit. The +12 volt strobe is installed on all units.

4.3.2.4.8 **Output Settling Time** . . . . . Default (00:00:01)
If a reference voltage or +12 volt strobe is required, the operator is prompted to specify the amount of time that the reference voltage and/or +12 volt strobe is to be present before the acquisition process is started. The warm up time is specified in a HH:MM:SS format.

4.3.2.4.9 **Amplifier Gain** . . . . . Default (1x)

The gain factor prompts the operator to select a signal pre-amp gain factor before the analog to digital conversion is performed. The analog board pre-amp can be set to have a gain of 1x, 10x, 100x or 1000x. Refer to table 4-8 for the maximum voltage range available when using 10x, 100x or 1000x gain.

Gain Factor	Voltage Range
1x	-5.0 to +5.0
10x	-0.5 to +0.5
100x	-0.05 to +0.05
1000x	-0.005 to +0.005

Figure 4 -7 **Gain Factor Voltage Ranges**

4.3.2.4.10 **Common Task Elements** . . . . . Defaults (as specified)

Refer to section 4.3 for a description of the reminder of the task programming elements.

4.3.3 Digital Sensor Tasks

4.3.3.1 **Parallel Input**

The digital task is for parallel input or output on the digital I/O connector. The digital I/O connector is for digital inputs and outputs D0 to D5 only. D0 to D5 are always available. The other digital inputs share hardware with the SDI inputs and the pulse counter inputs, these are referred to as D6 to D12. D6 and SDI-0 are common, D7 and SDI-1 are also common. D8 through D12 are equivalent to PC0 through PC4. The operator selects a number of consecutive bits as inputs by specifying the starting bit location and the number of bits required. The operator may optionally attach one of eight digital output strobes to each digital task. If a strobe is attached to the digital task, it is assumed that the digital sensor has an output disable capability thereby allowing the parallelling of several digital sensors, each being activated by a different strobe. Optionally the operator may want to setup a dummy digital task to use the attached strobe output to activate an external device.

4.3.3.1.1 **Task Programming**

4.3.3.1.1.1 **Task Priority** . . . . . No Default

This is a value from 1 to 47. Please refer to the common task elements section for more information.

4.3.3.1.1.2 **Digital Input LSBit** . . . . . Default (0)

The starting bit number specifies the bit number connected to the least significant bit of the digital sensor.

4.3.3.1.1.3 **Number Of Input Bits** . . . . . Default (1)

The number of significant bits specifies the number of bit locations required by the digital sensor. For example,if the starting bit number equals 2 and the number of significant bits is set to 11, then the LSB of the digital sensor must be connected to bit 2 and MSB to bit 12. There are 0 through 12 available.

4.3.3.1.1.4 **Bit Input Mode** . . . . . Default (Binary)

The bit input mode allows the operator to specify the data format of the connected digital input, either binary or BCD.

4.3.3.1.1.5 **Invert Input** . . . . . Default (No)

The invert input mode allows the operator the option of inverting the input before processing. This option is required if the sensor employs a negative logic output. D8 - D12 (PC0 - PC4) have internal pull up resistors and must be pulled down to record a low input.

4.3.3.1.1.6 **Number of Output Bits** . . . . . Default (0)
The number of bits that are to be used for digital output signals. There are 8 outputs available, D0 through D7.

4.3.3.1.2 **Common Task Elements** . . . . . Defaults (as specified)
Refer to section 4.3 for a description of the reminder of the task programming elements.

4.3.3.2 **Pulse Counter Tasks**

The pulse counter task counts the number of input pulses over a given time period. The operator may select a pulse counter input channel. The input will then be sampled every 10 ms with either a rising, falling, or both edges causing a counter increment.

4.3.3.2.1 **Task Programming**

4.3.3.2.1.1 **Pulse Counter Channel** . . . . . Default (PC0)
There are 7 channels available. They are PC0 through PC4 and SDI-0 and SDI-1. PC0 through PC4 are pulled high and must be switched with ground. SDI-0 and SDI-1 require +5 volts inputs to be switched.

4.3.3.2.1.2 **Transition Level** . . . . . Default (Rising)
The transition level input allows the operator to select how the counter will be incremented. The options are rising, falling, or both. Both will count twice as fast.

4.3.3.2.1.3 **Reset Counter After Each Sample** . . . . . Default (Yes)
This option allows the operator to reset the count to zero after each sample occurs. The sample length is set in the acquisition interval. If the input pulses occur at 20 per second and the interval is one minute, then the pulse counter task will record 1200 pulses and reset to zero. The display should read 1200.

4.3.3.2.2 **Common Task Elements** . . . . . Defaults (as specified)
Refer to section 4.3 for a description of the reminder of the task programming elements.

4.3.3.3 **Shaft Encoder**

The shaft encoder task can be used to directly connect to an incremental shaft encoder that does not have an SDI interface. This usually involves four wires, power, ground, LSBit and MSBit. The Vedas II has an internal shaft encoder connector for interfacing the optional internally mounted shaft encoder. This connector can be used with direct connections or SDI interfacing.

4.3.3.3.1 **Task Programming**

4.3.3.3.1.1 **Shaft Encoder Channel LSB Bit** . . . . . Default (PC0)
The shaft encoder LSB number specifies the least significant bit number of the two shaft encoder inputs. The allocated bits must be dedicated solely to the shaft encoder function. PC0 and PC1 are connected to the internal shaft encoder connector. The choices are PC0, PC1, and PC3. PC0 uses PC0 and PC1 internally or on the connector board, PC1 uses PC1 and PC2 on the connector board, and PC3 uses PC3 and PC4 on the connector board.

4.3.3.3.1.2 **Switched 12 Volt Output** . . . . . Default (None)
The switched 12 volt output allows the operator to attach a +12 volt strobe to the task. If a +12 volt strobe is not required, an input of "2 = None" is specified when programming the task. Strobes 12S0 and 12S1 refer to the +12 volt strobes outputs attached to the Power Outputs on the connector board on the side of the unit. The +12 volt strobe is installed on all units.

4.3.3.3.2 **Common Task Elements** . . . . . Defaults (as specified)
Refer to Section 4.3 for a description of the reminder of the task programming elements.

4.3.3.4 **High Speed Acquisition**

The high speed event counter consists of a high speed counter input which is gated by a known time base. The base result of a high speed counter acquisition is displayed as a frequency measurement in hertz. The input can be up to 200 KHz, from 20 mV to 20 volts.

4.3.3.4.1 **Task Programming**

4.3.3.4.1.1 **High Speed Input Channel** . . . . . Default (0)
The operator can select from two high speed inputs, HS0 and HS1 on the pulse input strip on the connector board.

4.3.3.4.1.2 **Maximum Frequency** . . . . . Default (200 KHZ)
This allows the operator to specify a maximum frequency to be measured. The default is the absolute maximum available.

4.3.3.4.1.3 **Switched 12 Volt Output** . . . . . Default (None)
The switched 12 volt output allows the operator to attach a +12 volt strobe to the task. If a +12 volt strobe is not required, an input of "2 = None" is specified when programming the task. Strobes 12S0 and 12S1 refer to the +12 volt strobes outputs attached to the power outputs on the connector board on the side of the unit. The +12 volt strobe is installed on all units.

4.3.4 **Serial Acquisition**

The serial acquisition task receives serial data from one of the serial ports. The serial acquisition has been designed to support both known serial sensors as well as a general sensor type providing it conforms to the required parameters. If a customer wishes to use a serial sensor not supported by the current software version, they should contact Valcom Limited directly and inquire about obtaining sensor support.

4.3.4.1 **Serial Task Reading**

The serial acquisition is designed to support multiple data values contained in the returned sensor message. It processes the first piece of data presented by the sensor. The serial task performs the physical acquisition and therefore requires the appropriate acquisition timing parameters to determine the time of acquisition.

4.3.4.2 **Default Sensor Format**

The general sensor type has been designed to expect data strings of fixed lengths that contain one or multiple data values in each message received. The receiving algorithm parses the received data string discarding all non-numeric characters until the first numeric value is found. Subsequent numeric values are converted to a value. This is considered to be the first acquired value. Parsing, then continues for the second value, etc. Please refer to section 13, "Vedas II Programming Examples" for an example of the serial acquisition parsing technique.

4.3.4.2.1 **Task Programming**

4.3.4.2.1.1 **Number of Data Values** . . . . . Default (1)
The number of data values parameter specifies the number of data values to be processed from the incoming serial message.

4.3.4.2.1.2 **Serial Channel** . . . . . Default (RS232)
The operator may select from the RS-232 port on the connector board or the RS-485 port on the same connector.

4.3.4.2.1.3 **Driver Always On ?** . . . . . Default (No)
This option allows the operator to specify if the RS-232/RS-485 Driver output voltage is to be continuously present. The serial drivers will consume approximately 15 mA continuous current.

4.3.4.2.1.4 **Baud Rate** . . . . . Default (9600)
The serial ports supports baud rates of: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600.

4.3.4.2.1.5 **Number Of Bits** . . . . . Default (8)
The operator must match the expected serial data format to the Input serial data format. The default is 8 Bits with 1 stop bit and no parity. The operator may select 8 bit or 7 bit data format.

4.3.4.2.1.6 **Number Of Stop Bits** . . . . . Default (1)
The operator may select 1 or 2 stop bits.

4.3.4.2.1.7 **Parity Bit** . . . . . Default (None)
The operator may select, none, even or odd parity if the number of bits has been set to seven. If eight bits are selected it will use no parity always.

4.3.4.2.1.8 **Message Length (1-127)** . . . . . Default (32)
The number of characters in the message.

4.3.4.2.1.9 **Switched 12 Volt Output** . . . . . Default (None)
The Switched 12 volt output allows the operator to attach a +12 volt strobe to the task. If a +12 volt strobe is not required, an input of "2 = None" is specified when programming the task. Strobes 12S0 and 12S1 refer to the +12 volt strobes outputs attached to the power outputs on the connector board on the side of the unit. The +12 volt strobe is installed on all units.

4.3.4.2.2 **Common Task Elements** . . . . . Defaults (as specified)
Refer to section 4.3 for a description of the remainder of the task programming elements.

4.3.5 SDI-12 Acquisition

The controller board has two SDI-12 interfaces marked as SDI-12 channel 0 and SDI-12 channel 1. The SDI-12 operation is in accordance with the SDI-12 interface standard. Refer to Appendix A-10 for further information on the SDI-12 structure and protocol.

4.3.5.1 SDI Task Readings

The SDI-12 acquisition is designed to support multiple data values contained in the returned sensor message. The SDI task performs the physical data acquisition process, and therefore requires the appropriate acquisition timing parameters to determine the time of acquisition.

4.3.5.2 Task Programming

4.3.5.2.1 **Number Of Data Values** . . . . . Default (1)
The number of data values determines the number of data values to be processed from the incoming SDI-12 message.

4.3.5.2.2 **SDI-12 Channel Number** . . . . . Default (1)
The SDI-12 channel determines the SDI-12 port channel number on the connector board to which the sensor is connected. The operator may select SDI channel 0 or SDI channel 1. Both connectors are removable for easy set up and removal of the channels.

4.3.5.2.3 **Device Address** . . . . . Default (0)
The device address parameter specifies the SDI-12 device address of the sensor from which data is to be acquired. The valid input ranges are (0-9), (a-z) and (A-Z). Please refer to Appendix A10 for finding and setting the correct channel on the sensor being used.

4.3.5.2.4 **Measurement Command** . . . . . Default (M)
The measurement command determines the type of measurement to be made as determined by the sensor. The measurement command is the parameter which instructs the sensor to act based on the SDI-12 command protocol. The operator may select from: M, M1 - M9, C, C1 - C9, R0 - R9 or V. The operator should refer to Appendix A10 to become familiar with these instructions.

4.3.5.2.4.1 **Switched 12 Volt Output** . . . . . Default (None)
The Switched 12 volt Output allows the operator to attach a +12 volt strobe to the task. If a +12 volt strobe is not required, an input of "2 = None" is specified when programming the task. Strobes 12S0 and 12S1 refer to the +12 volt strobes outputs attached to the Power Outputs on the connector board on the side of the unit. The +12 volt Strobe is installed on all units.

4.3.5.2.5 **Common Task Elements** . . . . . Defaults (as specified)
Refer to Section 4.3 for a description of the remainder of the task programming elements.

4.3.6 **Linked Acquisition**

This acquisition task is a generic task which obtains its data from the reading taken by other tasks, not directly from their sensors. If maximum, minimum, and/or average values are required from one sensor, the sensor need only be accessed once using a conventional acquisition task with the remaining data requirements being processed by linked acquisitions. An example is to take a temperature reading once per hour as an analog task, then a linked task can use all of the day's readings to find the high temperature for the day. It may also be used for applying different formulas to a sensor single reading. This process saves time and extends the battery life. Linked acquisition is **not** the same as an alarm activated task.

At the specified acquisition time the linked acquisition task will probe the specified acquisition and gather the last data sample value obtained by the acquisition. Subsequent data processing is identical to other acquisitions. Note that the sample obtained is raw data, ie. has not been processed by the formula or calibration parameters. The only exception to this occurs when a linked task is performed on another linked task. In this case, the value obtained has been processed by the specified formula and calibration values in the first linked task.

4.3.6.1 **Task Programming**

4.3.6.1.1 **Get Data From Task Number** . . . . . No Default
This parameter requests the task priority number of the acquisition task from which the linked task will get its data. The task priority must currently exist in the system.

4.3.6.1.2 **Common Task Elements** . . . . . Defaults (as specified)
Refer to Section 4.3 for a description of the remainder of the task programming elements.

4.4 **Scheduled Data Outputs**

The Vedas II system, in addition to providing scheduled acquisition tasks, also provides scheduled output tasks. These tasks output the gathered data via a transmission medium to a central site. The Vedas II output tasks consist of the RF transmitter output and a modem output. For other possibilities, please contact Valcom for technical assistance.

4.4.1 **RF Transmitter Output and Power Reading**

The Rf transmitter can be a GOES transmitter or a future upgrade to an Orbcomm transmitter.
The GOES transmitter for the Vedas II is manufactured and/or sold by Valcom Limited. It is a fully synthesized unit and is approved by the NESDIS authority for use as a GOES transmitter. The compatible GOES transmitters are: the Telonics model TGT-1, the Valcom model 697-07, the Campbell Scientific model SAT HDR and Valcom model VGOES HDR. Each of these transmitters require a different communications cable. Please contact Valcom if you require assistance.

NOTE

If, during system initialization, a GOES error is encountered (ie. placed in the Error Log), the GOES task will be removed from the time table as an error was logged during the GOES set-up procedure. The GOES initialization procedure will be retried ONLY after editing the system time or the GOES task. Once the GOES transmitter has been successfully set up, operation is completely automatic.

4.4.1.1 **Task Programming**

4.4.1.1.1 **Task Priority** . . . . . Default(49)
The task priority of any RF transmission is set at 49.

4.4.1.1.2 **RF Transmitter Type** . . . . . Default(TGT-1)
The operator must specify the hardware in the unit, Telonics TGT-1, Valcom 697-07 or HDR GOES. Future options may be available.

4.4.1.1.3 **GOES Transmission Mode** . . . . . Default (Self Timed)
The GOES transmission mode determines the transmission mode under which the GOES will be operating. Refer to the GOES operator manual for more information on the GOES transmission modes. Inputs “0" through “2" represent the following modes: 0 = Self Timed, 1 = Self Timed/Alarm, 2 = Random Alarm.

4.4.1.1.4 **Transmission Preamble** . . . . . Default (long)
The transmission preamble allows the operator to chose either the long or short message pre-amble when transmitting to the GOES satellite. The long preamble provides the satellite with a longer sync string and should be used if the transmission angle is close to the horizon or the transmission path is obstructed. The short pre-amble provides a shorter sync string and allows more data to be transmitted in the transmission window.

4.4.1.1.5 **Transmission Window Length** . . . . . Default (60 Seconds)
This option allows the operator to vary the length of the transmission between 10 seconds and 120 seconds. The default setting is 60 seconds. If the operator wants to increase this time they must first make sure that they are allocating enough time in the NESDIS System. Please check the length of the assigned window. It should never be set for more time than is allotted. It should never be set for less time than is required to send the message otherwise data may be truncated. Please consult with the NESDIS protocols if there is a problem with the default setting.

4.4.1.1.6 **RF Transmitter Data Rate** . . . . . Default (100)
This option appears only when the SAT HDR GOES model is selected. It allows the user to select the transmitting baud rate of either 100, 300 or 1200 bps.

4.4.1.1.7 **Transmission Message Format** . . . . . Default (Condensed)
This option allows the operator to select a condensed message or a detailed transmission. The condensed message will require less time than the detailed transmission.

4.4.1.1.8 **Archive GOES Update Time** . . . . . Default (Yes)
The archive “GOES Update Time” determines whether the time of the data update to the GOES (1 minute before transmission) is date/time stamped into the archive memory.

4.4.1.1.9 **Modem Sends GOES Update Time** . . . . . Default (Yes)
This option allows the modem (if present) to transmit the time of the data update to the GOES (1 minute before transmission).

4.4.1.1.10 **GOES Transmission ID Code** . . . . . No Default
The GOES transmission ID code determines the GOES transmission ID as assigned by the NESDIS authority.
The GOES transmission ID consists of 8 characters ranging from “0" through “9” and “A” through “F”.
The GOES transmission ID will be rejected if it does not conform to the NESDIS format.

4.4.1.1.11 **GMT Offset** . . . . . Default (-5:00)
The GMT offset determines the time offset between the current time zone and the time at the Greenwich Mean. The GMT value is entered as an hour and minute offset (ie. HH:MM). The minute offset is limited to 15 minute intervals.

GMT EXAMPLE

Greenwich, England, 0 GMT offset, is 5 hours ahead of Ontario, Canada (EST). The correct GMT entry for Ontario is then -5:00, ie. 5 hours behind Greenwich time.

4.4.1.1.12 **GMT Start Of Transmission** . . . . . Default (00:00:00)
The GMT start of transmission determines the time of the first transmission after the start of the day (ie. 00:00:00 hours GMT).

4.4.1.1.13 **Self Timed Transmission Interval** . . . . . Default (03:00:00)
The self timed TX interval determines the transmission interval for the GOES transmission while in the self timed or self timed/alarm GOES transmissions modes. The GOES transmission interval is assigned by the NESDIS authority and must be greater than 2 minutes.

4.4.1.1.14 **Regular Random TX Interval** . . . . . Default (03:00:00)
The regular random TX Interval determines the transmission interval for the GOES transmission while in the regular random or random alarm GOES transmissions modes. The GOES transmission interval is assigned by the NESDIS authority.

4.4.1.1.15 **GOES Self-timed Channel** . . . . . Default (1)
The GOES self-timed channel determines the self timed channel operation for the self timed and self timed/alarm GOES transmissions modes. The GOES channel number is assigned by the NESDIS authority (0-199).

4.4.1.1.16 **GOES Random Channel** . . . . . Default (2)
The GOES random channel determines the alarm channel operation for the self timed/alarm and random alarm GOES transmissions modes. The GOES channel number is assigned by the NESDIS authority (0-199).

4.4.1.1.17 **Common Task Elements** . . . . . No Defaults
There are no common elements in the RF transmission output task.

4.4.1.1.18 **Update New Settings to the GOES** . . . . . Default (No)
This option appears only when the SAT HDR GOES model is selected. The settings chosen above can be stored within the transmitters own memory banks for possible use as a stand-alone transmitter.

4.4.1.1.19 **Add Power Acquisition Task** . . . . . Default (No)
this option allows the user to include a power output reading task after setting up the RF output task. This task can be added at any time by selecting menu option 1-Add Acquisition, then menu option 9-Add GOES Power Acquisition.

4.4.1.1.20 **Type of Power Reading** . . . . . Default (Forward)
Here, the user can select whether they would like to measure the Forward or Reverse Power or just the VSWR. This option is not available when the SAT HDR GOES option is selected.

NOTE

The SAT HDR GOES transmitter only provides a ratio reading representing the VSWR. Nominal transmission power values are 7.9 Watts at 100 baud rate and 15.8 Watts at both 300 and 1200 baud rates.

4.4.1.1.21 **Units of Power Reading** . . . . . Default (None)
Here the user can specify whether they would like to see Watts, dBm or no units at all associated with the Power reading. This option is not available if the SAT HDR GOES option is selected.

4.4.1.1.22 **Start of Power Acquisition and** . . . . . Default (see below)
The default setting for the Start of Power Acquisition is 2 minutes after the Start of RF Output Task. This is not user adjustable.

4.4.1.1.23 **Interval of Power Acquisition** . . . . . Default (see below)
The default setting for the Interval of Power Acquisition is the same as for the Interval of RF Output Task. This is not user adjustable.

4.4.2 Add Modem Output

This option allows the user to set up various modem output tasks, including both land-line modems and radio modems. Upon activation, the current system data is sent to the operator supplied telephone number, or in the case of a radio modem, the information is sent to the recipient at the receiving end of the modem.

Through the use of the "Vedas II Modem Interface Auto Dial" capability and the software's built in alarm monitoring it is possible to convert the Vedas II into a stand alone monitoring system. When functioning in this stand alone mode, the appropriate offices will be automatically alerted in the case of an input exceeding a user supplied alarm limit.

Refer to section 8.0 for further details on the required set-up of the modem outputs. Refer to section 3.5.2.8 for configuration set-ups.

4.4.2.1 Task Programming

4.4.2.1.1 **Priority Of Task** . . . . . No Default
This parameter is the value used to index/reference the telephone output task in the system. Priority values 1 to 47 have been dedicated to user entered tasks.

4.4.2.1.2 **Telephone Number** . . . . . No Default
This parameter allows the operator to specify the telephone number to be accessed upon the activation of the telephone output task. Entered telephone numbers must meet one of the following formats: 123-1234, 1-123-1234, or 1-123-123-1234. If more than one telephone number is required then more than one modem output task will be required.
For the Radio Modem Output tasks, this is simply the Task Label.

4.4.2.1.3 **Start Of Output** . . . . . Default (00:00:00)
The start of output time is the time of the first telephone output of the day. If the telephone output task is to be alarm activated only, a start time of 24:00:00 should be entered.

4.4.2.1.4 **Output Interval** . . . . . Default (01:00:00)
The output interval specifies the time interval between telephone outputs.

4.4.2.1.5 **Baud Rate** . . . . . Default (9600)
The modem task supports baud rates of: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 and 57600. Check the maximum baud rate of the modem in use.

4.4.2.1.6 **Number Of Bits** . . . . . Default (8)
The operator must match the output serial data format to the expected serial data format at the other end. The default is 8 bits with 1 stop bit and no parity. The operator may select 8 bit or 7 bit data format.

4.4.2.1.7 **Number Of Stop Bits** . . . . . Default (1)
The operator may select 1 or 2 stop bits.

4.4.2.1.8 **Parity Bit** . . . . . Default (None)
The operator may select, none, even or odd parity if the number of bits has been set to seven. If eight bits are selected it will use no parity always.

4.4.2.1.9 **Retry Delay (Min.)** . . . . . Default (1)
The retry delay determines the time between a failed communication and the subsequent connection retry (1 to 59 minutes). The Vedas II will try to complete the connection 3 times before logging a failed telephone output attempt. This setting is not available for Radio Modem Output Tasks.

4.4.2.1.10 **Archive Modem Output Time** . . . . . Default (Yes)
The archive modem output time determines whether the time of the data update to the modem is date/time stamped into the archive memory.

4.4.2.1.11 **Modem Sends Last Execution Time** . . . . . Default (Yes)
The modem output message will include the time of the last transmission.

4.4.2.1.12 **Message Preamble** . . . . . No Default
The message preamble allows the user to prefix the modem output message with an alphanumeric string of up to 34 characters.

4.4.2.1.13 **Common Task Elements** . . . . . No Default
There are no common elements in the modem output task.

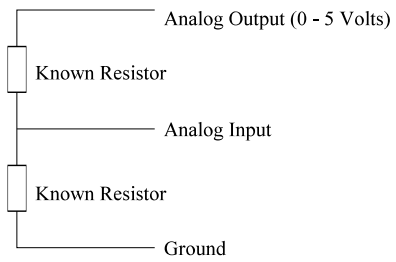
4.4.3 Measuring Unknown Resistance

The analog acquisition task can be used to find the resistance of a sensor or a resistor. You will require an unknown resistance to be measured and either one or three resistors of known value. Follow the analog acquisition programming procedures and enter either “2 - Half Bridge” or “3 - Full Bridge” when asked for the measurement type.

4.4.3.1 Resistance Measurement

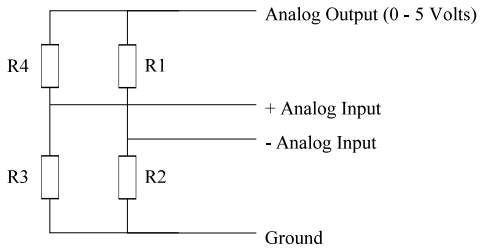
The Vedas II will supply an output voltage on one of A0 - A3, the current will flow through the resistance bridge and set up an input voltage that is directly related to the value of the unknown resistance. An Analog input will read this voltage and calculate the resistance in Ohms.

4.4.3.1.1 **Half Bridge Method** . . . . . No Default
The half bridge method is a voltage divider that will set up one input voltage for the Vedas II to read. It can be used with a single ended analog acquisition or a differential acquisition with the negative connection grounded. It requires one resistor of known value connected between an analog output and the analog input. The unknown resistance must be placed between the analog input and ground. The voltage at the input will be directly proportional to the unknown resistance.



4.4.3.1.2 **Full Bridge Method** . . . . . No Default

The full bridge method will set up two input voltages for the Vedas II to read. This full bridge method must be used with a differential analog acquisition. It requires three resistors of known value and one unknown resistance. Connect the resistors as shown. The unknown resistor can be placed anywhere in the circuit. The Vedas II will ask which resistor is unknown, R1, R2, R3 or R4. It will then ask for a value for the other three. The voltage at the inputs will be directly proportional to the unknown resistance and its position in the bridge.



4.4.3.2 **Task Programming**

4.4.3.2.1 **Priority Of Task** . . . . . No Default

4.4.3.2.2 **Input Type** . . . . . Default (0 = Differential)

This allows the operator to select the type of analog task required. For resistance measurement there are two alternatives (0=Differential, 1=Single Ended, 2=Battery, 3=Temperature). The default is a differential analog input. This allows half bridge or full bridge to be used. The user can also select single ended analog inputs if a half bridge measurement is required.

4.4.3.2.3 **Analog Input Channel** . . . . . Default (0 or A)

The channel number allows the operator to select the analog input channel from which the analog measurement will be made. Differential from 0 (+ and -) to 6 (+ and -), or A through S and A0 - A3 for single ended inputs. The Vedas II will prompt the operator appropriately depending on the input type selected. The full bridge is only available with the differential selection.

4.4.3.2.4 **Measurement Type** . . . . . Default (0 = Volts)

Input either half bridge or full bridge. The Vedas II will prompt the operator appropriately depending on the measurement type required. The half bridge acquisition will request the value of the known resistor. The full bridge acquisition will request the position of the unknown resistor and the values of the other three.

4.4.3.2.5 **Analog Output Voltage** . . . . . Default (0.000)

An excitation voltage is required for the resistance measurement. The user must enter the appropriate voltage (0.000 through +5.000 volts) at the prompt. A low resistance probe may draw too much current if a high output voltage is used. If the known resistor is less than 1000 ohms, then a low voltage should be used.

4.4.3.2.6 **Analog Output Channel** . . . . . Default (2=None)

The operator will be prompted to select an output channel. There are four output channels available, (A0 to A3). The Vedas II unit will monitor usage of these outputs and alert the operator if a channel is being used by more than one task. It is the responsibility of the operator to make sure that if an output channel is being used by two different tasks it will not affect the sensor readings.

4.4.3.2.7 **Analog And Common Task Elements** . . . . . Default (2=None)

Follow the rest of the procedures of section 4.3.2 analog acquisition.

4.5 Data Retrieval

4.5.1 Retrieve Memory Archive

This selection prompts the operator to specify the date and time from which to start the memory archive dump. The operator may also choose to retrieve only particular labels by entering the label at the prompt. The dump is formatted as single acquisitions (ie. 33 character strings) beginning with a carriage return/line feed combination. During the archive dump, the operator may use the <ESC> key to abort the listing or alternately use the space key to stop the listing for observation. Any key will continue the archive dump.

Review Appendix A-6 for a description of the Vedas II memory archive dump format. Some sensor types may contain error messages in place of the data, refer to Appendix A-3 for information regarding the error messages.

4.6 Using the Vedas II as a SCADA Terminal

The Vedas II is fully capable of becoming a SCADA (Supervisory Control and Data Acquisition) terminal. The acquisition task alarm options, along with the resident task contained in the Vedas II system, provide the tools to have the Vedas II system react and control various events.

An example of these capabilities is to have the Vedas II stop GOES transmissions once the battery voltage falls below a preset limit (11 volts) and then re-enable the transmissions when the battery voltage is restored (> 11.5 volts). In this scenario the user must program two battery tasks (the second task could be a linked task). The first task would place an alarm limit for < 11 with the alarm task being task 100 (disable GOES transmitter). The second battery task would have an alarm limit of > 11.5 with the alarm task being 101 (enable GOES transmitter).

The above example could be expanded to have acquisition tasks activate data output tasks to notify the central office of an alarm situation or activate a +12 volt strobe which may activate a switch to cause a correcting action to occur. The possibilities are endless.

SECTION 5.0

SYSTEM UTILITIES AND DIAGNOSTICS

5.1 System Utilities

Vedas II supports many system functions designed to allow the operator to test or view information about the current operation of the Vedas. These utilities, in the "Operators Mode Menu", are a good technique for interacting with sensor data and sensor readings without stopping the operation of the Vedas II.

5.1.1 Immediate Task Execution

This feature allows the operator to immediately execute a data acquisition as specified by the task parameters and send the acquired data to the programmers terminal. A local acquisition does not place any information in the archive memory, nor will it update the GOES/Modem archive buffers.

5.1.1.1 Programmed Task

Upon selecting the local acquisition option the operator is presented with a list of available task priorities and their respective labels. The operator specifies the desired task by entering the task's priority number. The operator may reissue the local acquisition by striking the <ENTER> key or alternately may specify another task. If the operator places the letter "C" after the priority number, the Vedas II will continuously perform local acquisitions of the specified task until the <ESC> key is struck.

The operator should be aware that a local acquisition option performs the acquisition in its entirety. In other words, if the task is to provide an hourly average using a number of samples, the local acquisition will take 1 hour to acquire the data. If a more immediate result is required, refer to section 10.0, site calibration.

5.1.2 View Archived Data

This option allows the operator to view the acquired data in the Flash memory. Enter the date and time of the data to be viewed. The operator is prompted to enter the labels of the data required. If no labels are entered, (strike enter at first label request) all labels will be dumped. The Flash memory will start to send all of the data to the screen that was recorded after the date and time entered. The dump is formatted as single acquisitions starting with a carriage return/line feed combination. During the archive dump the operator may use the ESC key to abort the listing or alternately use the space key to stop the listing for observation. Any subsequent key will continue the archive dump.

5.1.3 Send Archived Data

This option allows the operator to transmit the acquired data from the Flash memory to a PC or the PCMCIA card. Enter the date and time of the data to be sent. After entering the date and time, the memory retrieval routine will ask for the device to transmit to, the PCMCIA card or to a PC. At this point it will begin dumping the data to the specified device. If using a PC, the operator should be prepared to capture the data to a file for subsequent processing if required. Review Appendix A6 for a description on the Vedas II memory archive dump format.

5.1.4 Emergency Message

The emergency message option allows the operator to substitute the regular RF transmitter message with a text message in order to inform the central office of a situation. This option is meant to be used in the case of an emergency situation. This can also be accessed through the "Keypad/Display Menu".

5.1.5 GOES Transmitter

The Vedas II supports the entry of an emergency message which will be transmitted via GOES at the next transmission timeslot. The emergency message option is accessed via the "Operator Mode Menu", item 7. After selecting the "Create Emergency Message" option, the operator will be prompted to enter the desired message. The message may consist of up to 80 characters and is terminated with a carriage return.

5.1.6 **Formula Listing**

This feature produces a listing of the acquisition formulas currently contained in the system. The listing will display all of the user input formulas, 0 through 29, and all of the predefined formulas, 30 though 43. If the formula listing does not contain a formula suitable for your data requirements, refer to chapter 10, "Entering New Formulas". Contact Valcom Limited to have the formula listing updated. A sample formula listing is shown below.

```
VEDAS II Formula List
=====================          (where x = Current Task's Acquisition Value)

30/even = (x + Calibration Offset) * Calibration Gain
31/odd = (x * Calibration Gain  ) + Calibration Offset
32/23 = x * x
34/35 = 1 / x
36/37 = Lakewood Temp. Probe (10KOhm, 5V Exite) 0-5 Volt Output to Deg. C
38/39 = Campbell Scientific Temp. Probe (HMP 35C) 0-5 Volt Output to Deg. C
40/41 = Converts 4 Bit 77C Wing Sensor Direction into Degrees
42/43 = GOES TGT-1 Power Output Conversion to dbm
-- End of List --
```

Figure 5-1 **Vedas II Formula Listing**

5.1.7 **Test Formula**

This option can be used to test any of the formulas entered in the memory. Input a gain, an offset and a value for the acquisition input, and compare the answer to an expected value. All newly entered formulas should be tested for accuracy.

5.1.8 **Resident Tasks**

The Vedas IIsupports several "resident tasks" which may be invoked as an alarmed task. The following indicates the currently existing resident tasks;

Task Priority	Resident Task Function
100	Disable the GOES Transmitter.
101	Enable the GOES Transmitter.
102	Disable Switched 12V Output 12S0
103	Enable Switched 12V Output 12S0
104	Disable Switched 12V Output 12S1
105	Enable Switched 12V Output 12S1
106	Display Greenwich Mean Time (GMT)
107	Beep Program Terminal Bell

Table 5-1 **Resident Task Listing**

5.1.9 **Display PCMCIA Information**

This option displays information about the PCMCIA card that has been inserted into the PCMCIA memory card slot. The card must be present. It will display the number of free bytes, the write protection status and the manufacturer's information about the card itself.

5.1.10 **Erase/Format PCMCIA Card**

This option will erase and format the PCMCIA card. When the formatting is completed, the card will be empty and ready to store archived data.

5.1.11 **Upgrade VEDAS II Software From PCMCIA Card**

This option allows the operator to load new Vedas II software from the PCMCIA memory card. The card must contain a new version of Vedas II software.

5.2 **Diagnostic Menu**

The diagnostic menu allows the operator to verify the integrity of the Vedas II unit and connected peripherals and to perform set-up procedures on serial sensors prior to acquisitions (ie. set SDI-12 device address, etc.). Refer to the Appendix for further information on communicating with sensors and external devices.

5.2.1 **Direct RF Transmitter Communication**

This feature allows direct communication with the GOES transmitter. Refer to the GOES transmitter manual for the appropriate GOES command sequences.

For 100bps low data rate transmitters, operator input is not buffered. Consequently, an entered character is relayed to the RF transmitter immediately. The <ESC> key terminates the communication mode.

If the transmitter is an HDR GOES, characters are buffered and sent as CSI (Campbell Scientific Inc.) formatted packets after a carriage return. Macros are available to send common CSI commands.

**** Direct SAT HDR GOES Communication Mode **** ESC to quit
<CTRL-B> to toggle hex/dec mode
<CTRL-D> to send Read Config
<CTRL-E> to send Read Time
<CTRL-F> to send Transmit Random Message
<CTRL-G> to send Read Status
<CTRL-O> to send Offline
<CTRL-P> to send Online
<CTRL-T> to switch to transparent mode

The Valcom VGOES transmitter provides extra diagnostic information through a text based terminal menu. It can be accessed using transparent mode by pressing <CTRL-T>.

**** Transparent Mode ****
<CTRL-T> <CTRL-T> <CTRL-T> to quit
transmitter mode:[RUN]-v1.0.0 21:03:42
[1]event log
[2]system status
[3]process slots

Exit by pressing <CTRL-T> three times consecutively.

5.2.2 **Direct SDI-12 Communication**

This feature allows direct communication with an SDI-12 channel. All user inputs are buffered until a carriage return is received at which point the buffered message is communicated to the SDI-12 device, observing the necessary protocol requirements. Refer to Appendix A-10 for further information regarding the SDI-12 communication standard command structure.

Before communications commence the operator will be prompted for the SDI-12 channel number. The channel number determines which SDI-12 port is being used. The entry of "0" or "1" corresponds to the SDI-12 channel number. An SDI-12 acquisition using the requested channel number must currently exist in the system. The <ESC> key terminates the communication mode.

5.2.3 **Direct Serial Communication**

This feature allows direct communication with a serial port. Operator input is not buffered. Consequently, an entered character is sent to the serial device immediately. This option may also be used to communicate directly with the internal modem, or to an external telephone modem connected to the RS-232 serial port.

Before communications commence the operator will be prompted for the serial port channel. The channel selection determines which serial port the operator will be using, the modem/RS-232 or the RS-485. A serial acquisition using the requested channel number must currently exist in the system. The <ESC> key terminates the communication mode.

5.2.4 **SDI-12 Loopback Testing**

This feature allows the operator to verify the integrity of the SDI-12 communication ports. Prior to the test the operator must disconnect all existing sensors. A jumper must be installed between the DATA connections on channels 0 and 1 of the SDI-12 ports. The test is easy to perform and verifies the operation of each port. Refer to Figure 5-1 for the appropriate connections. Refer to Table 5-1 for error message interpretation.

SDI-12 Chan 0, Data ———————————— Data, SDI-12 Chan 1

Figure 5-1 **Terminal Strip SDI-12 Loopback Connections**

ERROR MESSAGES FOR SDI-12 LOOPBACK TEST

Error Message
Test Channel X -> Channel X Communications ... Test FAILED !
Error Code XX

where the error code XX is a 2 digit hexadecimal value;

Error Code	Error Description
1XXX XXXX	Received Break Only
X1XX XXXX	Recorded Framing Error
XX1X XXXX	Recorded Parity Error
XXX1 XXXX	Recorded Overrun Error
0000 0000	Sent Character Was Never Received Or A Different Character Was Received

Table 5-2 **Error Messages for SDI-12 Loopback Test**

5.2.5 **Clear Archive Memory**

The archive memory clear option allows the operator to clear all archive memory contained in the system. Each memory archive bank, “0" through “9", will be erased. If the test returns a failed message the Vedas II unit should be marked as unserviceable and then returned to Valcom Limited for repair.

5.2.6 **Display Error Log**

This option allows the operator to view a list of errors the Vedas II has encountered and will prompt the operator to clear the log to read “No Errors”.

5.3 **Vedas II Information**

This option of the diagnostics menu allows the operator to view important information about the unit. It is the easiest way to determine what resources are present in the unit. It displays information regarding Initialization, memory usage, program parameters, and clock corrections. It also displays information on the presence of hardware features such as 12 volt switch output, internal modem, analog section, keypad/display and the RS-485 interface.

The analog section requires three calibration factors. They are listed as the (+ and -) 5 volt reference chip outputs, and the temperature offset. If the unit does not contain an analog section, these number should be 5.0000, -5.000 and 20.0 degrees. The unit serial number is listed last. The serial number is important for maintaining service records on each individual unit. The display shows all of the following information.

```
VEDAS II INFORMATION
 ====================
VEDAS II Was Reset On                          -> 1998/12/31 At 08:30:15
VEDAS II Was Last Initialized On               -> 1998/12/31 At 08:30:15
Program Parameters Last Archived On            -> 1998/12/31 At 08:30:15
Archive Memory Will Be Full On                 -> 1999/07/16
0 Seconds Were Added To The RTC Clock Since 1998/12/31 At 08:30:15
0.000012 Seconds Will Be Added To the RTC At Midnight

Program Parameter Checksums
---------------------------
Calculated              -> 5F4A
Current (SRAM)          -> 5F4A
Archived (FLASH)        -> 5F4A

12 Volt Switches        -> Installed
Internal Modem          -> Not Installed
Analog Section          -> Installed
Display/Keypad          -> Installed
RS485 Interface         -> Not Installed
Current 5 Volt Reference Chip Output Voltage -> 4.9948 or -4.9983
5 Volt Reference Chip Output At 25.00 Deg. C -> 4.9949 or -4.9984
Serial Number           -> 980100
```

5.4 **Other Diagnostic Functions Of The VEDAS II**

5.4.1 **Diagnostic Task**

The diagnostic task performs the following diagnostic checks, a system parameter check, a valid option check, a task table check, and a check for a valid telephone condition.

The operator is able to edit the following diagnostic task parameters.

5.4.2 Task Programming

5.4.2.1 **Priority Of Task** . . . . . Predefined Parameter (50)
The diagnostic task has a predefined priority of 50. The operator cannot change this.

5.4.2.2 **Task Label** . . . . . No Default
The label is the text that will precede the processed diagnostic acquisition in the output message. It may be 0 to 10 alphanumeric characters in length.

5.4.2.3 **Diagnostic Check Interval** . . . . . Default (01:00:00)
This interval is the time between automatic checks of the current error log. The default time is one hour. This interval can be set to record errors when they occur.

5.4.2.4 **Archive Error Log Errors** . . . . . Default (Yes)
The archive error log errors allows the operator to specify that the total number of diagnostic errors saved as a memory archive data entry.

5.4.2.5 **Error Log Errors Sent By RF Transmitter** . . . . . Default (2=All)
The "Error Log Errors Sent By RF Transmitter" option allows the operator to specify whether the Vedas II errors are appended to the regular RF transmission (GOES or Orbcomm). The operator may choose to transmit none of the errors, only the system critical errors, or both the system critical and the diagnostic errors. The format conforms to Vedas II RF output format contained in Appendix A-5.

5.4.2.6 **Modem Sends Error Log Errors** . . . . . Default (Yes)
The "Modem Sends Error Log Errors" option allows the operator to specify whether the Vedas II errors are sent with the regular modem transmission.

5.5 System Error Log

The system error log allows the operator to view and subsequently clear the system error log. The error log is broken up into two categories depending on their effect on the Vedas II system. System critical errors and non-critical errors are presented to the operator for action once the communication link is made. Diagnostic errors may only be viewed by accessing the display error log option in the diagnostic menu. Errors are also recorded in the condensed task display in the diagnostic task's last data column. System critical errors are given a weight of 1, while diagnostic errors are given a weight of .0001. (ie. 4 system critical errors and 5 diagnostic errors would be shown as 4.0005 errors).

5.5.1 System Critical Error

System critical errors are a major cause for concern and may cause partial or complete operational failure of the system. These types of errors are usually caused by a Vedas II system failure or a malfunctioning sensor.

5.5.2 Diagnostic Error

Diagnostic errors have been placed in the Vedas II to flag situations that are invalid. Interpretation of these errors can vary and should be reported to Valcom Limited if the number of errors becomes significant.

Refer to section A-3 for a description the Vedas II errors.

5.5.3 Program Checksum

This feature automatically performs a checksum calculation on the system program Flash memory to verify system integrity. The test will return "Testing Flash ..." and then "Passed" or "Failed". In the case that the test returns "Failed", the Vedas II unit should be marked as unserviceable until the Vedas II program code can be reentered into the system. Contact Valcom Limited in order to obtain the transfer and binary image files required to perform this procedure.

SECTION 6.0

KEYPAD AND LCD DISPLAY

6.1 **Keypad and Display**

The Vedas II can be ordered with an optional keypad and display panel. The liquid crystal display has two lines of twenty characters which are used to display user prompts. The embossed keypad can be used to access many of the Vedas II functions. The keypad/display and a PCMCIA card can be used to gather and store data without the use of a computer, a modem or an RF transmitter.

6.1.1 **Power Usage**

Use of the LCD display wakes the Vedas II from power saving mode. The current draw for the unit while the display is active is about 100 mA. The display is programmed to automatically turn itself off if a key has not been pressed within the last one minute. This is designed to save power.

6.1.2 **Keypad Functions**

6.1.2.1 **PWR - The Power Key** . . . . . No Default

The <PWR> key will activate the display panel when pressed. When it is pressed, the display will show the error log and request that it be cleared. If there are no errors in the system, it will display the Vedas II software version, the time and the date. If no other keys are pressed, the display will shut off after one minute.

If the power to the unit has been interrupted, the unit may prompt the operator to verify the correct time.

If the unit is being accessed by another device such as the program terminal or the modem, then the display will read, "Vedas II Is Accessed By Another Device". The display will show this message for four seconds and then turn itself off. The other device will have to be disconnected before the keypad and display can be used.

The <PWR> key is also used to turn the display off.

6.1.2.2 **ENTER - The Enter Selection Key** . . . . . No Default

The <ENTER> key is used to accept the current cursor selection. If the display is asking to reset the error log and the cursor is indicating a default setting of "Y", then the <ENTER> key will clear the log.

6.1.2.3 **EXIT - The Exit Selection Key** . . . . . No Default

The <EXIT> key will exit the current menu selection and return to the last menu displayed. It can also re-initialize the unit if the time has been modified.

6.1.2.4 **MODE - The Change Mode Key** . . . . . No Default

The <MODE> key is reserved for future software upgrades.

6.1.2.5 **UP ARROW - The Change Selection Key** . . . . . No Default

The <UP> arrow key can be used to scroll between the menu selections and to increase a cursor indicated item.

6.1.2.6 **DOWN ARROW - The Change Selection Key** . . . . . No Default

The <DOWN> arrow key can be used to scroll between the menu selections and to decrease a cursor indicated item.

6.1.2.7 **RIGHT ARROW - The Move Cursor Right Key** . . . . . No Default

The <RIGHT> arrow key can be used to move the cursor to the right. It will also scroll the display to view or select parts of the displayed information that do not fit in the 20 character wide display screen. Some lines of text are longer than 20 characters.

6.1.2.8 **LEFT ARROW - The Move Cursor Left Key** . . . . . No Default

The <RIGHT> arrow key can be used to move the cursor to the left. It will also scroll the display back to view or select parts of the displayed information that have scrolled off the left-hand side of the display screen.

6.2 The KEYPAD Menu System

The keypad and display have their own menu system. It is set up to allow the operator to perform any of the operations required. The keypad options are listed below. They can be accessed by using the <UP> and <DOWN> arrow keys to display the selection and the <ENTER> key to execute it. The reference to PCMCIA is to the PCMCIA memory card. The PCMCIA card will function as a floppy disk for storing files.

6.2.1 KEYPAD Menu Functions

1. Calibrate Task
2. Execute Task
3. View Current Data
4. Data To PCMCIA
5. Setup To PCMCIA
6. Setup From PCMCIA
7. Format PCMCIA
8. Set Vedas II Time
9. Set Terminal Baud

6.2.1.1 **KEYPAD Menu Option 1. Calibrate Task** . . . . . No Default

This option allows the operator to select and calibrate the acquisition task in the system. Use the <UP> and <DOWN> arrow keys to select the desired task and press <ENTER>. The task will display its current readings and request the operator to input the correct data. The operator must have a separate, calibrated sensor reading to input into the Vedas II. Use the <RIGHT> and <LEFT> arrow keys to select the digits to be changed and use the <UP> and <DOWN> arrow keys to change the numbers until the displayed number is correct. Press <ENTER> to accept the number. Press <EXIT> to return to the "Keypad Menu" without entering a calibration number.

6.2.1.2 **KEYPAD Menu Option 2. Execute Task** . . . . . No Default

This option allows the operator to select and execute a task to ensure that it is functioning properly. Use the <UP> and <DOWN> arrow keys to select the desired task and press <ENTER> to execute it. The task will display the task label, the reading taken, and the time stamp. The operator can verify if the sensor reading is correct. Use the <EXIT> key to return to the "Keypad Menu".

6.2.1.3 **KEYPAD Menu Option 3. View Current Data** . . . . . No Default

This option allows the operator to select and view the current data from any of the acquisition tasks in the system. Use the <UP> and <DOWN> arrow keys to scroll through the data of each task. Press the <ENTER> key to view the next scheduled acquisition for each task. Use <EXIT> to return to the "Keypad Menu".

6.2.1.4 **KEYPAD Menu Option 4. Data To PCMCIA** . . . . . No Default

This option allows the operator to transfer the archived data from the Vedas II Flash memory to the PCMCIA memory card. This works the same as operator menu mode selection 3, "Send Archived Data".

Set the write protect to OFF and insert the Memory card.
Select option 4 and press <ENTER>.
The Vedas II will prompt for the starting date and starting time.
The Vedas II will then store the data in a file on the PCMCIA card.
Use <EXIT> to return to the "Keypad Menu".

6.2.1.5 **KEYPAD Menu Option 5. Setup To PCMCIA** . . . . . No Default

This option allows the operator to transfer the current program parameters from the Vedas II Flash memory to a file on the PCMCIA memory card. This works the same as configuration menu selection 10, "Send Program Parameters".

Set the write protect to OFF and insert the Memory card.
Select option 5 and press <ENTER>.
The Vedas II will prompt for a file name.
The Vedas II will then store the program parameters in a file on the PCMCIA memory card.
Use <EXIT> to return to the "Keypad Menu".

6.2.1.6 **KEYPAD Menu Option 6. Setup From PCMCIA** . . . . . No Default

This option allows the operator to transfer new program parameters from the PCMCIA memory card to the Vedas II Flash memory. This works the same as configuration menu selection 11, “Overwrite Program Parameters”.

Set the write protect to OFF and insert the Memory card.
Select option 6 and press <ENTER>.
The Vedas II will prompt for the name of the input file.
The Vedas II will then store the new program parameters in the Flash Memory.
Use <EXIT> to return to the “Keypad Menu”.

6.2.1.7 **KEYPAD Menu Option 7. Format PCMCIA** . . . . . No Default

This option allows the operator to erase the contents of the PCMCIA card and reformat the card for new data storage. After reformatting, the card will be ready to accept new data files.

Set the write protect to OFF and insert the Memory card.
Select option 7 and press <ENTER>.
The Vedas II will ask for confirmation of the request.
The Vedas II will then erase and reformat the card.
Use <EXIT> to return to the “Keypad Menu”.

6.2.1.8 **KEYPAD Menu Option 8. Set VEDAS II Time** . . . . . No Default

This option allows the operator to set the Vedas II time. Use the four arrow keys to modify the displayed time and press <ENTER> to accept it. Press <EXIT> to Initialize the unit.

Note: Whenever the time is modified the unit becomes uninitialized. Pressing <EXIT> will Initialize the unit and then it will continue to run.

6.2.1.9 **KEYPAD Menu Option 9. Set Terminal Baud** . . . . . Default (0 - Autobaud)

This option allows the operator to select a different terminal baud rate. The <UP> and <DOWN> arrow keys will change the settings. Zero is the autobaud feature. Press <EXIT> to return to the “Keypad Menu”.

6.2.2 **Future Developments**

This menu can be expanded in the future to include a feature that will upgrade the Vedas II software directly from the PCMCIA card. This option can allow easy software upgrades by simply inserting the card and selecting the “Upgrade Software” option.

SECTION 7.0
INSTALLATION

7.1 **Introduction**

This section of the manual details installation procedures for correctly installing the Vedas II equipment.

The deciding factor in insuring a trouble free installation when installing equipment in the field is usually the preliminary setup in the shop. During the setup, the Vedas II and associated sensors can be tested and the Vedas II is preprogrammed to insure everything is working properly when you go to the site. Once you have the system working satisfactorily in the shop, disassemble the setup and make sure that each item is packed along with any tools required. If the site is sufficiently remote, a number of spare items may be considered.

7.2 **Unpacking**

Open the heavy cardboard carton and remove the packing material from the container. Carefully remove the static bag containing the Vedas II enclosure and place it on a properly grounded work station table top.

CAUTION

The Vedas II system contains "STATIC SENSITIVE DEVICES" which may be damaged if appropriate precautions are not observed with respect to electrostatic discharge. Operators handling or having access to the Vedas II electronics should ground themselves by wearing a proper wrist strap or other protective device.

7.2.1 **Inspection**

Visually inspect the Vedas II enclosure for physical damage such as dents or scratches which may have occurred during shipment of the equipment to its destination. If equipped with a GOES transmitter, check that it is fastened securely in position. Ensure that all connectors and plugs are in good condition and are securely in place.

7.3 **System Grounding**

When installing the Vedas II at the site, it is very important to secure a good ground for the unit. A poor system ground will compromise the lightning and transient protection circuits located in the Vedas II and expose the system to possible damage. The grounded conductor should be fastened to the ground stud on the enclosure. It is marked with a ground symbol.

An acceptable earth ground usually consists of a steel rod driven into the earth's surface approximately three feet. The quality of the ground path depends on the soil composition and the moisture content and will change throughout the year as weather conditions change.

When laying out the grounding conductors (conductor size should be 18 AWG or larger) at the site the operator should ensure that only a single path to the earth ground exists. This prevents transients which develop due to loops which can cause differences in electrical potential within the grounding system.

7.4 Power Protection System

The Vedas II unit is equipped with reverse, under and over voltage protection on the battery input connection.

7.4.1 Under-Voltage Protection

The Vedas II under-voltage protection circuit removes power from the Vedas II once the battery voltage drops below 9.5 volts. The Vedas II will test the input and resume normal operation if the input voltage has increased to a higher level. The +12 volt connections on the terminal strip and the +12 volt power lines in the SDI-12 interfaces are not affected by the protection circuit.

7.4.2 Over-Voltage Protection

The Vedas II over-voltage protection circuit starts to limit the battery voltage at 14.0 volts. The Vedas II can run properly up to 17 volts input. All Vedas II connections are protected by the over-voltage protection circuit. This circuit has been custom designed to provide over voltage protection while providing very little voltage drop across the circuit during normal conditions.

7.4.3 Reverse-Voltage Protection

The Vedas II reverse-voltage protection circuit will protect the Vedas II in case the power is accidentally connected in reverse. The unit will not operate if the power is accidentally connected in reverse.

7.5 Sensor Connections

Carefully read each sensor's hookup instructions and apply them to the Vedas II connections available. Draw connection diagrams detailing wire colours, functions, and terminating connections. Note that you can reduce the overall power consumption of the site if you are able to power the sensor via a +12 volt strobe rather than a constant +12 volt connection.

Contact the sensor manufacturer if you are unclear regarding the proper connections. Valcom Limited is also available for consultation. We will require the installation manual for the sensor in order to provide guidance.

7.6 Site Configuration Programming

7.6.1 Set Telephone Interface

The Vedas II software must be informed of the type and parameters to be used in establishing a telephone interface. Refer to section 8.0 for parameter information regarding the establishment of a telephone interface.

7.6.2 Set RF Transmitter Type

The Vedas II software must be informed of the type and parameters to be used in establishing an RF transmitter interface. Refer to section 9.0 for parameter information regarding the establishment of an RF transmitter interface.

7.6.3 Set Other Site Parameters

The operator may set other Vedas II parameters to configure the Vedas II system to individual preferences. On the following page is a table detailing the parameter, a short description of the default condition, and corresponding section in the manual that details the parameter.

Parameter	Description	Default
Station Number/Name	Set the station number and name	None
Date/Time	Set the system date and time	None
Date Format	Set the display format of the date	Y/M/D
Error Log Mode	Set the error log mode to reset all errors at midnight	No
Archive Memory Mode	Set the action to be taken once the FLASH memory is full	Ring
Power Down Voltage	Set the power down voltage, from 9.5 volts to 11.5 volts	9.5 V
Modem Interface	Set up modem if present	None
Menu Language	Set the menu language	Eng.
Terminal Baud Rate	Set the default terminal baud rate (Default is autobaud)	0

Table 7-1 **Additional Station Parameters**

Save the configuration parameters after the programming is complete. The configuration parameters are saved by using main menu selection 10, “Save Program Parameters”.

7.7 Setting SDI-12 Sensors

In order to program the SDI-12 acquisitions, it is necessary to obtain the address of each SDI-12 sensor. Each SDI-12 sensor may have an internal address from (0-9), (a-z) or (A-Z). The operator should at this time verify that no sensors have the same address. Consult the operator's manual for the appropriate SDI-12 sensor for the address change command if it is necessary to change a sensor's address.

In order to establish the address of each SDI-12 sensor, it is necessary to enter a dummy SDI-12 task into the Vedas II system. Once this is done, the operator may establish direct SDI-12 communications via the diagnostic menu (refer to section 5.2 for more information). To establish the sensor's address, connect the sensor to the appropriate Vedas II SDI-12 communications port. If unsure of the correct channel, the operator will have to try all addresses from 0 to 9 (ie. type *a!<ret>* where *a* is the address) until a sensor response is obtained (ie *a<cr><lf>*). Once the address is established, record the sensor address and disconnect the sensor. Repeat the above sequence until the address of all sensors has been determined.

7.8 Task Programming

Once the Vedas II software has been informed of the hardware setup, the operator is free to start entering the required data acquisitions to access the desired sensors. Refer to section 4, “Acquisition Programming” for information on programming the data acquisitions.

Remember to save the acquisition program after the programming is complete. The program parameters are saved by selecting main menu selection 10, “Save Program Parameters”.

7.9 Verifying Sensor Operation

Note that all sensor connections should be performed with the power disconnected from the Vedas II system.

If an ammeter is available, place it in series with the Vedas II battery cable positive connection. Observe the meter each time the power is applied to the unit. An excessive current draw will be an immediate sign that the current hookup is incorrect and requires review.

Connect one sensor at a time. After each sensor is connected, verify its operation by powering up the Vedas II system and performing a local acquisition from either the "Operator Menu" (section 5.4) or the "Site Calibration Screen" (section 10).

7.10 Calibrating Site

Once all sensors are connected and verified as operational it will be necessary to calibrate the sensor readings to the actual measured readings. This process involves accessing the "Site Calibration Screen" from the main menu, accessing the appropriate sensor label, performing a physical reading of the parameter being measured, and then entering the reading into the Vedas II system. The physical reading must be taken with a separate, calibrated sensor. Once the reading has been entered, the Vedas II will perform a single acquisition of the sensor and compare the obtained reading against the entered reading to obtain the difference. The software will then add the difference to the current calibration offset value thereby calibrating the obtained reading to the entered reading. Refer to section 10 for further details on the operation of the "Site Calibration" option.

If a task being calibrated has connected linked tasks the operator will be prompted on whether to adjust the calibration offset parameter on each of the linked tasks.

7.11 GOES Testing

Testing of the LDR GOES transmitter can be performed by one of two methods. The first is easily set up as two acquisition tasks, the second requires an RF power meter so that both forward and reflected power can be measured. In both cases, it is necessary to have a GOES transmitter task programmed into the Vedas II system, followed by manipulating the Vedas II parameters to cause a transmission to occur.

7.11.1 Forcing a Transmission

In order to force a transmission to occur it is necessary to manipulate the Vedas II system clock to a time of less than two minutes before a scheduled GOES transmission. To determine the time of a scheduled GOES transmission (you must take into account the GMT offset) initialize the Vedas II system and use the condensed task display to determine the time of the next GOES transmission (Nxt Acq. parameter). The system time should be set to the next GOES transmission time minus three minutes. Once the time is set, initialize the system and wait. The GOES transmission should occur less than 30 seconds after the schedule time.

7.11.2 GOES Power Acquisition

This test is a simple check of the GOES operation tested by the transmitter itself. Enter two GOES power acquisition tasks. The first for forward power and the second for reflected power. Set the acquisition time for two minutes after the scheduled transmission time. The results should show about 8-10 Watts Forward and less than 0.4 Watts Reflected.

7.11.3 RF Power Meter

The RF power meter must be connected in series with the RF cable as close to the Vedas II unit as possible. Ensure the input side of the meter is connected to the Vedas II side. During the transmission period, the meter should deflect to show approximately 8-10 watts of forward transmit power and less than 0.4 watts of reverse reflected power.

7.11.4 **Poor Power Readings**

If poor power readings are present for either of the two testing methods described above, remove the power from the Vedas II system and inspect the RF cable connections at the Vedas II and antenna locations. Remove the connections and verify that the centre conducting pin in the cable is present and not in contact with the outer shell. Inspect the RF cable and insure that there are no kinks and that the cable has not been damaged. Reconnect the RF cable and repeat the transmission test. If poor power readings are still present, substitute the RF cable and then the antenna with spares (if available) until the faulty component is found.

SECTION 8.0

VEDAS II TELEPHONE INTERFACE

8.1 Introduction

The Vedas II system has two methods of communicating via the telephone system. The first method involves a direct connect internal modem that is mounted in the Vedas II enclosure. The second method of interfacing is via the RS-232 port which, when used with an external Hayes compatible modem, also provides a direct connect system.

8.2 Vedas II Internal Modem Interface

Access to the internal modem is performed via the telephone interface connector found on the connector board of the Vedas II enclosure. This is connected directly to the TIP and ring functions of the modem.

The Vedas II telephone interface provides the necessary electronics to directly connect to a single line telephone network. The Vedas II software supports an auto-answer mode operation with up to 14,400 baud rate.

8.2.1 Modem Setup

In order to program the Vedas II system to use the internal modem the operator must first ensure that the internal modem is installed and that the jumpers JP1, JP2, JP3, JP4 and JP13 are **NOT** installed. To check this easily, from the main menu, enter 8 - "Diagnostics Menu", then enter 9 - "Vedas II Information". The status of the internal modem should be displayed.

To access the modem parameter set-up from the main menu, enter 6 - "Configuration Menu", then enter 8 - "Setup Modem Interface". Enter "No" to the password and then enter 1 - "Internal". Setup the baud rate and data as specified below. The following lists each item in the modem set-up option, along with a description.

8.2.1.1 **Baud Rate** . . . . . Default (9600)
This option selects the baud rate of the telephone interface, rates of 300 baud to 14,400 are supported.

8.2.1.2 **Number of Bits** . . . . . Default (8)
This option sets the number of data bits per word for the transmitted and received data.

8.2.1.3 **Number of Stop Bits** . . . . . Default (1)
This option sets the number of stop bits for the transmitted data.

8.2.1.4 **Parity Bit** . . . . . Default (None)
This option sets the parity bit for the transmitted data. The input range is 0-2 where, 0=none, 1=even, 2=odd. A parity error on received data will cause the QUART error in the error log to be incremented.

8.2.1.5 **Tone Dial** . . . . . Default (Tone)
This option determines the dial out method of any telephone output task existing within the system. A "Y" response selects touch tone dialling while "N" selects the pulse dial method.

8.2.1.6 **Hang Up Delay** . . . . . Default (1)
This option sets the number of whole minutes that will expire between the last key entry and the automatic hang-up performed by the Vedas II unit (range 1-10 minutes).

8.2.1.7 **Archive Modem Access Time** . . . . . Default (No)
This option allows the operator to select whether the time of telephone accesses will be stored in the memory archive.

8.2.1.8 **Initial Data Dump** . . . . . Default (Yes)
This option allows the operator to specify, that upon receipt of a carrier, the Vedas II unit will transmit the current acquisition data via the telephone interface. The operator may subsequently access the main menu by striking the

<Enter> key within 15 seconds after the initial data dump is complete. Further explanation of the data format is contained in Appendix A-7.

8.2.1.9 **Modem Answer Message** . . . . . No Default
This is the user input message that will be transmitted when the Modem answers an incoming call. It can be up to 34 characters in length.

8.2.1.10 **Change Password**
This option allows the operator to set restricted access through the use of a password system. Access via a telephone is allowed for both restricted and non-restricted users, however, all set-up operations are confined to users with password access.

The operator is first prompted as to whether the password is to be changed. If yes, then the operator is asked for the old password. Upon verification the operator is prompted for the new password (20 characters maximum) and is then asked to verify it. Note that during all password entry, the Vedas II echoes "." to the screen. Also, note that there is a distinction between upper and lower case characters.

NOTE
The default system password is a <space> character.

Once the telephone interface is entered via the Vedas II software slot assignment, the unit is set to the default conditions. The auto answer mode is immediately in effect.

8.3 Vedas II Serial Modem Telephone Interface

In addition to the Vedas II telephone interface card option the Vedas II now supports an external serial modem option via the RS-232 channel on the connector board. This option allows the operator to use an external modem of their choice. This includes the option of connecting a radio modem.

8.3.1 Modem RS-232 Connections

	TXD	———————————	2 Transmit (RS-232)	
	RXD	———————————	3 Receive (RS-232)	Modem
Vedas II	GND	———————————	7 Ground	Connector
	CD	———————————	8 SD	(DB-25)
	RI	———————————	22 RI	

Figure 8-1 **Serial Modem Cable Connections**

8.3.2 Modem Setup

In order to program the Vedas II system to use the external modem the operator must first ensure that the jumpers JP1, JP2, JP3, JP4 and JP13 are Installed. To check this easily, from the Main Menu and enter 8 - "Diagnostics Menu", then enter 9 - "Vedas II Information". The status of the internal modem should be displayed as "Not Installed".

To access the modem parameter set-up from the main menu, enter 6 - "Configuration Menu", then enter 8 - "Setup Modem Interface". Enter "No" to the password and then enter 2 - "External". Setup the baud rate and data as specified below. The following lists each item in the modem set-up option, along with a description.

8.3.2.1 **Baud Rate** . . . . . Default (9600)
This option selects the baud rate of the telephone interface, rates of 300 baud to 57600 are supported.

8.3.2.2 **Number of Bits** . . . . . Default (8)
This option sets the number of data bits per word for the transmitted and received data.

8.3.2.3 **Number of Stop Bits** . . . . . Default (1)
This option sets the number of Stop bits for the transmitted data.

8.3.2.4 **Parity Bit** . . . . . Default (None)
This option sets the parity bit for the transmitted data. The input range is 0-2 where, 0=none, 1=even, 2=odd. A parity error on received data will cause the QUART error in the error log to be incremented.

8.3.2.5 **Tone Dial** . . . . . Default (Tone)
This option determines the dial out method of any telephone output task existing within the system. A "Y" response selects touch tone dialling while "N" selects the pulse dial method.

8.3.2.6 **Hang Up Delay** . . . . . Default (1)
This option sets the number of whole minutes that will expire between the last key entry and the automatic hang-up performed by the Vedas II unit (range 1-10 minutes).

8.3.2.7 **Archive Modem Access Time** . . . . . Default (No)
This option allows the operator to select whether the time of telephone accesses will be stored in the memory archive.

8.3.2.8 **Initial Data Dump** . . . . . Default (Yes)
This option allows the operator to specify, that upon receipt of a carrier, the Vedas II unit will transmit the current acquisition data via the telephone interface. The operator may subsequently access the main menu by striking the <Enter> key within 15 seconds after the initial data dump is complete. Further explanation of the data format is contained in Appendix A-7.

8.3.2.9 **Modem Answer Message** . . . . . No Default
This is the user input message that will be transmitted when the modem answers an incoming call. It can be up to 34 characters in length.

8.4 Type Of Service

The Vedas II is designed to be used on standard device telephone lines. It connects to the telephone line by means of a standard jack called the USOC RJ-11C (or USOC FJ45S). Connection to telephone company provided coin service (central office implemented systems) is prohibited. Connection to party line service is subject to state tariffs.

SECTION 9.0

VEDAS II RF TRANSMITTER INSTALLATION

9.1 **Introduction**

This section deals with the installation and verification of the GOES transmitter. The Vedas II software supports the Telonics TGT-1 transmitter, the Valcom model 697-07 transmitter and the VGOES model HDR transmitter.

9.2 **Synthesized GOES Transmitter**

The GOES transmitter is used by the Vedas II to send environmental data observations from ground stations to the GOES satellite. Data and programming information are input to the transmitter over a bidirectional serial ASCII port in the unit. Any of the 199 North American GOES channels may be selected through the operator menu.

The GOES transmitter is compact and highly reliable. It incorporates extensive VLSI technology and has low power consumption. It is designed to withstand the most severe of climatic conditions and is certified by the NOAA/NESDIS for stand-alone operation with the GOES system.

9.2.1 **Installation**

Installation of a GOES transmitter into a Vedas II unit is not a simple procedure and is ideally suited to the shop environment.

9.2.1.1 **Requirements**

You will require:

GOES Transmitter, TGT-1, 697-07 or SAT HDR
GOES Transmitter Cable
GOES Transmitter RF Cable
GOES Antenna and Cable
GOES Mounting Bracket
Mounting Hardware
697-07 Mounting Bracket (if 697-07 is to be Installed)
SAT HDR Mounting Bracket (if SAT HDR is to be installed)
GPS Antenna and Cable (if SAT HDR is to be Installed)

Please contact Valcom if you do not have all of the requirements as listed above. Please note that none of the cables used in the first generation of VEDAS may be able to be used in the VEDAS II.

9.2.2 **Mounting the GOES Transmitter.**

1. The power **MUST** be disconnected from the Vedas II.
2. Turn **OFF** the internal battery if there is one present in the unit.
3. The installer should follow static sensitive precautions and wear a ground strap.
4. Open the cover of the Vedas II. Remove the PCMCIA card if there is one in the unit.
5. Remove the 4 screw covers from the screws on the cover panel. Remove the 4 screws.
6. If the panel has a keypad and display, it will have wires attached underneath.
7. Carefully lift the panel making sure not to damage the PCMCIA connector.
8. Disconnect the keypad connector and the display connector if present.

9. Remove the panel and place it aside. Make sure it is not resting on the display module. It is static sensitive.

10. If the unit has an internal battery, disconnect the connector on J9.

11. Remove the mounting bracket in the unit if it is present; otherwise, remove the two stand offs.

12. If you are installing a TGT-1, remove the internal battery if present. Mount the TGT-1 on the GOES bracket using three 6-32 x 3/8 flat head screws. Replace the battery.

13. If you are installing a 697-07, it should already be mounted on the 697-07 mounting bracket. Hook the bend of the 697-07 bracket into the slot on the GOES bracket. Attach it with two 8-32 x 3/4 pan head screws at the other end.

14. If you are installing a SAT HDR, slide the two "C" brackets around the transmitter and attach the assembly to the GOES bracket using four 8-32 x 1/2 flat head screws, four #8 lock washers, four #8 flat washers and four 8-32 nuts. When installed, the transmitter should sit parallel to the bottom of the VEDAS II enclosure with the RF output connector facing the back left corner.

15. Connect the Goes communication cable to the GOES transmitter and tighten the screws. The TGT-1, the 697-07 and the SAT HDR require different cables.

16. Mount the GOES bracket into the unit.

17. Carefully reconnect the internal Battery cable to J9, if it is present. It should only fit one way.

18. Carefully connect the GOES communication cable to J12 on the printed wiring board. It should only fit one way.

19. Connect the internal GOES RF cable to the GOES RF connector and to the antenna connector on the VEDAS.

20. If you are installing a SAT HDR, connect the GPS cable to the GPS antenna connector on the GOES transmitter and the \n to the GPS antenna connector found on the inside of the VEDAS enclosure.

21. Get the cover panel. If it has a keypad and display, connect the flat keypad connector to "J3 - Keypad". Connect the ribbon cable connector to "J4 - Display". The cables should not be twisted.

22. Lift the PCMCIA connector tab. Carefully place the panel back onto the unit making sure not to damage the PCMCIA connector.

23. Attach the four screws and screw covers.

24. Connect the antenna cable and antenna to the antenna connector as described in the antenna mounting procedures.

25. **DO NOT** operate the GOES transmitter without an antenna or calibrated RF dummy load.

26. If you are installing a SAT HDR, connect the GPS antenna to the GPS antenna connector found on the outside of the VEDAS enclosure.

27. Connect the power and follow the start up procedures. If there is a problem, disconnect the power.

28. Test the keypad and display using the system diagnostic menu. Setup the GOES transmitter using a RF transmitter output task.

9.2.2 **GOES Testing**

Refer to section 7.11, "GOES Testing".

SECTION 10.0
ENTERING ACQUISITION FORMULAS

10.1 **Acquisition Formulas**

The Vedas II can apply conversion formulas to the data of any acquisition task. These formulas are used to convert readings taken from an input voltage into other formats such as a temperature or pressure reading. The acquisition task automatically applies a formula to every acquisition. The default is formula 31, which simply multiples by a linear gain and adds an offset. The default gain is 1.0000 and the default offset is 0.0000. The reading will not change if the defaults are used. Formula 30 would add the offset and then multiply by the linear gain. If the defaults are used the reading will also be the same.

10.2 **Formula Listing**

This feature produces a listing of the acquisition formulas currently contained in the system. The listing will display all of the user input formulas, 0 through 29, and all of the predefined formulas, 30 though 43. A sample of the formula listing is shown below.

```
VEDAS II Formula List
=================             (where x = Current Task's Acquisition Value)

30/even = (x + Calibration Offset) * Calibration Gain
31/odd  = (x * Calibration Gain  ) + Calibration Offset
32/23 = x * x
34/35 = 1 / x
36/37 = Lakewood Temp. Probe (10KOhm, 5V Exite) 0-5 Volt Output to Deg. C
38/39 = Campbell Scientific Temp. Probe (HMP 35C) 0-5 Volt Output to Deg. C
40/41 = Converts 4 Bit 77C Wing Sensor Direction into Degrees
42/43 = GOES TGT-1 Power Output Conversion to dbm
-- End of List --
```

Figure 10-1 **Vedas II Formula Listing**

10.2.1 **Entering A New Formula**

The operator can enter a new formula into the Vedas II for use by any acquisition task. There are 30 formula numbers available for user input, numbered 0 through 29. The operator can access this feature through the configuration menu, option 9, "Enter Formula".

The Vedas II will list the following instructions on the screen and then prompt the operator to enter "Formula 0". It will list any formula that may already be present. All of the formula numbers will be listed in order and the operator may select any unused number for a new entry.

```
Use x as the current task's acquisition value.
Use z as the result of an optional 1st stage formula.
# Represents a task priority number from 1 to 48.
VALID INSTRUCTIONS (Executed From Left To Right):
   *=multiply /=divide %=remainder +=add -=subtract ^=raise to the power
   #m#=minimum #M#=maximum #v#=average acquisition value in task range
   NOTE: Above Instructions All Have The Same Priority
   c=cosine s=sine t=tangent q=square root ()=do first ;=calculate z
   C=arc cosine S=arc sine T=arc tangent f=fractional i=integer I=1/X
   h=hyperbolic cosine H=hyperbolic sine y=hyperbolic tangent
   e=exponential l=natural log L=base-10 log a=absolute value
   P=3.14159265359 d=rad->deg r=deg->rad @#=get acquisition value from task
EXAMPLE:   l(1.23*x) ; 4+(x*z)-(z^2*2)+(x^3*3)

FORMULA 0 ->
```

10.2.2 **Important Entry Notes**

It is important to understand these mathematical functions and use them properly or the results may be unpredictable. Here are a few things to remember when adding a formula.

Even numbered formulas will add the calibration offset and then multiply by the calibration gain.
Odd numbered formulas will multiply by the calibration gain and then add the calibration offset.
Do not try to divide by zero. The answer will not be useful.
Nested brackets are allowed.
Formulas execute in mathematical order.
The Vedas II will inform the operator of entry errors.
Logarithms must have a positive, non-zero input.
It is important to test a new formula to ensure it is correct.
Subsequent task calibration may alter the calibration offset value to calibrate the specific readings for that sensor.

10.2.3 **Testing The Formula**

This feature allows the operator to test any formula to make sure the values are correct. From the operator mode menu enter 7, "Test Formula". This option will display all of the formula currently in the system and prompt the operator for the formula number. It will request and calibration gain and calibration offset and then an input value. The formula will run and display the result for operator verification.

10.2.4 **Mathematical Functions And Operators**

The Vedas II formula can use simple mathematical operators such as plus, minus, multiply and divide. It can also use mathematical functions such as trigonometry functions, square roots and logarithms.

Use x as the current task's acquisition value. (Lower case only)
Use z as the result of an optional 1st stage formula. (Lower case only)
Use w as the result of an optional 2nd stage formula. (Lower case only)
Represents a task priority number from 1 to 48.

VALID INSTRUCTIONS:

Mathematical Operators Available

*	multiply	/	divide
%	remainder	+	add
-	subtract	^	raise to the power
#m#	minimum	#M#	maximum
#v#	average acquisition value in task range		

Mathematical Functions Available

c=cosine	s=sine	t=tangent
q=square root	()=do first	;=calculate z
C=arc cosine	S=arc sine	T=arc tangent
f=fractional	i=integer	I=1/X
h=hyperbolic cosine	H=hyperbolic sine	y=hyperbolic tangent
e=exponential	l=natural log	L=base-10 log
a=absolute value	P=3.14159265359	
d=rad->deg	r=deg->rad	
@#=get acquisition value from task		

EXAMPLE: l(1.23*x) ; 4+(x*z)-(z^2*2)+(x^3*3) Where; x = the acquisition value from the sensor
z = ln(1.23 * x) (Natural Logarithm)

Answer = 4 + (x*z) - (z^2*2) + (x^3*3) -> 4 + (x*ln(1.23*x)) - (ln(1.23*x)*ln(1.23*x)*2) + (x^3*3)

Therefore, if x = 1.5 volts
Then Answer = **14.293457**

SECTION 11.0
OPERATIONAL THEORY

11.1 **Time-driven Tasks**

The Vedas II operates on a timed schedule of events. The scheduled tasks are normal time dependant acquisition tasks and are set to execute at the starting times and intervals programmed by the operator. Use main menu selection 4, "Display Vedas II Schedule" to observe the scheduled start times and interval times for each task. They run unconditionally and cycle on a daily basis. Each time a time-driven task is executed, the Vedas II will update the schedule and allocate a new time for the task to execute. Every time-driven task will execute at least once per day.

11.2 **Event-driven Tasks**

Event-driven tasks are the exception to the Vedas II schedule. They are also known as "event triggered alarm tasks". As the name implies, they run at times controlled by external events. They can be any task programmed into the system as well as the resident tasks. Typically, they can be any programmed task, but are often entered for a conditional start to perform acquisitions when some unusual external condition exists. The Vedas II resident tasks can only operate as event driven alarm tasks. An event-driven task, when activated, runs only once.

A time-driven task must be used to trigger an event-driven task through the activation of alarm limits. When programming a time-driven task, the user is asked for an optional alarm limit for the data acquired. If one is entered, the alarm limit will activate a specific task once the alarm limit is exceeded. The event-driven task runs to completion and terminates. The task is specified by its priority number.

Typical applications of event-driven tasks are to increase acquisition rates or to notify a remote operator, via telephone, or GOES that an alarm condition exists. The resident tasks can be used to disable the GOES transmitter or a switched 12 volt output if a task alarm finds a problem that could cause damage to the unit. Refer to 13.6.3 for an example of this type of alarm.

In summary, if a normal time-driven acquisition exceeds the programmable alarm limit, an event-driven alarm acquisition is invoked. An event-driven alarm task can be any existing task within the system including the GOES transmitter or a telephone output. The alarm task system provides the tools to create a DCP with alarm condition reporting in real time.

11.3 **Sanity Timer**

The hardware-based sanity timer circuit constantly monitors operations and will automatically activate a hardware reset, causing a sanity timer error, should it detect the software operation has been corrupted. The sanity timer circuit guarantees that once set, the Vedas II unit will not fail due to a software corruption.

11.4 **Power Saving Modes**

The Vedas II has two power modes; a fully active mode which occurs when the Vedas II is handling acquisitions and a deep sleep mode which is invoked when the Vedas II is idle and no activity is required in the next 5 seconds.

Power consumption in the fully active mode for a loaded Vedas II system will vary according to the specific task it is performing. Normally it will be below 50 mA. The GOES transmitter will draw an additional 10 mA minimum. The GOES requires approximately 4 amps when transmitting.

Power consumption for the deep sleep mode for a loaded Vedas II system will be less than 1.5 mA. As the deep sleep mode will be invoked for a majority of the time, the Vedas II will experience a reduction in the overall power consumption of the system.

11.5 **Analog Task Acquisition Events**

The following events occur during the execution of an Analog acquisition.

1. If a reference voltage or switched 12 volt output voltage is required, it is activated at the next scheduled activation time minus the warm-up time.

2. If a reference voltage is required, the reference voltage is activated and is fed back to a dedicated input in the Analog section. The reference voltage is adjusted until it matches the desired level (ie. compensation for load).

3. At the scheduled acquisition time the first sample is acquired.

4. If a reference voltage or switched 12 volt output is required and if the time to the next sample time is greater than the warm-up time, the reference voltage or switched 12 volt output voltage is removed and re-activated at the time of the next sample, minus the warm-up time.

5. All samples are gathered and processed according to the sample option.

6. The formula number is processed.

7. The calibration slope/offset values are processed.

8. If selected by the operator, the acquisition value is placed in the memory archive.

9. If the acquisition meets the TX archive criteria, the value is placed in the transmit archive.

10. The next acquisition time is calculated and placed in the time queue.

11.6 **Digital Acquisition Task**

The following events occur during the execution of a digital acquisition.

1. If a digital strobe is required it is activated at the next scheduled activation time minus the warm-up time.

2. At the scheduled acquisition time, the first sample is acquired.

3. If a digital strobe was required, and if the time to the next sample time is greater than the warm-up time, the digital strobe is removed and re-activated at the time for the next sample minus the warm-up time.

4. All samples are gathered and processed according to the sample option.

5. The formula number is processed.

6. The calibration slope/offset values are processed.

7. If selected by the operator, the acquisition value is placed in the memory archive.

8. If the acquisition meets the TX archive criteria, the value is placed in the transmit archive.

9. The next acquisition time is calculated and placed in the time queue.

11.7 **Event Counter Acquisition Task**

The following occurs every 10 ms for each event counter acquisition placed in the system.

1. The current event counter input is read, compared to the last read value and incremented if the change equals the programmed transition level.

The following events occur during the execution of an event counter acquisition.

1. At the scheduled acquisition time the current event count is acquired.
2. The formula number is processed.
3. The calibration slope/offset values are processed.
4. If selected by the operator, the acquisition value is placed in the memory archive.
5. If the acquisition meets the TX archive criteria, the value is placed in the transmit archive.
6. The current event count is cleared if optioned by the operator.
7. The next acquisition time is calculated and placed in the time queue.

11.8 **Shaft Encoder Acquisition Task**

The following events occur every 10 ms for each shaft encoder acquisition placed in the system.

1. If a digital strobe is required it is activated.
2. The current shaft phase configuration is read and compared with the last value. The resident shaft encoder count is modified accordingly.
3. If a digital strobe is required it is removed.

The following events occur during the execution of an shaft encoder acquisition.

1. At the scheduled acquisition time the first sample is acquired from the resident shaft encoder count.
2. All samples are gathered and processed according to the sample option.
3. The formula number is processed.
4. The calibration Slope/Offset values are processed.
5. If optioned by the operator, the acquisition value is placed in the memory archive.
6. If the acquisition meets the TX archive criteria the value is placed in the archive.
7. The next acquisition time is calculated and placed in the time queue.

11.9 **High Speed Counter Acquisition Task**

The following events occur during the execution of a high speed event acquisition.

1. If a digital strobe is required it is activated at the next scheduled activation time minus the warm-up time.
2. At the scheduled acquisition time the first sample is acquired.
3. If a digital strobe is required and if the time to the next sample time is greater than the warm-up time the digital strobe is removed and re-activated at the time for the next sample minus the warm-up time.
4. All samples are gathered and processed according to the sample option.
5. The formula number is processed.
6. The calibration slope/offset values are processed.
7. If selected by the operator, the acquisition value is placed in the memory archive.
8. If the acquisition meets the TX archive criteria the value is placed in the transmit archive.
9. The next acquisition time is calculated and placed in the time queue.

11.10 **Serial Acquisition Task**

The following events occur during the execution of a serial acquisition.

1. All characters received at the serial port are written to a FIFO (First In First Out) buffer equal to twice the acquisition length in size.
2. If a switched 12 volt output voltage is required it is activated at the next scheduled activation time minus the warm-up time.
3. At the scheduled acquisition time, the first sample is acquired.
4. If a switched 12 volt output voltage is required, and if the time to the next sample time is greater than the warm-up time, the switched 12 volt output voltage is removed and re-activated at the time for the next sample minus the warm-up time.
5. The received data string is parsed for the appropriate data.
6. All serial tasks are processed similarly.
7. All samples are gathered and processed according to the sample option.
8. The formula number is processed.
9. The calibration slope/offset values are processed.
10. If selected by the operator, the acquisition value is placed in the memory archive.
11. If the acquisition meets the TX archive criteria, the value is placed in the transmit archive.
12. The next acquisition time is calculated and placed in the time queue.

11.11 **SDI-12 Acquisition Task**

The following events occur during the execution of an SDI-12 acquisition.

1. At the scheduled acquisition time the SDI-12 device is sent the appropriate measurement command.
2. The SDI-12 device returns the time required to perform the measurement.
3. After the measurement time has elapsed, the SDI-12 device is sent a send data command.
4. The SDI-12 device sends the acquired data.
5. The data string is parsed for the appropriate data. The received string is then passed to the next secondary task.
6. All secondary tasks are processed similarly.
7. All samples are gathered and processed according to the sample option.
8. The formula number is processed.
9. The calibration slope/offset values are processed.
10. If selected by the operator the acquisition value is placed in the memory archive.
11. If the acquisition meets the TX archive criteria the value is placed in the transmit archive.
12. The next acquisition time for the parent task is calculated and placed in the time queue.

11.12 **Modem Output Task**

The following events occur during the execution of a modem output task.

NOTE

While the modem task is executing all communications to the program terminal are suspended until the modem operations are completed.

1. At the scheduled time of the modem output task the Vedas II powers up and initializes the modem.
2. The modem is placed in the off-hook condition and the software waits until a dial tone is detected. If no dial tone is detected in 15 seconds the modem card is powered down and the operation re-scheduled at the current time plus the re-try delay (maximum of 3 retries).
3. Once a dial tone is detected, the software waits 1.3 seconds, then dials using touch or pulse dialling as selected by the operator.
4. If no outgoing ring signal is detected, the modem is powered down and the operation re-scheduled at the current time plus the re-try delay (maximum of 3 retries).
5. If the call is not answered within 15 seconds the modem is powered down and the operation re-scheduled at the current time plus the re-try delay (maximum of 3 retries).
6. Once the call is answered, the software waits for the detection of a carrier. If no carrier is detected within 15 seconds the modem card is powered down and the operation re-scheduled at the current time plus the re-try delay (maximum of 3 retries).

7. Once a carrier is detected, the software proceeds to send the current acquisition values.

8. If the transmission is successful, the time of the modem output is placed in the memory archive if selected by the operator.

9. The next modem output time is calculated and placed in the time queue.

11.13 **GOES Transmit Communication Task**

The following events occur during the execution of a GOES communication output task.

Immediately after system initialization, the GOES transmit parameters are sent to the GOES transmitter.

Self-Timed Transmission

1. At one minute before the scheduled time of transmission, the software transmits the contents of all GOES archive buffers to the GOES transmitter.

2. The memory archive is sent an entry stating the GOES update time if so optioned by the operator.

3. The next GOES output time is calculated and placed in the time queue.

Random Alarm Transmission For A 697-07 GOES Transmitter

1. Immediately after initialization, the GOES output task is invoked. Current GOES archive data is gathered and sent to the GOES transmitter.

2. The GOES update time is sent to the archive memory if selected by the operator.

3. The next GOES output time is calculated as the current time, plus the regular random transmit interval.

4. The GOES will transmit the data one time within the regular random transmit interval on the selected random channel.

5. If an alarm condition occurs, the GOES output task is removed from the time queue and the GOES transmitter is updated immediately. The GOES update time is sent to the memory archive if selected by the operator.

6. Once the random alarm TX interval expires, the regular alarm mode of operation is reinstated.

Random Alarm Transmission For A TGT-1 GOES Transmitter or a SAT HDR GOES Transmitter

1. Immediately after initialization, the GOES output task is invoked. Current GOES archive data is gathered and sent to the GOES transmitter.

2. The GOES update time is sent to the archive memory if selected by the operator.

3. The next GOES output time is calculated as the current time, plus the regular random transmit interval.

4. The GOES will transmit the data one time within the regular random transmit interval on the selected random channel.

5. If an alarm condition occurs the GOES buffer is updated immediately and the update time is sent to the archive memory if selected by the operator.

6. The GOES transmitter is then instructed to immediately transmit the data one time on the selected random channel.

11.14 **Diagnostic Acquisition Task**

The following events occur during the execution of a diagnostic task.

1. Upon completion of the system initialization the diagnostic task is immediately invoked.
2. The integrity of the system set-up parameters stored in FLASH memory is verified.
3. If a modem is present and in the powered down state, the ring detect circuitry is verified to be active.
4. The next acquisition time is calculated and placed in the time queue.

SECTION 12.0

UPGRADING SYSTEM HARDWARE

12.1 **System Hardware**

Vedas II is not a modular system. The Vedas II electronic hardware is not user serviceable or field serviceable. The only field service operations are to install peripheral components like a GOES Transmitter, Internal Modem, or replace the Internal Battery. Please contact Valcom if you require assistance installing any new items like these. Please contact Valcom if a Vedas II unit requires an electronic upgrade. Software upgrades can be performed by the operator.

Vedas II System Hardware is constructed mainly of surface mount devices. There are only two printed wiring boards, the main board and the connector board. Both of these boards are **static sensitive** and should **Not** be handled. All service work should be performed at Valcom Ltd.

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Fax: (519) 824-3411

12.2 **Installation of Analog Section**

Valcom can install an analog section in any Vedas II unit. The unit must be returned to Valcom for the installation. Please contact Valcom about arrangements regarding the installation procedure.

12.3 **Installation of Internal Battery**

Valcom can install an internal battery and battery charger in any Vedas II unit. If the unit does not currently have a battery charger then the unit must be returned to Valcom for the installation. Please contact Valcom about arranging to have this procedure done.

If the unit currently has a battery and battery charging circuit, but it is malfunctioning or requires a new battery, then it should be returned to Valcom for repair.

12.4 **Installation of High Speed Counter**

Valcom can install a high speed counter in any Vedas II unit. The unit must be returned to Valcom for the installation. Please contact Valcom about arrangements regarding the procedure.

12.5 **Installation of Goes Transmitter**

A GOES transmitter can be installed in any Vedas II unit. The unit has mounting holes to accommodate the Telonics TGT-1, the Valcom 697-07, the Campbell Scientific SAT HDR or Valcom VGOES HDR transmitters. Each transmitter requires a different connection cable. Please refer to chapter 9 for details about the procedure.

12.6 **Installation of Internal Modem**

Valcom can install an Internal Modem in any Vedas II unit. The unit must be returned to Valcom for the installation. Please contact Valcom about arrangements regarding the procedure.

If the unit is internal modem ready, then the modem, Cermetek model CH1794, can be installed by following the modem installation procedure. Please note that the Vedas II contains static sensitive components. Valcom does not assume any responsibility for damage done to the unit due to installation of any module outside of Valcom Ltd.

CAUTION

The Vedas II system contains "STATIC SENSITIVE DEVICES" which may be damaged if appropriate precautions are not observed with respect to electrostatic discharge. Operators handling or having access to the Vedas II electronics should ground themselves by wearing a proper wrist strap or other protective device.

12.6.1 **Mounting the Internal Modem.**

1. The power **MUST** be disconnected from the Vedas II.
2. Turn **OFF** the internal battery if there is one present in the unit.
3. The installer should follow static sensitive precautions and wear a ground strap.
4. Open the cover of the Vedas II. Remove the PCMCIA card if there is one in the unit.
5. Remove the screw covers from the screws on the cover panel. Remove the screws.
6. If the panel has a keypad and display, it will have wires attached underneath.
7. Carefully lift the panel making sure not to damage the PCMCIA connector or wiring.
8. Disconnect the keypad connector and the display connector from the main board, if present.
9. Remove the panel and place it aside. Make sure it is not resting on the display module, it is static sensitive.
10. Find the U13 marking on the printed wiring board. It should have two rows of sockets mounted on the board. It is directly over the program terminal connector on the side of the enclosure.
11. If the two rows of sockets are not there then the unit is **NOT** internal modem ready. Stop the installation and proceed to step 14.
12. Find JP1, JP2, JP3, JP4 and JP13 located beside U13. If there are shorting jumpers on the headers then they should be removed. Remove each one carefully, Do **NOT** remove any others.
13. Carefully insert the modem into the two rows of sockets on the main printed wiring board. It should only fit one way. It should be well connected to the sockets.
14. Get the cover panel. If it has a keypad and display, connect the flat keypad connector to "J3 - Keypad". Connect the ribbon cable connector to J4 - Display. The cables should not be twisted.
15. Lift the PCMCIA connector tab. Carefully place the panel back onto the unit making sure not to damage the PCMCIA connector.
16. Attach the screws and screw covers.

17. Connect the telephone line to the jack.

18. Connect the power cable and follow the start up procedures. If there is a problem disconnect the power.

19. Test the keypad and display using the system diagnostic menu. Set up the modem and test it using the diagnostic menu. Dial in to the unit and check proper operation of the modem.

12.6.2 **Connections For An External Modem, Radio Modem or RS-232 Interface.**

An external modem can be connected to the RS-232 connector on the side of the unit. Use the configuration menu selection 8, "Setup Modem Interface" to set the operation of the Modem.

If the setup modem interface will not allow an external modem because the internal modem is setup , then the internal modem must be removed and the jumpers must be installed. The Vedas II will not allow an external modem unless the correct jumper connections are present. Refer to section 2.3.2 for the jumper settings.

To remove the internal modem or to install the internal modem jumpers, JP1, JP2, JP3, JP4 and JP13, follow the internal modem installation procedures with two changes. At step 12 add the jumpers to the headers, use a two pin shunt assy. At step 13 carefully remove the modem.

SECTION 13.0

VEDAS II PROGRAMMING EXAMPLES

13.1 ANALOG ACQUISITION EXAMPLES

13.1.1 Battery Voltage Acquisition

Battery voltage is to be read at 5 minute intervals starting at the top of the hour. An hourly battery voltage reading occurring at 15 minutes after the hour, is to be transferred to the modem and RF transmitter.

```
                                        ADD Analog Acquisition
                                        ======================

                                                Priority of Task (1-47) -> 1
Input Type (0=Diff, 1=Single Ended, 2=VEDAS Temp, 3=Battery) <0> -> 3
                                                  Task Label  -> Battery
                                      Start of Acquisition <00:00:00> ->
                                    Interval of Acquisition <01:00:00> -> 00:05:00
                                      Number of Samples (1-18000) <1> ->
    Output Data Format (0=Exponential, 1-9=Number of Digits) <0> -> 3
                                       Archive Acquisition Data ? <Y> ->
                                Number of Output Archives (0-99) <0> -> 6
                        First Acquisition For Output Archive <00:00> -> 00:15
                                      Output Archive Interval <01:00> ->
                           Attach Time Stamp To Output Archives ?<Y> ->
                                      Modem Sends Output Archives <Y> ->
                                           Formula Number (0-43) <31> ->
                                     Calibration Gain <1.000000000> ->
                                   Calibration Offset <0.000000000> ->
Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.1.2 **Temperature Probe Acquisition**

A Valcom temperature probe is connected to channel 0 of the analog inputs. Using an excitation voltage of 1.788 volts through a bias resistor of 23.1 Kohms connected to A0. A calibration gain of -100 and a calibration offset of 106.05 will produce an output in degrees Celsius. It will take six readings per hour consisting of 10 samples each to be averaged together. A sample rate of 1 sample per minute is required. Hourly temperature readings occurring at 20 minutes after the hour are to be transferred to the modem and GOES transmitter.

```
                                                    ADD Analog Acquisition
                                                    ======================

                                                Priority of Task (1-47) -> 2
        Input Type (0=Diff, 1=Single Ended, 2=VEDAS Temp, 3=Battery) <0> ->
                                          Analog Input Channel (0-6) <0> ->
Measurement Type (0=Volts, 1=Frequency, 2=Half Bridge, 3=Full Bridge) <0> ->
                               Analog Output Voltage (0 or 0.01-5) <0.000> -> 1.788
                                    Analog Output Channel (0-3=A0-A3) <0> ->
                          Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> ->
                                       Output Settling Time <00:00:01> ->
                                       Amp Gain (1, 10, 100, 1000) <1> ->
                                                        Task Label  -> TB
                                       Start of Acquisition <00:00:00> ->
                                    Interval of Acquisition <01:00:00> -> 00:10:00
                                       Number of Samples (1-18000) <1> -> 10
                                     Period of Acquisition <00:00:45> -> 00:09:00
         Sample Option (0=Min, 1=Max, 2=Last, 3=Avg, 4=Totalize) <3> ->
       Output Data Format (0=Exponential, 1-9=Number of Digits) <0> -> 4
                                       Archive Acquisition Data ? <Y> ->
                                  Number of Output Archives (0-99) <0> -> 6
                           First Acquisition For Output Archive <00:00> -> 00:20
                                       Output Archive Interval <01:00> ->
                              Attach Time Stamp To Output Archives ?<Y> ->
                                       Modem Sends Output Archives <Y> ->
                                            Formula Number (0-43) <31> ->
                                     Calibration Gain <1.000000000> -> -100
                                   Calibration Offset <0.000000000> -> 106.05
    Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.1.3 **OBS-3 Turbidity Sensor**

The turbidity sensor is to be connected to channel 1 on the analog interface. The output voltage swing of 0 to +5 volts corresponds to .02 to 2000 FTU. The sensor requires an excitation voltage of 7 to 15 volts for 10 seconds before the first reading can be taken. It is connected to 12S1. Six readings per hour are required starting at 5 minutes past the hour. Hourly readings occurring at 5 minutes after the hour are to be sent to the GOES transmitter. Each reading is to consist of an average of 10 samples taken at 5 second intervals. Task 10 is required to be activated via alarm starting at a level of 800 FTU and then in increments of 100 FTU. Task 10 will cause a strobe to be activated which, in turn, drives a water pump sampling system.

```
                                                ADD Analog Acquisition
                                                ======================

                                                  Priority of Task (1-47) -> 3
          Input Type (0=Diff, 1=Single Ended, 2=VEDAS Temp, 3=Battery) <0> ->
                                               Analog Input Channel (0-6) <0> -> 1
Measurement Type (0=Volts, 1=Frequency, 2=Half Bridge, 3=Full Bridge) <0> ->
                                 Analog Output Voltage (0 or 0.01-5) <0.000> ->
                           Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> -> 1
                                      Output Settling Time <00:00:01> -> 00:00:10
                                      Amp Gain (1, 10, 100, 1000) <1> ->
                                                          Task Label  -> OBS3
                                      Start of Acquisition <00:00:00> -> 00:05:00
                                    Interval of Acquisition <01:00:00> -> 00:10:00
                                      Number of Samples (1-18000) <1> -> 10
                                     Period of Acquisition <00:00:45> ->
           Sample Option (0=Min, 1=Max, 2=Last, 3=Avg, 4=Totalize) <3> ->
         Output Data Format (0=Exponential, 1-9=Number of Digits) <0> -> 5
                                       Archive Acquisition Data ? <Y> ->
                                  Number of Output Archives (0-99) <0> -> 6
                          First Acquisition For Output Archive <00:00> -> 00:05
                                      Output Archive Interval <01:00> ->
                             Attach Time Stamp To Output Archives ?<Y> ->
                                      Modem Sends Output Archives <Y> -> N
                                           Formula Number (0-43) <31> ->
                                     Calibration Gain <1.000000000> -> 400
                                    Calibration Offset <0.000000000> -> .02
          Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> -> #800+100
                                           Alarm 1 Activates Task <0> -> 10
```

13.2 DIGITAL ACQUISITION EXAMPLES

13.2.1 Precipitation Gauge

The precipitation gauge consists of a weight scale to measure the amount of precipitation gathered. The weight deflection drives an absolute shaft encoder which provides a 12 bit (3 digit) BCD output. One bit is equivalent to 1 mm of precipitation. The shaft encoder requires a supply voltage of +10 to +15 volts using 12S0. The output bits are expressed in negative logic. A precipitation value is required every 30 minutes. The output readings are to be expressed in metres of precipitation. The GOES transmitter is scheduled to transmit every three hours starting at 00:45 local time. One reading per hour is to supplied to the GOES transmitter, the operator should insure the transmitted data is current.

Start Time Calculation:

start time = GOES Local Tx Time - GOES Update time - task processing time
start time = 00:45 - 0:01 - 00:00:20
start time = 00:43:40

Remove Seconds offset

start time = 00:43:00

Adjust for 2 readings per hour

start time = start time - 00:30:00
start time = 00:13:00

ADD Digital Acquisition
==========

```
                                          Priority of Task (1-47) -> 4
Digital Input LSBit 0-5=(0-5=D0-D5, 6=SDI-0, 7=SDI-1, 8-12=PC0-PC4) <0> ->
                                   Number of Input Bits (1-13) <1> -> 12
                                 Bit Input Mode (0=BIN, 1=BCD) <0> -> 1
                                               Invert Input ? <N> -> Y
                                   Number of Output Bits (0-8) <0> ->
                         Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> -> 0
                                   Output Settling Time <00:00:01> -> 00:00:02
                                                    Task Label  -> Precip Gau
                                   Start of Acquisition <00:00:00> -> 00:13:00
                                Interval of Acquisition <01:00:00> -> 00:30:00
                                   Number of Samples (1-18000) <1> -> 10
                                  Period of Acquisition <00:00:45> -> 00:00:18
            Sample Option (0=Min, 1=Max, 2=Last, 3=Avg, 4=Totalize) <3> ->
          Output Data Format (0=Exponential, 1-9=Number of Digits) <0> -> 3
                                     Archive Acquisition Data ? <Y> ->
                               Number of Output Archives (0-99) <0> -> 6
                        First Acquisition For Output Archive <00:00> -> 00:43
                                   Output Archive Interval <01:00> ->
                              Attach Time Stamp To Output Archives ?<Y> ->
                                   Modem Sends Output Archives <Y> ->
                                        Formula Number (0-43) <31> ->
                                    Calibration Gain <1.000000000> -> 0.001
                                  Calibration Offset <0.000000000> ->
        Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.2.2 **Tipping Bucket Rain Gauge**

The tipping bucket rain gauge provides 1 output pulse for every 1 mm of rain gathered. It is connected to PC4. An hourly precipitation value is required starting at the top of the hour.

```
                                    ADD Pulse Counter Acquisition
                                    =============================

                                                Priority of Task (1-47) -> 5
  PC0-PC4 Switched With GND. SDI-0 & SDI-1 Switch With +5 Volts.
        Pulse Counter Channel (0-4=PC0-PC4, 6=SDI-0, 7=SDI-1) <0> -> 4
                Transition Level (1=Rising, 2=Falling, 3=Both) <1> ->
                             Reset Events After Each Sample ? <Y> ->
                                                  Task Label  -> Tip Bucket
                                   Start of Acquisition <00:00:00> ->
                                 Interval of Acquisition <01:00:00> ->
                                   Number of Samples (1-18000) <1> ->
     Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                    Archive Acquisition Data ? <Y> ->
                                Number of Output Archives (0-99) <0> ->
                        First Acquisition For Output Archive <00:00> ->
                                   Output Archive Interval <01:00> ->
                           Attach Time Stamp To Output Archives ?<Y> ->
                                   Modem Sends Output Archives <Y> ->
                                        Formula Number (0-43) <31> ->
                                    Calibration Gain <1.000000000> ->
                                  Calibration Offset <0.000000000> ->
  Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.2.3 **Incremental Shaft Encoder**

An incremental shaft encoder (quad phase output) is to be used to gather water level measurements in a stilling well. The LSBit is connected to PC1 and the MSBit is connected to PC2, the power comes from a 12 volt output. Water level measurements are required every 15 minutes starting at 2 minutes past midnight. The specific reading occurring at 32 minutes past the hour is to be sent to the GOES transmitter.

```
                                    ADD Shaft Encoder Acquisition
                                    =============================

                                                Priority of Task (1-47) -> 6
               Shaft Encoder Channel LSBit (0=PC0, 1=PC1, 3=PC3) <0> -> 1
                    Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> ->
                                                  Task Label  -> Shaft
                                   Start of Acquisition <00:00:00> -> 00:02:00
                                 Interval of Acquisition <01:00:00> -> 00:15:00
                                   Number of Samples (1-18000) <1> ->
     Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                    Archive Acquisition Data ? <Y> ->
                                Number of Output Archives (0-99) <0> -> 3
                        First Acquisition For Output Archive <00:00> -> 00:32
                                   Output Archive Interval <01:00> ->
                           Attach Time Stamp To Output Archives ?<Y> ->
                                   Modem Sends Output Archives <Y> ->
                                        Formula Number (0-43) <31> ->
                                    Calibration Gain <1.000000000> ->
                                  Calibration Offset <0.000000000> ->
  Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.2.4 **Absolute Atmospheric Pressure**

An absolute pressure transducer is to be used to gather atmospheric pressure. A +12 volt supply voltage is required to cause an output consisting of +5 volt pulses whose frequency is proportional to the measured pressure. The sensor requires the supply to be present for 15 seconds for the output to become stabilized. A correction gain of -.2419 and offset of -39688 are required to produce an output in millibars.

ie. (x + offset) x gain = millibars

Atmospheric pressure readings are required every 15 minutes. A reading occurring at 20 minutes past the hour is to be sent to the GOES transmitter.

ADD High Speed Acquisition
==========

```
                                  Priority of Task (1-47) -> 7
                High Speed Input Channel (0=HS0, 1=HS1) <0> ->
              Maximum Frequency (0.0001-200 KHz) <200.0000> ->
           Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> -> 1
                        Output Settling Time <00:00:01> -> 00:00:15
                                             Task Label  -> Hg
                        Start of Acquisition <00:00:00> -> 00:05:00
                     Interval of Acquisition <01:00:00> -> 00:15:00
                        Number of Samples (1-18000) <1> ->
Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                         Archive Acquisition Data ? <Y> ->
                  Number of Output Archives (0-99) <0> -> 3
           First Acquisition For Output Archive <00:00> -> 00:20
                        Output Archive Interval <01:00> ->
              Attach Time Stamp To Output Archives ?<Y> ->
                        Modem Sends Output Archives <Y> ->
                             Formula Number (0-43) <31> -> 30
                         Calibration Gain <1.000000000> -> -.2419
                       Calibration Offset <0.000000000> -> -39688
Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.3 SERIAL ACQUISITION EXAMPLES

13.3.1 Serial Pressure Sensor

A pressure sensor outputs atmospheric pressure and ambient temperature in a serial RS-232 format, "7-bits, 2-stop bits, even parity" at 300 baud. Data is automatically output every 10 seconds. The data format of the sensor is:

/HG/28.880/TA/+23.4//<cr><lf>

where the first reading is in inches of Hg and the second in degrees Celsius.

Atmospheric pressure readings in millibars, are required every 15 minutes. A reading occurring at 3 minutes past the hour is to be sent to the GOES transmitter. The temperature reading is not required by the GOES.

Note: Millibars = in Hg x 33.86388
Message Length:
/HG/28.880/TA/+23.4//<cr><lf>
123456789012345678901 2 3 = 23 characters

ADD Serial Acquisition
==========

```
                                    Priority of Task (1-47) -> 8
                                 Number of Data Values <1> -> 2
                          Serial Channel (0=RS232, 1=RS485) <0> ->
                                   Driver Always On ? <N> ->
                                         Baud Rate <9600> -> 300
                                      Number of Bits <8> -> 7
                                   Number of Stop Bits <1> -> 2
                        Parity Bit (0=None, 1=Even, 2=Odd) <0> -> 1
                                  Message Length (1-127) <32> -> 23
                 Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> ->
                                                  Task Label  -> Hg
                               Start of Acquisition <00:00:00> -> 00:03:00
                            Interval of Acquisition <01:00:00> -> 00:15:00
                               Number of Samples (1-18000) <1> ->
    Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                  Archive Acquisition Data ? <Y> ->
                             Number of Output Archives (0-99) <0> -> 3
                   First Acquisition For Output Archive <00:00> -> 00:03
                               Output Archive Interval <01:00> ->
                      Attach Time Stamp To Output Archives ?<Y> ->
                               Modem Sends Output Archives <Y> ->
                                    Formula Number (0-43) <31> ->
                                 Calibration Gain <1.000000000> -> 33.86388
                               Calibration Offset <0.000000000> ->
Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

EDIT Data Value 2
==========

```
                                                  Task Label  -> Ta
    Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                  Archive Acquisition Data ? <Y> ->
                             Number of Output Archives (0-99) <0> ->
                                    Formula Number (0-43) <31> ->
                                 Calibration Gain <1.000000000> ->
                               Calibration Offset <0.000000000> ->
Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.4 SDI-12 ACQUISITION EXAMPLES

13.4.1 VISE Valcom Incremental Shaft Encoder, SDI-12 Model

The VISE is a SDI-12 device which outputs displacement in metres when using the specified pulley size. The VISE is connected to SDI-12 channel 1 on the Vedas II. The VISE has a programmed address of 1. The VISE documentation shows that a measurement command of 0 provides 2 pieces of data, the first being displacement in metres, the second being accumulated errors.

A displacement reading is required every 5 minutes starting at 2 minutes past midnight. The second data item is accumulative, there is no requirement to store it in memory. One reading (most current available) per hour is required by the GOES transmitter which transmits every 3 hours starting at 00:03:00 local time. The accumulated errors parameter is only to be transmitted once in the first transmission of the day.
NOTE: All data ready to be transmitted via GOES is transferred 1 minute before transmit time. The acquisition occurring at 00:02:00 would not be complete, therefore the acquisition occurring at 57 minutes after the previous hour must be used.

```
                                                ADD SDI-12 Acquisition
                                                ======================

                                                  Priority of Task (1-47) -> 10
                                               Number of Data Values <1> -> 2
                                  SDI-12 Channel (0=SDI-0, 1=SDI-1) <1> ->
                                               Device Address (0-9) <0> -> 1
              Measurement Command (M, M1-M9, C, C1-C9, R0-R9, V) <M> ->
                    Switched 12V Output (0=12S0, 1=12S1, 2=None) <2> ->
                                                          Task Label  -> VISE
                                     Start of Acquisition <00:00:00> -> 00:02:00
                                  Interval of Acquisition <01:00:00> -> 00:05:00
                                     Number of Samples (1-18000) <1> ->
       Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                      Archive Acquisition Data ? <Y> ->
                                Number of Output Archives (0-99) <0> -> 3
                        First Acquisition For Output Archive <00:00> -> 00:57
                                     Output Archive Interval <01:00> ->
                           Attach Time Stamp To Output Archives ?<Y> ->
                                     Modem Sends Output Archives <Y> ->
                                          Formula Number (0-43) <31> ->
                                      Calibration Gain <1.000000000> ->
                                    Calibration Offset <0.000000000> ->
   Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->

                                                   EDIT Data Value 2
                                                   =================

                                                          Task Label  -> Verr
       Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                      Archive Acquisition Data ? <Y> -> N
                                Number of Output Archives (0-99) <0> -> 1
                        First Acquisition For Output Archive <00:57> -> 23:57
                                     Output Archive Interval <01:00> -> 24:00
                           Attach Time Stamp To Output Archives ?<Y> ->
                                     Modem Sends Output Archives <Y> ->
                                          Formula Number (0-43) <31> ->
                                      Calibration Gain <1.000000000> ->
                                    Calibration Offset <0.000000000> ->
   Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.5 LINKED TASK ACQUISITION EXAMPLES

13.5.1 Daily Maximum/Minimum

Daily minimum and maximums are required for water level measured in a stilling well. The daily max and min values are to be transmitted via the GOES transmitter at the end of the day. Use the previous VISE SDI-12 acquisition example as the initial task. The `Start of Acquisition` of the Linked Acquisition should be at least 5 seconds after the `Start of Acquisition` of the SDI task.

```
                                        ADD Linked Acquisition
                                        ======================

                                    Priority of Task (1-47) -> 20
                                      Data From Task Number -> 10
                                                 Task Label  -> WL max
                                Start of Acquisition <00:00:00> -> 00:03:00
                              Interval of Acquisition <01:00:00> -> 24:00:00
                                 Number of Samples (1-18000) <1> -> 288
                                Period of Acquisition <00:02:04> -> 23:55:00
      Sample Option (0=Min, 1=Max, 2=Last, 3=Avg, 4=Totalize) <3> -> 1
     Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                   Archive Acquisition Data ? <Y> ->
                             Number of Output Archives (0-99) <0> -> 1
                   First Acquisition For Output Archive <00:00> -> 00:03
                                Output Archive Interval <01:00> -> 24:00
                      Attach Time Stamp To Output Archives ?<Y> ->
                                Modem Sends Output Archives <Y> ->
                                     Formula Number (0-43) <31> ->
                                  Calibration Gain <1.000000000> ->
                                Calibration Offset <0.000000000> ->
 Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->


                                        ADD Linked Acquisition
                                        ======================

                                    Priority of Task (1-47) -> 21
                                      Data From Task Number -> 10
                                                 Task Label  -> WL min
                                Start of Acquisition <00:00:00> -> 00:03:00
                              Interval of Acquisition <01:00:00> -> 24:00:00
                                 Number of Samples (1-18000) <1> -> 288
                                Period of Acquisition <00:02:04> -> 23:55:00
      Sample Option (0=Min, 1=Max, 2=Last, 3=Avg, 4=Totalize) <3> -> 0
     Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                   Archive Acquisition Data ? <Y> ->
                             Number of Output Archives (0-99) <0> -> 1
                   First Acquisition For Output Archive <00:00> -> 00:03
                                Output Archive Interval <01:00> -> 24:00
                      Attach Time Stamp To Output Archives ?<Y> ->
                                Modem Sends Output Archives <Y> ->
                                     Formula Number (0-43) <31> ->
                                  Calibration Gain <1.000000000> ->
                                Calibration Offset <0.000000000> ->
 Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

13.6 RF TRANSMITTER OUTPUT PROGRAMMING EXAMPLES

13.6.1 GOES Transmitter Output Task

The GOES transmitter within the Vedas II system is to be setup according to the parameters supplied by the NESDIS authority.

GOES Transmitter ID : 12345678
Self-Timed Transmission
GMT Start of transmission time : 02:17:00
Transmit Interval : 03:00:00
GOES Transmit Channel : 151

The Vedas II station is located in Guelph, Ontario, CANADA which has a GMT offset of -5 hours.

As the transmit path is relatively clear, and the transmit antenna angle not too close to the horizon, a short preamble is selected to maximize the amount of data that can be transmitted.

```
                                                ADD RF Transmitter Output
                                                =========================

  RF Transmitter Type (1=GOES TGT-1, 2=GOES 697-07, 3= SAT HDR GOES) <1> ->
Transmission Mode (0=Self Timed, 1=Self Timed/Alarm, 2=Random Alarm) <0> ->
                              Transmission Preamble (0=Short, 1=Long) <0> ->
                            Transmission Window Length (10-120 sec.) <60> ->
                   **RF Transmitter Data Rate? (1=100, 2=300, 3=1200) <1> ->
                Transmission Message Format (0=Condensed, 1=Detailed) <0> ->
                                     Archive GOES Update Time ? <Y> ->
                                   Modem Sends GOES Update Time ? <Y> ->
                                        Transmission ID Address  -> 12345678
                    GMT Offset (Local Time = GMT + GMT Offset) <-05:00> ->
                                  GMT Start of Transmission <00:00:00> -> 02:17:00
                                     Self Timed TX Interval <03:00:00> -> 03:00:00
                           Self Timed Transmission Channel (1-199) <1> -> 151
                          **Update New Setting to the SAT HDR GOES? <N> -> Y
```

** These settings are only available if the SAT HDR GOES is selected.

13.6.2 GOES Transmitter Power Monitoring

The GOES transmitter power monitor can only be done if a GOES output task is already entered in the system. In the previous example, a GOES output task is programmed with a GMT start time of 2:17 and a transmit interval of 3:00. The GMT offset is set for -5:00 hours. The message window length is 60 Seconds. The acquired power level is to be placed in the next transmit message.

Transmit time calculation for a 24 hour clock :

GMT Tx Time + GMT Offset = Local Tx Time
2:17 + -5:00 = 21:17

To find the next transmission time (n = number of intervals)
2:17 + (3:00)*n + -5:00 = 0:17, 03:17, 06:17, 09:17, 12:17, 15:17, ...

The forward power reading will have to be transmitted in the next transmission window. Please keep in mind that the GOES transmitter is updated one minute prior to the start of transmission

```
                                        ADD Goes Power Acquisition
                                        ==========================

                                              Priority of Task (1-47) -> 44
                    **Power Type (0=Forward, 1=Reflected, 2=VSWR) <0> ->
                           **Power Units (0=None, 1=Watts, 2=dBm) <0> -> 1
                                                    Task Label  -> PWR
          *** Start Time Is About 2 Minutes Later Than RF Task == 02:20:00 ***
             *** Interval of Acquisition Equals to the RF Task == 03:00:00 ***
                                    Number of Samples (1-18000) <1> ->
     Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                     Archive Acquisition Data ? <Y> ->
                                Number of Output Archives (0-99) <0> -> 2
                           First Acquisition For Output Archive <00:00> -> 02:19
                                    Output Archive Interval <01:00> -> 03:00
                              Attach Time Stamp To Output Archives ?<Y> ->
                                    Modem Sends Output Archives <Y> ->
                                         Formula Number (0-43) <31> ->
                                   Calibration Gain <1.000000000> ->
                                  Calibration Offset <0.000000000> ->
 Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> ->
```

** If the SAT HDR GOES is selected, these options are replaced by :

```
    SAT HDR GOES uses Ratio Power Acquisition (0.5 = Matched) <Y> ->
```

Note: HDR GOES utilizes only one type of power reading, the ratio power.

13.6.3 GOES Transmitter Power Monitoring And Event Driven Alarm

The GOES transmitter power monitor can only be done if a GOES output task is already entered in the system. In the previous example, a GOES output task was measured for forward power. In this example, the reflected power is checked and resident task 100 is invoked if the reflected power is greater than 2 watts.

```
                                        ADD Goes Power Acquisition
                                        ==========================

                                                Priority of Task (1-47) -> 45
                        ** Power Type (0=Forward, 1=Reflected, 2=VSWR) <0> -> 1
                                ** Power Units (0=None, 1=Watts, 2=dBm) <0> -> 1
                                                          Task Label  -> Reflected
                    *** Start Time Is About 2 Minutes Later Than RF Task == 02:20:00 ***
                       *** Interval of Acquisition Equals to the RF Task == 03:00:00 ***
                                            Number of Samples (1-18000) <1> ->
             Output Data Format (0=Exponential, 1-9=Number of Digits) <0> ->
                                         Archive Acquisition Data ? <Y> ->
                                    Number of Output Archives (0-99) <0> -> 2
                              First Acquisition For Output Archive <00:00> -> 02:19
                                            Output Archive Interval <01:00> -> 03:00
                                 Attach Time Stamp To Output Archives ?<Y> ->
                                            Modem Sends Output Archives <Y> ->
                                                 Formula Number (0-43) <31> ->
                                          Calibration Gain <1.000000000> ->
                                        Calibration Offset <0.000000000> ->
         Alarm Limit (0=None or Limit After <=, >=, @ or #start+stop) <0> -> >2
                                                 Alarm 1 Activates Task <0> -> 100
                                                 Alarm 2 Activates Task <0> ->
```

** If the SAT HDR GOES is selected, these options are replaced by :

```
            SAT HDR GOES uses Ratio Power Acquisition (0.5 = Matched) <Y> ->
```

Note : Resident task 100 will disable the GOES transmitter. This is done to protect the transmitter from damage due to high reflected power coming back into the unit.
HDR GOES utilizes only one type of power reading, the ratio power. In the power acquisition example an LDR transmitter was used.

13.7 Display of All Programming Examples

```
P#    Task Type      Ch   Op  Next Acq  Acq Intvl     Latest Data
==    =========      ===  ==  ========  =========  ==================
 1 -  ANALOG         BAT   6  14:40:00  00:05:00   Battery     /        13.6/14:35:00
 2 -  ANALOG         +0-   6  14:39:57  00:10:00   TB          /       113.0/14:20:00
 3 -  ANALOG         +1-   6  14:44:58  00:10:00   OBS3        /     -5.6498/14:35:00
 4 -  DIGITAL         D0   6  14:42:58  00:30:00   Precip Gau  /        0.03/14:13:00
 5 -  PULSE COUNTER  PC4   0  15:00:00  01:00:00   Tip Bucket  /  0.0000e+00/14:00:00
 6 -  SHAFT ENCODER  PC1   3  14:47:00  00:15:00   Shaft       /  0.0000e+00/14:32:00
 7 -  HIGH SPEED     HS0   3  14:49:45  00:15:00   Hg          /  9.6005e+03/14:35:00
 8 -  SERIAL         232   3  00:00:00  00:15:00   Hg          /  INITIALIZED
 9 -  *SERIAL        232   0  24:00:00  00:00:00   Ta          /  INITIALIZED
10 -  SDI-12         1-1   3  14:47:00  00:05:00   VISE        /  9.9990e+34/14:32:00
11 -  *SDI-12        1-1   1  24:00:00  00:00:00   Verr        /  9.9990e+34/14:32:00
20 -  LINKED          10   1  24:03:00  24:00:00   WL max      /INITIALIZED
21 -  LINKED          10   1  24:03:00  24:00:00   WL min      /INITIALIZED
44 -  GOES POWER     FWD   2  15:19:00  03:00:00   ForwardPWR  /  9.8765e+00/12:18:00
45 -  GOES POWER     REF   2  15:19:00  03:00:00   Reflected   /  0.2655e+00/12:18:00
48 -  ANALOG         151   1  15:34:40  01:00:00   VEDAS Temp  /       24.34/14:34:46
49 -  GOES OUTPUT          0  15:17:00  03:00:00   12345678    /            /12:16:00
50 -  DIAGNOSTIC          1  14:39:44  00:05:00   Diag        /  No Errors /14:34:44
14:35:52
```

GLOSSARY

ACQUISITION TASK	An acquisition task is a programmed event which causes an acquisition process to occur. The Vedas II may contain a maximum of 41 user based acquisition tasks.
ACQUISITION	Denotes the act of gathering data within the Vedas II system. An acquisition may consist of one or many samples. An acquisition may be stored with its associated label and time stamp, into the memory archive or transferred via an RF transmitter.
BAUD	In almost all cases (except when dealing with modems) baud is the same as bits per second, which determines the speed as which serial information is conveyed between devices. Technically, it refers to the rate of change of a signal carrying information. Since in most cases one signal state conveys one bit of information, baud and bits per second are interchangeable.
BCD	Binary Coded Decimal. A system of four binary digits used to represent decimal numbers, 0 - 9.
BINARY	A base 2 number system used by computers represented by 1 and 0.
BIT	A bit is a single piece of digital information. A bit can either be a 1 or a 0, this can corresponded to simple decisions like YES or NO, or, ON or OFF.
BYTE	A byte is a bit configuration consisting of 8 sequential bits. A byte may represent a numeric value ranging from 0 to 255.
CARRIER	A tone that a modem sends over the telephone lines before any data is sent. The carrier is used to synchronize and indicate a modems presence between two connected modems.
CHECKSUM	A checksum is a value which results from a mathematic operation being performed on a section of digital data. The value is stored and compared with subsequent checksum operations to verify the unchanged state of the digital data.
COLD BOOT	Performed when power is applied to the system or the sanity timer trips. The software checks the integrity of the RAM (non-destructive test) and the PEROM. If a GOES task exists in the system then the GOES transmitter is accessed to retrieve the time. If the GOES system time is invalid then the Vedas II retrieves the RTC time and invalidates the GOES task. If no GOES Task exists in the system then the system time retrieved from the RTC and the program terminal port is checked to see if a terminal is connected. If no terminal is connected a system initialization is performed. Alternately, if a terminal is connected, the Vedas II enters the menu system.
CTS	Clear to Send. RS-232 control line used for flow control handshaking. In the Vedas II system this line is also used to detect the presence of a serial modem device.
DCP	Data Collection Platform. In the industry, this term is used to denote a data logger equipped with a GOES transmitter option.
DEFAULT	Is a setting or answer to a prompt that will be automatically assumed if no entry is made with respect to the prompt.

DIFFERENTIAL	Is the difference between two values. In the context of the Vedas II, a differential input receives two signals a positive and a negative, the analog interface measures and outputs the difference between the two signals.
EEPROM	Electrical Erasable Programmable Read Only Memory.
EMI	Electro Magnetic Interference. EMI is unwanted electrical energy generated by electrical or electronic devices. EMI has the potential to disrupt the operation of unprotected circuits.
ERROR CORRECTION	Some modems contain built in error correction. Error correction tries to compensate for errors received due to noisy telephone lines. To implement error correction in a connected serial modem the hardware flow control features of the Vedas II and the connected modem should be enabled.
FIFO	First In First Out. Refers to a software buffer, denotes that the first item to enter the buffer will be the first item to leave the buffer.
FLASH MEMORY	Programmable Erasable Read Only Memory. The FLASH is a non-volatile memory device. The FLASH memory can be erased in block sections only. Any empty byte can have new data written to it.
FRAMING ERROR	A framing error occurs in serial data communications when data synchronized on a received start bit does not contain the proper trailing stop bit(s). The error may be accompanied by corrupted data.
GOES	Geostationary Orbiting Environmental Satellite.
HAYES MODEM	The Hayes compatible modem is a modem device which incorporates the Hayes modem command set.
HDR	High Data Rate. This is a term to describe the new generation of GOES transmitters capable of transmitting at higher baud rates than earlier transmitters.
HEX	Hexadecimal number. A base 16 number system used in software. It uses 0 - 9 and A - F to represent 0 - 15. One hexadecimal digit is commonly used to represent four binary digits.
INITIALIZED	Once initialized the Vedas II system will continue to gather data according to its acquisition schedule. The operator may view gathered data, perform local acquisitions, or access the archive memory without disturbing the data acquisition process.
LSB	Least Significant Bit. Bit of least significance (ie. lowest value) in a digital word or input.
MODEM	Modulator/Demodulator. A modem is an electronic device which converts serial digital information into a format which is easily transferred along a transmission medium (in most cases the telephone system).
MSB	Most Significant Bit. Bit of most significance (ie. highest value) in a digital word or input.
ORBCOMM	Orbcomm is a two way wireless packet data communications system using satellites in orbit 500 miles above the earth. Orbcomm provides access to a world wide telecommunication network from any location on earth.

OVERRUN ERROR	An overrun error occurs in serial communication when data is received faster that the controlling system can retrieve it. An overrun error usually means that received data has been lost.
PARITY BIT	The parity bit is usually the eighth bit in a seven bit serially transferred data word. The state of the parity bit is determined by the condition of the previous seven bits and the type of parity required (ie. Even of Odd Parity).
PARITY ERROR	An parity error occurs when the parity bit does not match the required parity state when calculated from the previous data bits.
PCMCIA	Personal Computer Memory Card International Association. PCMCIA is an association founded to define a standard memory card interface. The memory card slot in the Vedas II unit conforms to these guides.
PCMCIA Card	The PCMCIA Card is a Flash memory device used for easy transfer of stored data from the Vedas II to a central location. Vedas II can accept 1 Meg, 2 Meg, 4 Meg or 8 Meg cards.
PEROM	Programmable Erasable Read Only Memory. The PEROM is a non-volatile memory device. This is also referred to as FLASH memory.
QUART	Quad Universal Asynchronous Receiver/Transmitter. A QUART is a hardware device in a computer based system which selects one set of four different inputs and translates the parallel data information into a serial format.
RAM	Random Access Memory.
RS-232	RS-232 is an interface specification that details connection between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE). Data is transferred using an asynchronous serial format.
RS-485	RS-485 is a three way interface specification that details a balanced connection between data terminal equipment and multiple peripherals. Data is transferred using an asynchronous serial format.
RTC	Real Time Clock. A RTC device through an internal timing circuit maintains the current time and date. The Vedas II is equipped with an RTC device on the controller card.
RTS	Request To Send. RS-232 control line used for flow control handshaking.
SANITY TIMER	A sanity timer is a hardware base circuit which, if allowed to time out, will cause a hardware reset of the computer portion of the circuitry. During normal operation the sanity timer is constantly re-started via the software which prevents it from timing out. If the software portion becomes corrupted, the sanity timer will, in turn, not be reset, and so will cause a hardware reset which will restart normal operation of the software.
SAT	Abbreviation for the word Satellite. Campbell Scientific uses this abbreviation as part of the new model name for their GOES transmitter.
SDI-12	Serial Data Interface, 12 volts. SDI-12 is a serial data interface for monitoring and powering compatible SDI sensors operating at 1200 baud with a nominal 12 volts available for sensor power.

SERIAL PORT	A serial port is an electronic interface which has been designed to convey digital information in a serial time dependant stream. The Vedas II controller contains 4 serial ports, two of which are interfaced via the RS-232 standard, and two the SDI-12 standard.
SIGNAL CONTENTION	A signal contention occurs when two driven signals, at different states, try to occupy the same conductor. A signal contention is usually accompanied by an increase in current consumption as the two signals fight for control.
SINGLE ENDED	In the context of the Vedas II, a single ended input receives an analog signal, the analog interface measures and outputs the difference between the analog signal and the +12 volt ground potential.
SPURIOUS	A false or erroneous signal superficially appearing to be a real signal.
SRAM	Static Random Access Memory.
STROBE (+12 Volt)	A +12 volt strobe is a switched +12 volt source which is controlled by the Vedas II acquisition routines. Rather than powering a sensor continuously, the switched +12 volt strobe powers the sensor only when a reading is being performed.
TERMINAL	A terminal is a device which allows an operator to interact with computer based electronic equipment. The human interface consists of a view screen and a keypad. Desired actions are entered via the keypad, responses are shown via the view screen.
TRANSIENT	A transient is an unwanted electrical signal that tends to upset or corrupt electronic circuitry.
TTL	Transistor Transistor Logic. TTL is a digital operating specification which conveys digital information between +5 volts (TRUE, 1 state) and 0 volts (FALSE, 0 state).
UART	Universal Asynchronous Receiver/Transmitter. A UART is a hardware device in a computer based system which translates parallel data information into a serial format.
UNARY	Having or consisting of a single element.
UNINITIALIZED	An uninitialized system performs no scheduled acquisitions nor will it allow the operator to perform any local acquisition. The operator may however view the last current data, perform any diagnostic task, or access the archive memory.
VEDAS II	Valcom Environmental Data Acquisition System - Second Generation
WARM BOOT	A warm boot occurs at midnight. All scheduled tasks are halted, the Vedas II is reinitialized clearing all device busy flags, etc. and the system re-initialized. This occurrence prevents an inadvertent system glitch (close lightning strike, etc.) from causing the system to fail for longer than a 24 hour period.

A-1 USER INTERFACE MENU STRUCTURE

Throughout the Menu system the following keys will always perform the attached function.

ESC (Escape Key) - Will always abort the current procedure and return the operator to the calling menu. If the operator is in the Main Menu when the Escape key is struck a system initialization procedure will be invoked.

BS (Back space) - Will always delete the previous key stroke if one exists.

DEL (Delete) - Will always delete the previous key stroke if one exists.

CTRL-Y - When prompted to enter a string (ie. task label) the CTRL-Y combination erases the default string and prompts the operator with an empty buffer.

<default> - Upon prompting for an entry from the operator, all numeric default or previous data will be located between less than and greater than signs. To accept the default condition the operator need only strike the (ENTER) key.

If the entry requires an alphanumeric string input, the default or current string will be offered for editing.

A-2 VEDAS Start-Up Sequence

The following is the preferred VEDAS start-up routine.

a. If a computer is being used as a program terminal device ensure that it is appropriately configured. The Vedas II uses a baud rate between 300 and 57600, 8 data bits, 1 stop bit, no parity. Acceptable communication software is V2UP.EXE supplied by Valcom or Procomm. Load the software and have it running.

b. Connect the battery or power supply to the VEDAS power cable observing marked polarity. The Voltage should be 11-15 volts.

c. Connect the program terminal cable to both the terminal device and to the VEDAS.

d. Connect the Vedas power cable to the VEDAS.

e. Press the <Space> bar on the terminal and *"FLASH Check ..."* should appear. The VEDAS sign-on *"VEDAS X.XX"* should appear which is followed by a request to verify the date.

f. No message will appear until the <Space> bar is pressed to invoke the automatic baud matching feature of the Vedas II. If a different key is pressed, the Vedas II may interpret this as a different baud rate. If it does, disconnect the program terminal cable, wait a few seconds, then reconnect it and press <Space> again.

g. If the text *"FLASH Check ..."* appears but the VEDAS sign-on message *"VEDAS X.XX"* does not appear and the system never prompts for the date or error log reset, press the <Space> bar again.

h. If there is still a problem performing a memory initialization, refer to the procedure as detailed in Appendix A-9. The watch dog timer may have tripped and caused a watch dog error. This is not a problem. Pressing <Space> will reinitialize the unit.

i. If no message appears remove the power connector, check all electrical connections, and repeat steps "d" through "g".

j. If no message appears remove the program terminal connector, wait 30 seconds, replace the connector, and repeat steps "e" through "g".

k. If still no message appears, mark the unit as unserviceable and return for repair.

A-3 Error Message Index

DEFINITION OF ERRORS IN THE ERROR LOG REPORT

Non-Critical Errors		
No.	Error	Description
0	TERM_OVERUN	Program Terminal Overrun Error
1	TERM_NOISE	Program Terminal Noise Error
2	TERM_FRAME	Program Terminal Framing/Break Error
3	TERM_PARITY	Program Terminal Parity Error
4	Q_A_OVERUN	Modem / RS232 Overrun Error
5	Q_A_PARITY	Modem / RS232 Parity Error
6	Q_A_FRAME	Modem / RS232 Framing Error
7	Q_A_BREAK	Modem / RS232 Received Break
8	Q_B_OVERUN	GOES Overrun Error
9	Q_B_PARITY	GOES Parity Error
10	Q_B_FRAME	GOES Framing Error
11	Q_B_BREAK	GOES Received Break
12	Q_C_OVERUN	SDI-0 / RS485 Overrun Error
13	Q_C_PARITY	SDI-0 / RS485 Parity Error
14	Q_C_FRAME	SDI-0 / RS485 Framing Error
15	Q_C_BREAK	SDI-0 / RS485 Received Break
16	Q_D_OVERUN	SDI-1 Overrun Error
17	Q_D_PARITY	SDI-1 Parity Error
18	Q_D_FRAME	SDI-1 Framing Error
19	Q_D_BREAK	SDI-1 Received Break
20	ARCHIVE_FUL	Archive Memory Is Full; Nothing Else Will Be Archived
21	ARCHIVE_OVR	Archive Memory Bank Has Been Overwritten
22	SHAFT_SKIP	Shaft Encoder Counts Were Skipped
23	NO_CARRIER	No Carrier Detected By Modem Output Task

System Critical Errors		
No.	**Error**	**Description**
32	TST_RESET	System Test Routine Caused Reset
33	SYS_RESET	MPU Reset Instruction Caused Reset
34	CLK_RESET	Loss of Clock Reference Caused Reset
35	HLT_RESET	Halt Monitor Caused Reset
36	DOG_RESET	Watchdog Caused Reset
37	PUP_RESET	Power Up Reset Occurred
38	EXT_RESET	External Signal Caused Reset
39	BRK_PNT	MPU Caused Breakpoint Interrupt
40	BUS_ERR	MPU Caused Bus Error Interrupt
41	SWR_INT	MPU Caused Software Interrupt
42	ILLEGAL	MPU Encountered Illegal Instruction
43	DIV_ZERO	MPU Encountered Divide By Zero
44	UN_INIT	Uninitialized Interrupt Was Encountered
45	SPUR_INT	Spurious Interrupt Was Encountered
46	SRAM	SRAM Test Failed
47	SRAM_WR	Copying From FLASH To SRAM Error
48	FLASH_WR	Copying From SRAM To FLASH Error
49	DEFALT_PRM	Default Program Parameters Have Been Set In SRAM
50	DIAG_PRM	Diagnostic Task Encountered Bad Program Parameter
51	DIAG_RELD	Diagnostic Task Was Reloaded
52	DIAG_TAB	Diagnostic Task Encountered Bad Task Table Entry
53	INIT_TASK	Initialization Encountered Bad Task Table Entry
54	TEMP_RELD	Temperature Task Was Reloaded
55	BATT_V	Battery Voltage <= Power Down Voltage
56	S1_SHORT	12S1 Output Was Shorted To Ground
57	S0_SHORT	12S0 Output Was Shorted To Ground
58	NO_A_CAL	Analog Calibration Values Not Stored In FLASH
59	A_CAL_SHRT	Analog Section Calibration Time Is Too Short
60	NO_TX_MEM	Not Enough Memory For A Task's Output Message

System Critical Errors		
No.	**Error**	**Description**
61	BAD_LINK	Deleted Linked Task With A Source Task Mismatch
62	SDI_RS485	Deleted SDI-0 Task Using RS485 Port
63	DIG_RS485	Deleted Digital Task Using RS485 Port
64	PC_RS485	Deleted Pulse Counter Task Using RS485 Port
65	ANALOG_OUT	Deleted Analog Task Because Analog Section Is Not Installed
66	SDI_COM_0	Invalid Response From SDI-0 Sensor
67	SDI_COM_1	Invalid Response From SDI-1 Sensor
68	D_A_5V	D/A Output May Be Shorted Since Output > 5V Was Requested
69	D_A_0V	D/A Output <= 0V Was Requested
70	D_A_NOT_V	Requested D/A Output Was Not Achieved
71	GOES_PRGM	GOES Transmitter Programming Error
72	GOES_MSG	Loading GOES Message Error
73	GOES_TIME	Getting Time From GOES Transmitter error
74	GOES_STOP	Stopping GOES Transmission Error
75	GOES_PWR	Getting Power From GOES Transmitter Error
76	RTC_BAD	RTC Is Malfunctioning
77	RTC_TIME	Time In RTC Was Corrupted
96	MAX_ERRORS	Only 96 RAM Locations In RTC For Error Log

A-4 SDI-12 Error Index

In the event of an SDI-12 communication error during an SDI-12 acquisition, the VEDAS will write an archive memory entry, replacing the data with one of the following messages depending on the cause of the error. Note that throughout the following text a lower case "a" is used to designate the respective device address.

Error String	Error Description
No CR/LF D.	The aDX! command returned a string without a terminating carriage return/line feed
Dvc Adr D.	The aDX! command returned an invalid device address
Dvc Adr T.	The aMX! command returned an invalid device address
Time Chr's<6	The aMX! command returned an invalid amount of time characters
T Chr Nt Dig	The aMX! command returned an invalid time string
D Chr Nt Dig	The aMX! command returned an invalid number of data items character
No CR/LF T.	The aMX! command returned a string without a terminating carriage return line feed
No Chr Aft T.	The aMX! command had no response
No Chr Aft D.	The aDX! command had no response

A-5a GOES OUTPUT MESSAGE STRUCTURE (VEDAS Default Format)

The GOES transmitter output message structure is determined by the VEDAS software and the selection of transmission message format. The transmission message format is set during the programming of the GOES transmitter output task. It supports a detailed message format and a condensed message format. This format may be modified to a customers requirements if the detailed or condensed formats are not suitable.

The Detailed Format

HEADER

station_ID/VEDAS Vx.xx/yyyy.mm.dd/

where;

station_ID	is the station name entered by the operator.
Vx.xx	is the version of the VEDAS software.
yyyy	is the year of the transmission
mm	is the month of the transmission
dd	is the day of the transmission

DATA

<label>±<data>@hhmm±<data>@hhmm....±data@hhmm/label±<data> ... //

where;

<label>	is the acquisition label.
<data>	is the latest acquisition data, the data is expressed according to the data format setting.
hh	is the hour of the acquisition time stamp.
mm	is the minute of the acquisition time stamp.

Diagnostic errors are added to the end of the transmission if so selected by the operator.

EXAMPLE

Valcom_Ltd/VEDAS V1.0 0/1992.04.02/VB+12.342@0115+12.401@0015
+12.432@2315/HG+1.2324@0110+1.2852@0010+1.2754@2310/TW-1.2134
@0110-1.2001@0010-1.1983@2310/DA 06=4,08=1//

A-5b GOES OUTPUT MESSAGE STRUCTURE

The Condensed Format

HEADER

:<label> MM#II±<value 1>±<value 2>.±<value n>$

where;

:	Delimiter, designates start of record
label	Is a 10 character label applied to the acquisition by the user during creation.
MM	Is the time in minutes before transmission that the latest (newest) sample was taken.
#	Delimiter
II	Is the time interval in minutes between the values transmitted.
±	Value delimiter, either (+) or (-) depending on the sample polarity.
<value>	Is a single acquisition value of 4 significant digits. If decimal notation is incapable of displaying the value, scientific notation will be used. The values are display in chronological order with the newest value being first.

The above pattern is repeated for each acquisition to be transmitted. The task priority value determines the order of transmission with the lowest value being transmitted first.

Diagnostic errors are added to the end of the transmission if so selected by the operator.

A-6 MEMORY ARCHIVE MESSAGE STRUCTURE

The VEDAS memory archive dump format contains parameters separated by forward slashes and consists of both data entries and date stamp entries. The memory dump always begins with a date stamp entry.

The data format is as follows:

<CR><LF>Sensor Label/Sensor Data/Acquisition time

Below is a sample sensor entry :

<CR><LF>BB / 1.4567e+01/01:15:03

where;

<CR><LF> carriage return, line feed combination.

BB Is the sensor label (ie. Battery Voltage). The sensor label always contains 10 characters. Labels shorter than 10 characters are padded with spaces.

/ delimiter

1.4567e+01 Is the recorded sensor data, (ie 14.567 volts). It is displayed in scientific notation, and always contains 5 significant digits. If negative, the number is prefixed with a dash.
In the case that an acquisition failed due to a hardware fault the software will place the cause of the error (ie. text message 12 character long) in place of the sensor data.

01:15:03 Acquisition time stamp.
For average and last sample options the time stamp is the time that the acquisition's first sample was taken. For the maximum and minimum sample options the time stamp is the time that the maximum or minimum event occurred.

A date stamp entry is placed in the archive memory each time a system initialization is performed and at the start of each day.

The data stamp format is as follows:

<CR><LF><sp><sp>/YYYY.MM.DD/Station Number/

Below is a sample date stamp entry :

<CR><LF>__/1991.01.20/0123456789/

where;

<CR><LF> Carriage return, Line Feed combination.

_ represents a space character

/ delimiter

YYYY represents the year of the date stamp entry

. delimiter

MM represents the month of the date stamp entry

DD represents the day of the date stamp entry

A-7 MODEM INTERFACE INITIAL DUMP FORMAT

The VEDAS modem interface initial format contains parameters separated by forward slashes.

The format is as follows:

```
<CR><CR><LF><STX>[MODEM ANSWER MESSAGE UP TO 34 CHARACTERS]
<CR><CR><LF><STX> /YYYY.MM.DD/[STATION_NUMBER]/<CR><LF>
[LABEL]/[DATA]/HH:MM:SS<CR><LF>
        "
        "
        "
<CR><LF>----------
<CR><LF>NOTE: <Ctrl K> Is Used To Hang Up At Any Time
<CR><LF>----------
<CR><LF>Enter Password ->
```

where;

<LF>	Line feed, (ASCII character 0aH)
<CR>	Carriage return (ASCII character 0dH)
<STX>	Start of header (ASCII character 02H)
YYYY	Current year
.	Delimiter
MM	Current month
.	Delimiter
DD	Current day
/	Delimiter
[STATION NUMBER]	Station number
[LABEL]	Acquisition label
[DATA]	Acquisition data
HH	Hour of acquisition
:	Delimiter
MM	Minute of acquisition
:	Delimiter
SS	Second of acquisition
Password	Is the unit's password. It should be entered to allow full access to the unit.
<ETX>	End of text (ASCII Character 03h)
<BCC>	Block check character (Exclusive OR of all characters between and including the STX and ETX characters.)

A-8 VEDAS Alarm Tutorial

The VEDAS supports three types of alarm modes; fixed level, rate of change, and fixed interval. Refer to the table below for the entry format of each type of alarm.

Alarm Type	Entry Format	Example
Fixed Level	>(value) <(value)	>5.50 <2.40
Rate of Change	@(value)	@2.2
Fixed Interval	#(start)+(interval) #(start)-(interval)	#20+2 #10-5

Fixed Level Alarm

With the fixed level alarm, an alarm will be activated each time an acquisition is performed that exceeds, or is equal to the alarm threshold. The threshold is determined by the operator's entry and can be either greater than or equal to ( ) a value or less than or equal to ( ) a value. For example, if the alarm is to activate if the input is above 3.21 volts, then the operator should enter ">= 3.21" at the alarm limit prompt.

The operator may use this mode to increase the frequency of readings once a set threshold has been reached. To do this the operator, after setting the threshold level, specifies the alarmed task to be the current task (in other word the task calls itself). If the current task is only taking one sample the software will automatically adjust the number of samples to two and will then prompt the operator for the sample interval. The sample interval will determine the increased acquisition rate once the alarm has been activated.

Rate of Change Alarm

The rate of change alarm is activated when the difference between the acquired data value and the previously gathered value exceeds or is equal to a threshold amount. Below is an example showing when an alarm is activated using an alarm limit of @2.5.

Acquired value	Alarm Calculations
2.04	2.04 - 0 = 2.04
2.87	2.87 - 2.04 = 0.83
4.94	4.94 - 2.84 = 2.07
7.54	7.54 - 4.94 = 2.60, **Alarm !!**
5.01	5.01 - 7.54 = -2.53
7.49	7.49 - 5.01 = 2.48
3.57	3.57 - 7.49 = -3.92
6.07	6.07 - 3.57 = 2.50, **Alarm !!**
7.54	7.54 - 6.07 = 1.47

Fixed Interval Alarm

The fixed interval alarm has been designed to cause a single alarm once the acquired data exceeds a set threshold. This feature will then cause an additional single alarm(s) once the acquired data exceeds a multiple of the interval value. Steps have been taken to insure that multiple alarms do not occur due to sensor variation around a threshold level. The following alarm formula can be used to determine when an alarm will occur. A fixed interval alarm is activated when :

Acquisition value >= alarm limit + (alarm step * level)

-or-

Acquisition value < alarm limit + (alarm step * (level-2))

This alarm mode is selected by using the "#" designation, followed by a <value> and a "+" or "-", then the <step value>.

An example using an alarm limit setting of #4+2 is also shown below. Note that the level value is updated after the alarm calculation is performed.

Acquired Value	Level	Alarm Status
0	0	
1	0	
2	0	
3	0	
4	1	Alarm Activated
4	1	
5	1	
6	2	Alarm Activated
9	3	Alarm Activated
8	3	
9	3	
8	3	
7	3	
6	3	
5	1	Alarm Activated
4	1	
3	1	

Acquired Value	Level	Alarm Status
2	1	
1	0	Alarm Activated
2	0	
3	0	
4	1	Alarm Activated
5	1	
6	2	Alarm Activated
3	0	Alarm Activated

The fixed interval alarm was designed for an application which required a pump sample to be taken once a turbidity sensor exceed a set amount. Additional pump samples were also required at fixed intervals above the set amount. The requirement was met by placing a fixed interval alarm into the turbidity sensor acquisition. The alarm activated a dummy serial acquisition which required a +12 volt output. The +12 volt output activated the pump sampler causing a sample to be acquired. The alarm function can be a powerful tool for customizing control of an operation.

A-9 VEDAS Program Monitor System

In order to provide an environment in which the VEDAS system will be able to upgrade its own run time code, a monitor program has been developed. The monitor program can only be accessed via the program terminal or the serial modem telephone connection. Instructions on accessing the program monitor system and upgrading VEDAS system software will be contained in the upgrade package supplied by Valcom Limited.

The monitor program sign-on is shown below. Striking the <ESC> key will reactivate the VEDAS software.

```
VEDAS II Firmware Upgrade Monitor V1.00 User Commands
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

ESC     = Exit VEDAS II Firmware Upgrade Monitor
 H      = Display This Help Screen
 C      = Calculate Checksum of FLASH Memory Contents of 0:0000 -> 7:FFFF
 E      = Erase VEDAS II Program Parameters In FLASH Memory 0:4000 -> 0:5FFF
 M      = Erase Monitor Code And Permanent Data In FLASH Memory 7:0000 -> 7:FFFF
L#####  = List The FLASH Memory Contents From The Given 5 Digit Hex Address
           (ESC Aborts listing And Any Other Key Stops/Starts Listing)
*
```

Operator entry into the monitor code should only be done using specific instructions received from Valcom Limited. Diagnostic options have been placed in the monitor program which can cause the run time code to be corrupted.

!! IMPORTANT !!

Valcom Limited will not be responsible for events that occur if the user accesses the Firmware Upgrade Monitor without receiving explicit instructions from Valcom Limited.

An internal sanity timer trip counter has been placed in the monitor routine and will cease to activate the VEDAS software once 10 sanity timer trips have been registered. The monitor routine will, if a modem exists, activate the modem and answer any incoming calls. The internal sanity trip counter is cleared by either a VEDAS power up occurrence, or the operator activation of the monitor program.

Memory Initialization Procedure

The following information details a procedure to initialize the VEDAS program memory via the monitor routine. Under normal operations this procedure should never be required and should only be used when the system becomes corrupted and the VEDAS software is inaccessible.

In order to access the monitor routine the message *"FLASH Check ..."* must appear on the terminal screen. If during the time the FLASH Check message is present on the screen the operator strikes the <?> key, the VEDAS firmware upgrade monitor program will be activated. An appropriate sign on message will appear followed by a "*" prompt.

A-10 SDI-12 Communication Primer

The following description has been reproduced from the SDI-12 specification written by Campbell Scientific.

Command and Response Description
In the following description, commands and responses are enclosed in quotes with the sensor address represented by "a". "ttt" represents a three digit integer specifying the maximum time in seconds for a sensor to have the resulting data available in its buffer. This time includes the time required to send a service request back to the data recorder. The valid range of "ttt" is 000 to 999 seconds.

Command	Description and Response
"aM!"	**Initiate a Measurement** The response is "atttn<CR><LF>" where "ttt" is the required sensor integration time in seconds, and "n" is the number of data values that will be provided. The values generated by measurements in response to this command are retained in the sensor for subsequent collection using the "D" commands. If "ttt" is not "000", a service request ("a<CR><LF>") is sent to the data recorder after the measurement is completed indicating the sensor has the data ready. The "D" commands are used to collect the data. If the service request is not received properly before the specified processing time (ttt) has elapsed, the data recorder wakes the sensor with a break and collects the data. If "ttt" is "000", then the specified number of data values will be available as soon as it can be retrieved with "D" commands and no service request will be sent from the sensor. Resulting data will be stored in the sensor until another "M" or "V" command is executed. If an invalid response has been received, the re-try sequence may cause a break to be sent. The sensor should abort its measurement upon receiving a break and flag this condition so that subsequent "D" commands return no data. The sensor will then be able to respond to a re-try of the "M" command. Unless a sensor operation is aborted with a break, no commands can be issued by a data recorder until after an anticipated service request has been received or until the maximum time "ttt" has elapsed.
"aV!"	**Initiate Verify Sequence** The response is "atttn<CR><LF>". After the verify sequence is completed a service request is sent to the data recorder (if "ttt" is not "000") and data will be collected using subsequent "D" commands. The result of this command is exactly the same as an "aM!" command except that the data returned is from a verification sequence instead of a measurement. The data returned by this command may include ROM signatures or CRC's, RAM test results, or results of other diagnostic processes.
"**aAb!**"	**Change Channel Number** This is to change the device from address "a" to address "b". The response will be "b<CR><LF>" to verify the sensor is now set for channel "b".

Command	Description and Response
"aD0!" through "aD9!"	**Send Data** The response is "a<values><CR><LF>". See Data Format section regarding the format of <values>. Values returned by a "D" command will be 33 characters or less. The data buffer in the sensor will not be altered by this command. If the number of values returned by a "aD0!" command are less than the number specified by the result of the previous "M" or "V" command, the rest of the data will be collected using "aD1!", "aD2!" ... and so on until all values specified have been collected. If one or more values were specified and a valid response to the "aD0!" is return with no data, the measurement was aborted and a new "M" command will have to be sent.
"R0!" through "R9!"	**Continuous Measurements** The response is "a<values><CR><LF>". See Data Format section regarding the format of <values>. Values returned by a "R" command will be 33 characters or less. The data buffer in the sensor will not be altered by this command. If the number of values returned by a "R0!" command are less than the number specified by the result of the previous "M" or "V" command, the rest of the data will be collected using "R1!", "R2!" ... and so on until all values specified have been collected. The "R" commands are the same as "D" except they do not need to be preceded by an "M" command.
"aI!"	**Send Identification.** The response is "allccccccccmmmmmmvvvxxx...xx<CR><LF>", where: "ll" is the SDI-12 level number indicating the SDI-12 version compatibility, eg. version 1.0 would be represented as 10. "cccccccc" is an eight character vendor identification to be specified by the vendor and is usually in the form of a company name or an abbreviation. "mmmmmm" is a 6 character field specifying the sensor model number "vvv" the sensor version number. "xxx... xx" is an optional field of up to a maximum of 13 characters to be used for serial number or other specific sensor information that is not relevant to the operation of the sensor. Level, Vendor, Model, and Version data will be provided as a unique response to allow a data recorder to automatically select sensor specific firmware if it has this capability.

Command	Description and Response
"a!"	**Acknowledge Active** This command returns a "a<CR><LF>" response and will only be used with the transparent mode (Extender Command Set) to make sure the sensor responds before sending a more lengthy command. The command "1!" will be returned with the response of "1" if the SDI sensor is using channel 1.
"aM1!" through "aM9!"	**Additional Measurement Commands** Used to obtain different types of measurements. The result of this command is exactly the same as the "M" or the "V" command. This extension allows the data recorder to initiate different types of measurement, calibration, or control functions at different time intervals. If 'N' is zero (0), no data will be available during the subsequent "D" command.

Data Format

Responses to the "D" command will be in the form of "apd.d<CR><LF>", where "a" is the sensor address, and "pd.d" is the value (p is the polarity sign, "d' represents numeric digits before or after the decimal). A decimal may be used in any position in the value after the polarity sign. If a decimal is not used, it will be assumed after the last digit.

The polarity sign (+ or -) will always be the first character of a value. This means that in a response with multiple values, the polarity sign is the delimiter between values.

The data recorder will be able to receive values containing between 1 and 7 digits.

The following is an example of a data block from a sensor (address 0) containing 5 values (29 characters of data) followed by a carriage return, line feed combination.

0+3.29+23.5+65.3-25.45+75.5491<CR><LF>

A-11 Operator Terminal Error Messages

The following program terminal error messages have been sorted alphabetically. The first word "Error," is common to all of the error messages and has been removed for clarity. Specific numbers have been replaced by "#". The definitions given may not fit all possible causes of error messages. If the error messages are persistent, Valcom should be contacted for further information or clarity.

Error String	Cause/Solution
0000 Program Parameters Expected 8072 Were Received	**Cause** There may be a problem with the uploaded file or filename or there may have been a error in transfer of the files from the terminal to the Vedas II. **Solution** Check the file, it should be 8072 Bytes. Check the baud rate, program parameters transfers should be performed at 9600 baud or lower.
12 Volt Switches Are Not Installed	**Cause** The 12 volt switched outputs are not installed or are malfunctioning. **Solution** If they are required, contact Valcom about servicing or upgrades.
12S0 Output Is Already Being Used By Task #	**Cause** The operator may have requested use of a 12 volt switched output that is being used by another task. **Solution** Check the sensor configurations for availability. The operator can select 12S1 or use a constant 12 volt output.
12S1 Output Is Already Being Used By Task #	**Cause** The operator may have requested use of a 12 volt switched output that is being used by another task. **Solution** Check the sensor configurations for availability. The operator can select 12S0 or use a constant 12 volt output.
A Child Task Cannot Be Deleted Delete Parent Task	**Cause** The operator has tried to delete a interdependent child task without deleting the parent task **Solution** Delete the parent task first.
Add An RF Transmitter Task	**Cause** The operator has entered an emergency message and the unit does not have an RF transmitter output task to transmit the message. **Solution** Add an RF transmitter task.
An Invalid Data Entry Was Found at <ADDRESS>	**Cause** A given memory location may be corrupted. **Solution** A corruption the memory allocation pointer may have occurred or a bad memory section may exist. Save the program parameters and disconnect the power. Reconnect the power and initialize the unit.
An Empty Archive Location Was Encountered At <ADDRESS>	**Cause** A given memory location was not found. **Solution** Check the value of the location entered and try a Flash test from the diagnostics menu.
An Analog Output Voltage Is Required For Resister Measurement	**Cause** The operator may have entered an analog task without specifying all of the parameters correctly. **Solution** Check the task in question and the hardware connections.

Error String	Cause/Solution
An Invalid Date Entry Was Found at <ADDRESS>	**Cause** A given memory location may be corrupted. **Solution** A corruption of the memory allocation pointer may have occurred or a bad memory section may exist. Save the program parameters and disconnect the power. Reconnect the power and initialize the unit.
An Invalid Message Entry Was Found At <ADDRESS>	**Cause** A given memory location may be corrupted. **Solution** A corruption of the memory allocation pointer may have occurred or a bad memory section may exist. Save the program parameters and disconnect the power. Reconnect the power and initialize the unit.
An Analog Output Voltage Is Required For This Channel	**Cause** An analog task may have been programmed incorrectly or the analog output drivers may be malfunctioning. **Solution** Check the task and measure the output voltage on the requested channel. If a problem persists mark the unit for repair.
Analog Section Is Not Installed	**Cause** The unit does not have an analog section. **Solution** If an analog task is required contact Valcom for information about hardware upgrades.
Analog Sample Rate Exceeded	**Cause** The interval rate of the analog task may have been set faster than the sample rate of the analog section. **Solution** Either increase the interval of acquisitions, increase the period, or reduce the number of samples.
Cannot Execute Child Task	**Cause** Operator attempted to perform a local acquisition of a secondary task. **Solution** Perform a local acquisition of the parent of the required secondary task. The secondary task data will also be displayed.
Channel Has Been Previously Allocated	**Cause** The operator may have selected use of a channel that is currently being used. **Solution** Check the current configuration or select another channel.
Display Is Not Installed	**Cause** The display unit may not be installed or it may be malfunctioning. **Solution** Open the cover to check if the display is present. Use the diagnostic menu to test the keypad/display if it is present. Contact Valcom if there are further problems.
Formula # Does Not Exist	**Cause** The operator may have specified a formula number that does not contain a valid formula. **Solution** Check the number entered. Check the contents of the formula numbers from the operators menu and enter a formula if necessary.

Error String	Cause/Solution
GOES Transmission Is Self Timed Only	**Cause** Operator tried to perform a local acquisition of a GOES output task while it was in the self-timed mode. **Solution** In order to perform a local acquisition of a GOES task the GOES transmission mode must be either regular random or random alarm.
High Speed Sample Rate Exceeded	**Cause** The sample rate of the high speed task exceeds the maximum of 200 KHz. **Solution** Reduce the frequency of acquisition.
I/O Writes Not Allowed To Code Half Of Flash Or to PCMCIA Card.	**Cause** The operator may have tried to write data to the block of memory which contains the Vedas II operating system. **Solution** Recheck the address entered, it should be between C0000 and FFFFF
Internal Modem Does Not Support This Baud Rate	**Cause** The operator may have selected a baud rate that is too high or too low for the internal modem in the unit. **Solution** The internal modem supports baud rates of 300 to 14400 only. Check to ensure the specified baud rate is valid, 9600 is suggested.
Internal Modem Is Using This Channel	**Cause** The operator may have request use of a channel that is being used by another function. **Solution** The internal modem shares hardware with the RS-232 interface and the Orbcomm connector. Only one of these functions can be used at a time. Hardware jumper configurations control these functions.
Internal Modem Is Not Installed	**Cause** The internal modem may not be installed or the internal hardwired jumpers may not be set for internal modem use. **Solution** Check the Vedas II Information in the diagnostic menu to check the status of the internal modem. The Internal Modem and the RS-232 and the Orbcomm share internal hardware. If this is a problem contact Valcom for further information.
Internal Modem Is Installed	**Cause** The Internal Modem may be installed or the internal hardwired jumpers may be set for internal modem use. **Solution** Check the Vedas II Information in the Diagnostic Menu to check the status of the internal modem. Set the modem for zero and re-initialize the unit. The Internal Modem, RS-232, and the Orbcomm all share internal hardware. If this is a problem contact Valcom for further information.
Interval of Acquisition Exceeded	**Cause** The period of acquisition exceeded interval of acquisition. **Solution** Either increase the interval of acquisition or decrease the period of acquisition. The period of acquisition must be less than the interval of acquisition.

Error String	Cause/Solution
Interval of Acquisition <= Warm Up Time	**Cause** The interval of acquisition is less than the specified warm-up time. **Solution** Either increase the interval of acquisition or decrease the warm-up time. The Sensor Warm-up time must be less than the interval of acquisition.
Interval of Acquisition Exceeded	**Cause** Alarm period of acquisition exceeded interval of acquisition. **Solution** Either increase the interval of acquisition or decrease the adjusted period of acquisition.
Invalid Entry	**Cause** General error **Solution** Review this manual regarding the operation causing the error and correct the input accordingly.
Invalid Acquisition Task	**Cause** Operator specified an invalid priority number **Solution** Review and correct task priority number entry.
Limit of 1 Sample/sec Exceeded	**Cause** The resulting number of samples per second exceeds the maximum of one. **Solution** Either increase the period of acquisition or reduce the number of samples.
Modem Baud Rate or Data Bits or Stop Bits or Parity Cannot Be Altered By External Modem Access.	**Cause** An operator accessing by external modem has attempted to change the modem access parameters. **Solution** This is not permitted because future access may be compromised.
Modem Type Has Not Been Selected	**Cause** The operator may have requested a modem function without specifying the modem type. **Solution** Enter the configuration menu and check the modem interface setup.
Modem Type Has Not Been Selected	**Cause** The operator selected a telephone output task without a telephone device in the system. **Solution** The operator must first select a telephone device type via item 4, “Setup Telephone Interface”, in the configuration menu.
New Password Not Verified	**Cause** New Password not verified. **Solution** Repeat the telephone setup routine.
Not Enough Memory For A Program Parameter Buffer.	**Cause** There may not be enough available memory to load the program parameters **Solution** Check the number of current tasks and delete some of them. Check the archive memory overwrite functions. Contact Valcom for further information.
Not Enough Memory For A Task’s Output Message	**Cause** The task’s output message is too big for the available memory. **Solution** Attempt to reduce the length of the output message or try to gather the stored data and erase some memory. Check the setting of the memory archive overwrite function.

Error String	Cause/Solution
Output Interval < 1 Min.	**Cause** Operator tried to specify a telephone output interval of < 1 per minute **Solution** Adjust the telephone output interval to be within the limitations of the VEDAS system.
Password Required	**Cause** The operator may have tried to perform a function that they were not password authorized to perform. **Solution** Exit and re-enter the system using a correct password.
Password Invalid	**Cause** Entered password was invalid. **Solution** The operator may re-enter the password via the telephone setup option in the configuration menu.
Password Invalid Restricted Access Only	**Cause** The operator has not provided a valid password and will only be permitted limited access to the function of the unit. **Solution** If unrestricted access is required re-enter the unit with a valid password.
PC# Input Is Being Used By Shaft Encoder Task #	**Cause** The operator may have requested use of a pulse counter or digital input that is currently being used as a shaft encoder input. **Solution** The operator should check all connections and select a different input for either a digital, pulse counter or shaft encoder input. They may share intemal hardware.
PC# Input Is Being Used By Pulse Counter Task #	**Cause** The operator may have requested use of a digital input that is currently being used as a pulse counter input. **Solution** The operator should check all connections and select a different input for either a digital, pulse counter or shaft encoder input. They may share intemal hardware.
PCMCIA Card Is Write Protected	**Cause** The write protect switch on the PCMCIA card is set. **Solution** Remove the card and check the switch.
PCMCIA Card Is Not Inserted	**Cause** The PCMCIA card may not be inserted properly. **Solution** Remove the card and insert it again.
Priority Is Invalid Or Already Exists	**Cause** General error the operator selected an invalid priority number. **Solution** Review and reselect a priority number.
Program Parameters Are Not Archived	**Cause** Programming error occurred while trying to save the acquisition parameters. **Solution** Retry operation. If error persists mark unit as unserviceable and return to Valcom for repair.
Random Alarm Interval Too Large	**Cause** The random alarm interval on the GOES output task is too large. **Solution** Reduce the random alarm interval.

Error String	Cause/Solution
Received Program Parameters Are Invalid	**Cause** There may be a problem with the uploaded file or file name or there may have been an error in transfer of the files from the terminal to the Vedas II. **Solution** Check the file, it should be 8072 bytes. Check the baud rate. Program parameters transfers should be performed at 9600 baud or lower.
Retry Delay To Large	**Cause** The telephone retry delay is too large. **Solution** Reduce the retry delay or increase the output interval. The output interval must be large enough to permit 3 retries to occur.
RF Transmitter Task Must Be Added	**Cause** The operator may have tried a task execution on a disabled transmitter. **Solution** Try adding the task. If this does not work, there could be a problem with the transmitter.
RF Transmitter Output Task Already Exists	**Cause** The operator tried to add a second RF transmitter output task. **Solution** The VEDAS system supports only one RF transmitter type at a time.
RF Transmitter Disabled	**Cause** The RF Transmitter is currently disabled from transmitting or a GOES transmitter may not be present in the unit. **Solution** Check the RF output task and initialize the unit.
RS485 Interface Is Being Used Instead Of This Channel	**Cause** The operator may have requested use of the SDI-0 channel while the RS-485 was installed. **Solution** They share common hardware and only one can be used at a time. This is internal hardwired jumper controlled.
RS485 Interface Is Not Installed	**Cause** The operator may have requested use of an RS-485 interface that does not exist in the unit. **Solution** If an RS-485 function is required contact Valcom for information about hardware upgrades.
SDI-12 Sample Rate Exceeded	**Cause** The sample rate of an SDI-12 task exceeds the maximum of .5 readings per second. **Solution** Either increase the period of acquisition or reduce the number of samples.
SDI-(0,1) Input Is Being Used By Digital Task #	**Cause** The operator may have request to use an input that is currently being used by another task. **Solution** Carefully examine the system hardware usage. The operator may have requested a wrong port during programming of a task. SDI ports due share their functions.

Error String	Cause/Solution
SDI-(0,1) Input Is Being Used By SDI Task #	**Cause** The operator may have requested use of an input that is currently being used by another task. **Solution** Carefully examine the system hardware usage. The operator may have requested a wrong port during programming of a task. SDI ports do share their functions.
SDI-(0,1) Input Is Being Used By Pulse Counter Task #	**Cause** The operator may have requested use of an input that is currently being used by another task. **Solution** Carefully examine the system hardware usage. The operator may have requested a wrong port during programming of a task. SDI ports do share their functions.
SDI-0 Input Is Not Available, RS485 Interface Is Being Used.	**Cause** The operator may have requested use of SDI-0 while the unit is using the RS-485. **Solution** They share internal hardware and only one is available for use at a time. The operator may choose to use SDI-1 if it is available.
Specified Task Does Not Exist	**Cause** The operator tried to perform an operation on a task that does not exist. **Solution** Review and re-specify the task priority number.
Specified Task Locations Not Available	**Cause** Not enough task priorities available for secondary task(s) creation. **Solution** Edit the conflicting task priorities, assigning them another priority number in order to free the required priority numbers.
Specified Task Cannot Be Calibrated	**Cause** The operator may have entered a site calibration on a task that does not exist or does not function. **Solution** Check the task and the entered value in the site calibration.
Specified Task Cannot Be Deleted	**Cause** The operator tried to delete a task that does not exist. **Solution** Review and re-specify the task priority number.
Specified Priority Currently Exists	**Cause** The operator tried to edit a task priority to a priority that already exists. **Solution** Review and re-specify the task priority number.
Starting Location Was Not Found	**Cause** The given starting memory location was not found. **Solution** Check the value of the location entered and try a Flash test from the diagnostics menu.
Task # Is Using A Different Transition Level On This Channel	**Cause** The operator may have requested a pulse counter task on an input that has a pulse counter task running with a different transition level, rising or falling **Solution** More than one pulse counter can share an input, but they should have similar transition levels.

Error String	Cause/Solution
This Is A Program Terminal Operation Only	**Cause** The operator tried to perform a program terminal only operation via the telephone interface connection. **Solution** The operator must physically go to the site, access the VEDAS unit via the programmers port in order to perform this function.
This Is An On Site Operation Only	**Cause** The operator may have tried to enter an emergency message from a location other than the program terminal connector. **Solution** This function is only permitted from the site.
This Option Is Still Being Developed	**Cause** The requested option is not currently supported in this version of software. **Solution** Contact Valcom Limited for further information.
Too Many Program Parameters Were Received.	**Cause** There may be too many parameters in the uploaded file or there may have been an error in transfer of the files from the terminal to the Vedas II. **Solution** Check the file, it should be 8072 Bytes. Check the baud rate. Program parameters transfers should be performed at 9600 baud or lower.
VEDAS II Is Uninitialized	**Cause** The operator tried to enter the calibration screen and perform a local acquisition while the system was uninitialized. **Solution** Initialize the system before entering the calibration screen.

A-12 Vedas II Specifications

Operating Temperature:
- -40°C to +50°C

Input Voltage:
- 9.5 to 17 VDC
- Reverse/Over/Under voltage protected

Input Current:
- 1.5 ma standby
- 40 ma active
- 60 ma during A/D measurement

Packaging:
- NEMA 4X moulded fibreglass polyester enclosure with 2 lockable quick-release latches and 4 mounting feet
- 30.5 cm x 25.4 cm x 15.2 cm (12”x10”x6”)
- Internally coated for EMI/RFI shielding

Weight:
- 3 kg. (without any options)

Real Time Clock:
- ± 60 sec/month (higher accuracy with GOES)

Display/Keypad:
- 20 (5x7 dot matrix) characters x 2 lines
- Display area: 7.08 cm x 1.15 cm
- VFD (-40°C to +85°C) or optional LCD
- Keypad: 8 keys

Communication Interface:
- Two RS-232C ports
- Selectable baud rates from 300 to 57.6K
- Program terminal cable included (9 pin female D-connector for program terminal)

PCMCIA FLASH Memory Card Slot:
- Accepts one, linear, type I or II, 5 V, 8 MByte PCMCIA FLASH Memory Card
- Optional PCMCIA FLASH Memory Cards standard or rated for -40°C to +85°C
- PCMCIA FLASH Memory Card is used to: retrieve stored data, upgrade operating system software or download user program parameters

Memory:
- 1 MByte FLASH for operating system, user program and data storage (64,000 entries)
- 128 Kbyte SRAM

SDI-12:
- Each of the 2 SDI ports can support sensors with addresses ranged from 0 to 9, a to z, and A to Z
- Each port can also be configured as a digital I/O or low frequency pulse counting channel

Digital I/O:
- 8 I/O channels + 5 input only channels
- Output level @ 1 ma:
  4.5 V high _5.0 V, low _0.2 V
- Input level: 3.5 V high _5.0 V, low 1.0 V
- Output resistance: 465_
- Input resistance: 200 K_

Excitation Outputs:
- 4 Individually programmable outputs:
  0 to 5.0 V @ 20 ma, 1.22 mV resolution, high impedance off state, load compensated
- 2 protected individually switched 12 V outputs @ 1 amp
- 4 protected 12 V outputs @ 1 amp
- One 5 V switched output @ 100 ma

Pulse Counter Inputs:
- 16 bit resolution
- 7 low frequency inputs: 5 V pulses_ 100 Hz
- 2 high frequency inputs:
  20 mV_{rms} to 20 V_{rms} 200 KHz

Analog Inputs:
- 7 single ended only channels
- 7 differential or up to 14 single ended channels
- Low level AC frequency measurements
- Battery voltage (internal)
- System temperature: 0.5°C accuracy
- Input level: -5.0 V to +5.0 V
- Selectable gains: x1, x10, x100, x1000
- Resolution: 0.2 mV (gain = x1)
- Sample rate: 10 Hz to 1.8 KHz
- Input resistance: 10 G_

Acquisition Interval:
- 1 to 86400 seconds with 1 second resolution

Options:
- Internal modem (-40°C to +85°C)
- GOES satellite transmitter
- Integrated shaft encoder
- RS-485 port instead of one SDI-12 port
- PC support software
- Internal Backup Battery (-20°C to +50°C)