Protime 100

Sequence of Event Recorder

User's Guide

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Publication #10032
Version 1.10

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1 SER SYSTEM OVERVIEW

The ProTime Sequence of Events Recorder (SER) provides a permanent record of events, which occur within milliseconds of each other, such as the operation of circuit breakers or the shutdown sequences of compressors and other high-speed devices. The SER will provide the time of the event, the state of the point, and the point identification.

Multiple ProTime SER cards may be synchronized together to provide a distributed event recording system. The ProTime SER module will synchronize with an external time standard such as a Global Positioning Satellite (GPS) receiver or an IRIG-B time code signal.

1.1 SER CARD

The ProTime SER inputs card is designed to be used as an input module for any device that can communicate using Modbus communications protocol. In addition to operating as an input module, the ProTime SER card contains additional logic to generate a time stamp for each transition of an input point. The clock in the ProTime SER card can be synchronized in four different ways.

- RS-485 Time synchronization signal connected to other SER cards.
- RS-232 connection to a NEMA compliant GPS receiver.
- Modulated IRIG-B signal.
- Demodulated IRIG- signal.

If no external time source is available, the Protime SER module will use its internal time of day clock as a time reference. Each of the 32 input points has an individually configurable digital noise filter, digital bounce filter and chattering contact filter. Each input may also be individually enabled or disabled for event processing. All of the configuration data for the card is stored in non-volatile memory contained in the module. The ProTime SER program is stored in flash memory for easy updates.

2 SER INSTALLATION

The ProTime SER is designed for mounting on a standard DIN rail. The module occupies 12 inches of rail space. Figure 1 shows the power and status input connections which are located along the bottom of the module. These connections are made through plug-in terminal blocks.

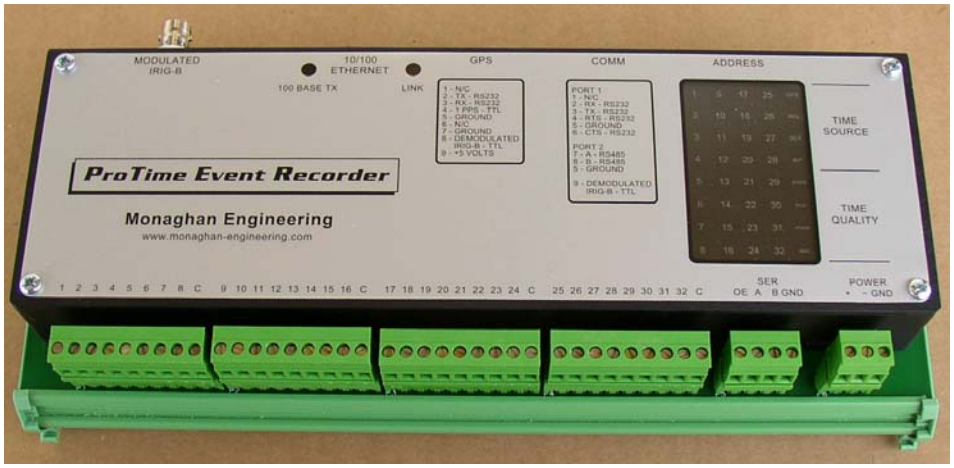


Fig. 1

Figure 2 shows the communications connections that are located across the top of the module.

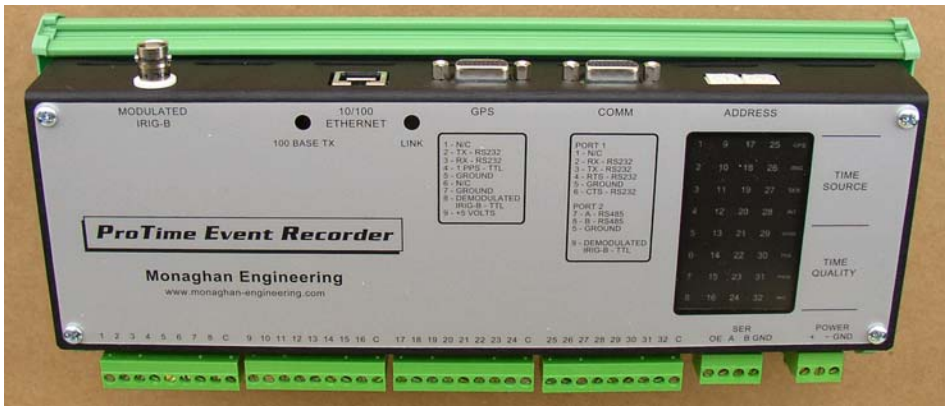


Fig. 2

2.1 FIELD WIRING

The status inputs are connected to the plug-in terminal blocks located across the bottom of the module as shown in Figure 1. The inputs are arranged in four groups of eight. A positive voltage is applied to each input to activate the status point and a common return is provided for each group of eight points.

2.2 POWER WIRING

Power for the module is connected to the plug-in terminal block located on the lower right hand side of the module.

2.3 GPS RECEIVER WIRING

The ProTime SER has a 9 pin D connector located on the top of the module for connecting to a GPS 300 00 GPS receiver. The ProTime SER and the GPS 300 00 communicate in NMEA protocol utilizing RS-232 signal levels. The GPS 300 00 receiver may be located up to 300 feet from the ProTimeSER.

2.4 IRIG-B WIRING

The ProTime SER has two IRIG-B time code inputs. The first input is a BNC connector located on the upper left hand side of the module, which is designed to accept a modulated IRIG-B input. The second

input utilizes pins 7 and 8 of the 9 pin D connector used for the GPS receiver. This input is a demodulated IRIG-B input utilizing TTL voltage levels.

2.5 RS-485 TIME SYNCHRONIZATION BUS WIRING

The ProTime module can either generate or receive a time synchronization signal connected to the SER connector located on the lower right hand side of the module. This signal is an optically isolated RS-485 connection. A three conductor cable is required to connect the ProTime SER module other modules. By using the RS-485 synchronization bus one ProTime SER module can be synchronized with either an IRIG-B time code signal or a GPS 300 00 GPS receiver and then act as a time synchronization master for other SER modules connected to the RS-485 bus.

2.6 RS-232 MODBUS COMMUNICATIONS WIRING

The ProTime SER module contains RS-232 Modbus port for communicating with the module. The communications parameters for this port are stored in modbus registers 40014 – 400016. The following pins are used on the 9 pin D connector for this port.

2 – RX Data
3 – TX Data
4 – RTS
5 – Ground
6 - CTS

2.7 RS-485 MODBUS COMMUNICATIONS WIRING

The ProTime SER module contains a multi-drop RS-485 Modbus port for communicating with the module. The communications parameters for this port are stored in modbus registers 40017 – 400019. The following pins are used on the 9 pin D connector for this port.

5 – Ground
7 – A
8 – B

2.8 ETHERNET WIRING

The Ethernet port is located on the top of the ProTime module. The port can be configured to auto-negotiate the speed or it can be set to 10Mbs or 100Mbs.

2.9 MODBUS ADDRESS SELECTION

For normal operation of the ProTime SER module the Modbus address selector switch should be set to a value from 1 to FE (1 – 254).

2.9.1 BOOT/FLASH CONFIGURATION MODE

In order to place the ProTime module into Boot/Flash Configuration mode, power should be applied to the ProTime module with the address switch set for FF (255). The ProTime module will indicate that it is in the Boot/Configure Mode by flashing the time quality and time source lights on the right hand side of the display. While in the Boot/Flash Configuration mode the baud rate for the Modbus serial ports is set to 9600 baud, 8 data bits, event parity and one stop bit. This allows the ProTime module to be configured through the serial port using a known communications port setting. While operating in the Boot/Flash Configuration mode the flash memory of the ProTime module can be programmed using the configuration software.

3 SETUP

The ProTime SER module comes with a Windows based configuration program. After installing the program on your computer, connect the computer to the ProTime module using a serial cable between the computers serial port and the COMM port on the ProTime module. The wiring diagram for the serial cable can be found in Appendix D.

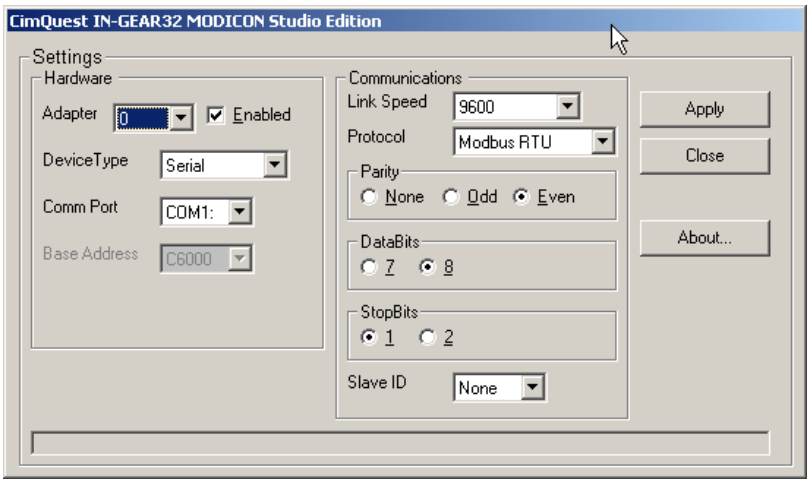
The configuration program communicates with the ProTime module at 9600 baud, 8 data bits, and even parity. This is the default configuration for the ProTime communications port while in Boot/Flash Configuration mode. If the ProTime module has been configured for different communications parameters you must switch to the Boot/Flash Configuration mode before trying to configure the module.

3.1 CONFIGURATION SOFTWARE INSTALLATION

The ProTime SER module comes with a Windows based configuration program. To install the software, run the setup.exe program form the CD ROM that comes with the ProTime module. The installation program will install the configuration program and the Modbus driver necessary for communicating with the ProTime module.

3.2 MODBUS DRIVER CONFIGURATION

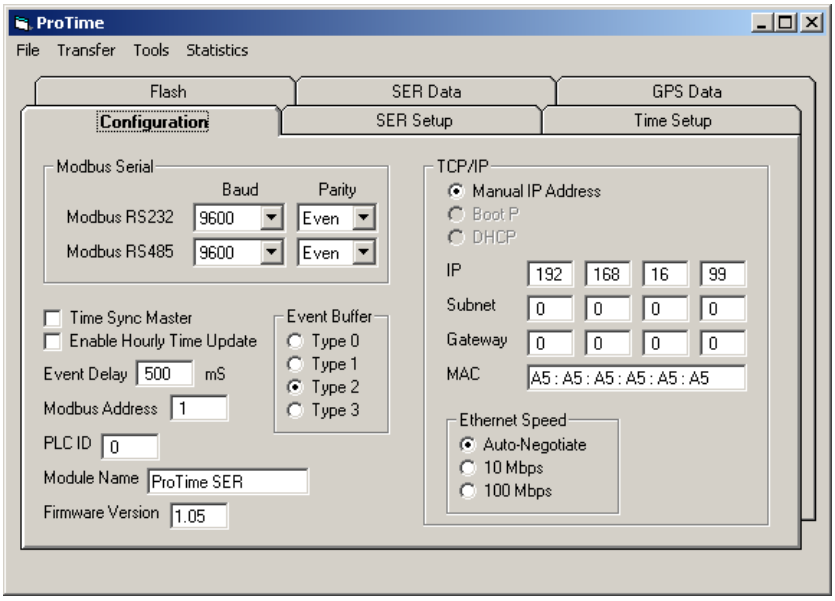
Before starting the ProTime setup program, you must configure the Modbus driver. From the start menu select ProTime and then ProTime Configure. The following screen should appear.



Set all of the parameters as shown above. Select the communications port that you wish to use. Make sure that the Enabled Check Box is checked and then click on the Apply button and then the Close button..

3.3 PROTIME CONFIGURATION

After the Modbus driver has been configured, start the ProTime configuration program. The configuration program has a tabbed display screen. Clicking on the Configuration Tab will bring up the following display.



3.3.1 MODBUS SERIAL

The Modbus Serial communications box provides a way to set the baud rate and parity for both the RS-232 and RS-485 communications ports.

3.3.2 ETHERNET MODBUS TCP/IP

TheTCP/IP communications box provides a way to set the IP address, Subnet mask , Gateway address and speed of the Ethernet connection.

3.3.3 TIME SYNC MASTER

The Time Sync Master check box allows the ProTime module to be configured as a time sync master. When the box is not checked, the ProTime module will try to synchronize its time with signal received from the GPS receiver input, the IRIG-B input or the RS-485 time synchronization input. When the box is checked, the ProTime module will still try to synchronize with the GPS receiver or IRIG-B time code input, but instead of listening for the RS-485 time synchronization signal, it will generate an RS-485 time synchronization signal for other modules to use.

3.3.4 ENABLE HOURLY TIME UPDATE

The Enable Hourly Time Update check box allows hourly time update events to be enabled or disabled. When events are being reported using Buffer Type 0, the hourly time update event provides the day, month and year information necessary to generate a complete time tag. Buffer types 1 through 3 contain the complete time tag information with each event, so the hourly time update event information is not necessary.

3.3.5 EVENT DELAY

The Event Delay entry box allows the user to specify a delay time from when the last event was generated until the ProTime module indicates that an event buffer is ready to be read. When events are being reported using Buffer Types 1 or 3, only a single event is reported at a time, so this entry is not used. When Buffer Types 0 or 2 are being used, multiple events can be placed in the buffer. The event delay time allows the ProTime module to wait for additional events to fill the buffer.

3.3.6 MODBUS ADDRESS

The Modbus Address field is a read only value that represents the current setting of the Modbus Address switches on the ProTime module.

3.3.7 PLC ID

The PLC ID entry box allows the user to set the PLC ID value that is returned in the SER event buffer.

3.3.8 MODULE NAME

The Module Name entry box allows the user to assign an ASCII name to the ProTime module.

3.3.9 FIRMWARE VERSION

The Firmware Version field is a read only value representing the current version of ProTime firmware.

3.3.10 EVENT BUFFER

The Event Buffer box provides a way to select the event buffer type that is generated by the ProTime module. The following is a brief description of each event type. A complete description of each event type is contained in Appendix X.

Type 0 – Event data is packed into 3 registers as bit fields. The buffer can contain up to 30 event records.

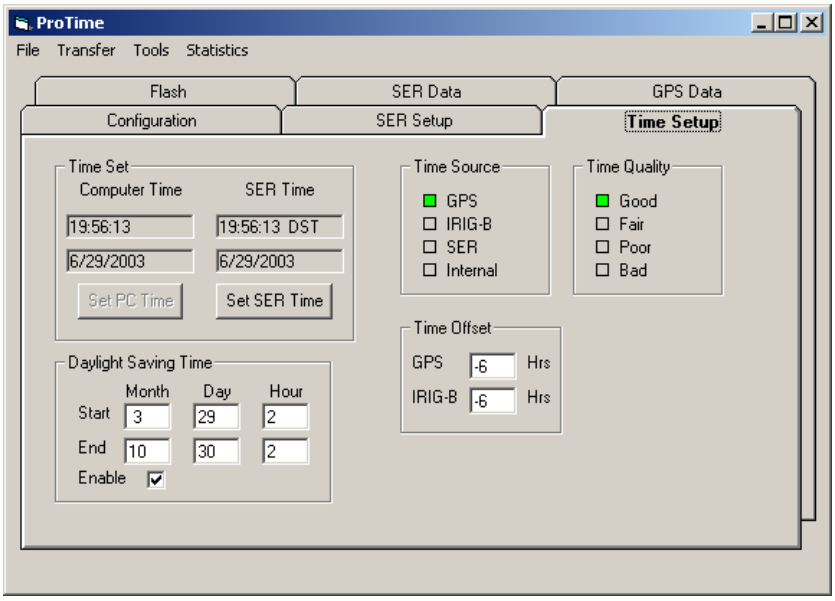
Type 1- Each event data item is placed in a separate register. The buffer contains 13 registers containing event type, point number, current state, millisecond, second, etc.

Type 2 - Event data is packed into 4 registers as bit fields. The buffer can contain up to 22 event records.

Type 3 – Event data is stored in the buffer as an ASCII string describing the event.

3.4 TIME SETUP

Clicking on the TIME SETUP tab will bring up the following display.



3.4.1 GPS OFFSET

The GPS 300 00 GPS receiver reports Coordinated Universal Time (UTC). The GPS Offset entry allows the user to adjust for local time.

3.4.2 IRIG-B OFFSET

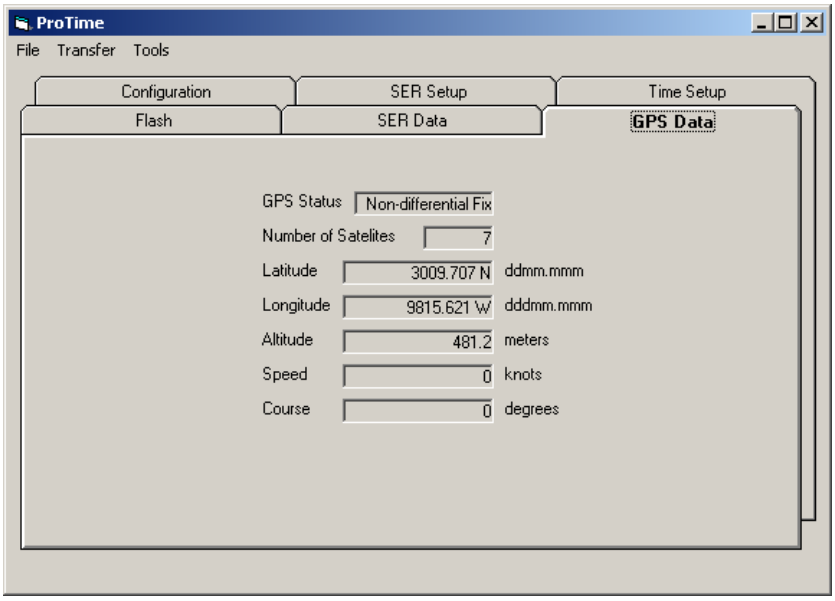
The IRIG-B Offset entry allows the user to adjust the time from the IRIG-B source to local time.

3.4.3 DAYLIGHT SAVING TIME

The Daylight Savings Time box allows the user to enable Daylight Savings Time calculations and to specify a starting date and time and ending date and time.

3.5 GPS DATA

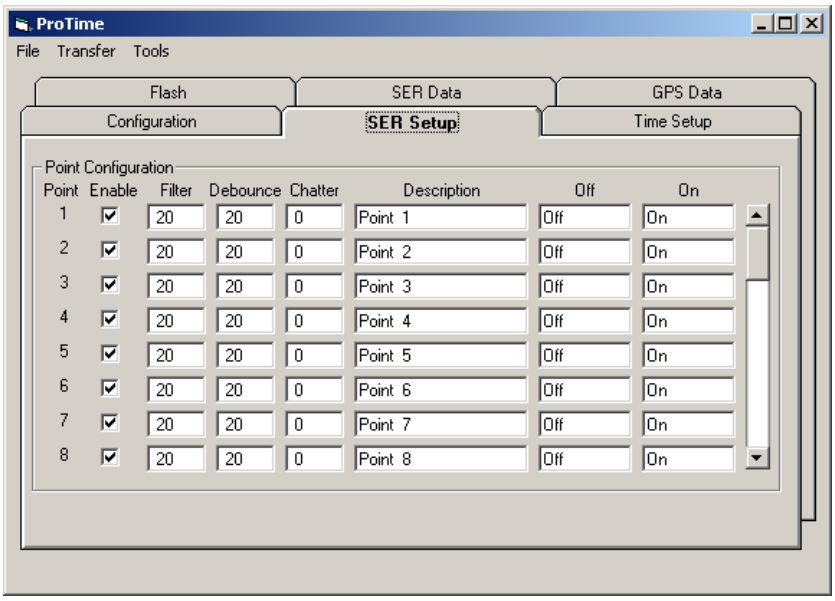
Clicking on the GPS DATA tab will bring up the following display.



This display shows the current GPS data being received from the GPS receiver.

3.6 SER POINT CONFIGURATION

Clicking on the SER SETUP tab will bring up the following display.



The following parameters may be set individually for each point:

- Contact filter time (0-65,535 mS)
- Contact debounce time (0-65,535 mS)
- Chatter count (0-255)
- Scan status (On/Off scan)
- Point description (32 Characters)
- On state description (16 Characters)
- Off state description (16 Characters)

The Enable check box allows each point to be enabled or disabled for event processing. When the box is checked, the point will be enabled for event processing.

The contact filter time can be set to any value from 0 to 65,535 milliseconds. The purpose of the contact filter time is to eliminate false event messages caused by noise. The filter time is the amount of time that a point must stay in a new state in order to be recognized as an event.

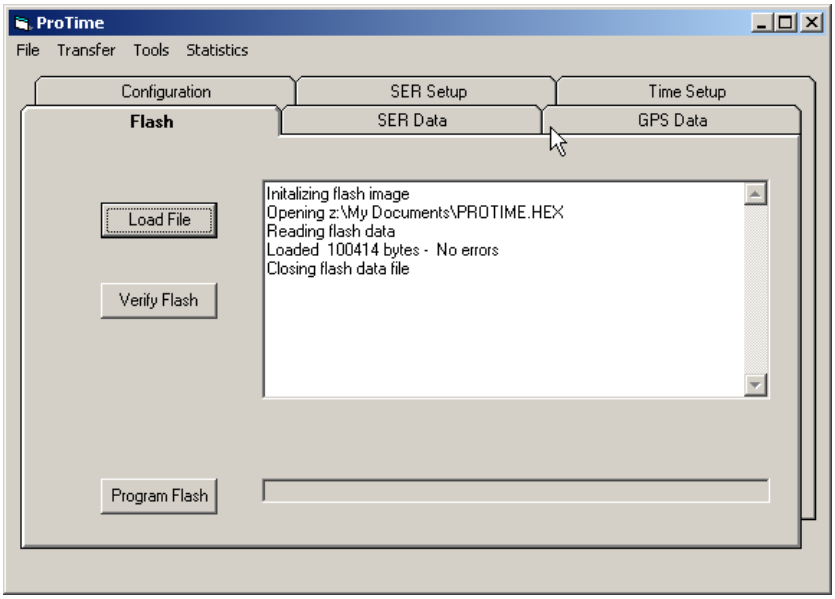
The contact debounce time can be set to any value form 0 to 65,535 milliseconds. The purpose of the contact debounce time is to prevent multiple events from being generated from a single contact closure. The debounce time is the amount of time that input processing is disabled for a point after an event has been recorded

The chatter count can be set to any value from 0 to 255. The purpose of the chatter count is to prevent erroneous event messages from being generated by a faulty input point. The SER card maintains a count of the number of events generated by each point. If the number of events per minute exceeds the value entered for the chatter count, the point will be disabled for event processing. An event message will be generated indicating the exact time at which the point was disabled. When the number of events per minute drops below the chatter count value, the point will be enabled for processing and another event message will be generated indicating the time at which event processing was enabled. Setting the chatter count to 0 will disable the chatter count feature.

The Point description, Off description and On description allow ASCII strings to be stored in the ProTime module for each point. These are used in Buffer Type 3 events to build the ASCII string describing the event.

3.7 FLASH MEMORY

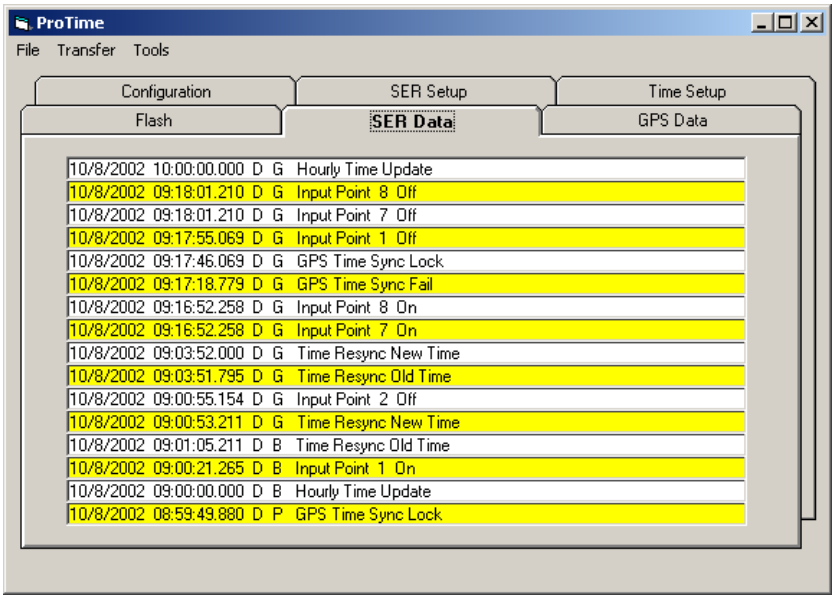
Clicking on the FLASH tab will bring up the following display



This display allows the user to load a new program file from disk and to download it to the ProTime module.

3.8 SER DATA

Clicking on the SER DATA tab will bring up the following display



This display shows the last 16 events retrieved from the module.

4 EVENT DATA

The event data is stored in modbus registers 400101 – 400200. The first ten registers contain the PLC identifier, buffer type and the number of events in the buffer. The next ninety registers contain the event data.

4.1 HOW DATA IS RETURNED

As the ProTime module detects new events it will place them into an event buffer. When the module determines that the buffer is ready to be read, it will set output coil 1. This coil acts as a buffer ready indication. The user software that retrieves event data should periodically read this coil to determine when to read the event buffer. When the coil is set, the software should read the event buffer and then set coil 2. Coil 2 acts as a data acknowledge to the ProTime module which will reset the data ready coil and clear the event buffer.

4.2 EVENT BUFFER TYPES

There are four different types of event buffers that may be selected. Each buffer type is optimized for a particular allpication.

4.2.1 EVENT BUFFER TYPE 0

Event buffer type 0 packs the data for each event into binary fields contained in three registers. The event buffer can contain up to 30 events.

4.2.2 EVENT BUFFER TYPE 1

Event buffer type 1 places each data field in a separate register. The event buffer contains only one event.

4.2.3 EVENT BUFFER TYPE 2

Event buffer type 2 packs the data for each event into binary fields contained in four registers. The date and time information is stored as a 32 bit integer representing the number of seconds since January 1, 1984. The event buffer can contain up to 22 events.

4.2.4 EVENT BUFFER TYPE 3

Event buffer type 3 stores the event as an ASCII string . The event buffer contains only one event.

4.3 EVENT DELAY

In order to optimize communications, the ProTime module will wait a user specified time after each event to see if additional events are generated. If the module detects another event before the delay time has expired, it will add the new event to the event buffer and reset the delay timer. After the buffer reaches its maximum capacity or the delay time expires the ProTime module will set the buffer ready output.

4.4 SER EVENT TYPES

The SER card communicates by generating event messages. The data that is associated with each event will vary depending on the event type. A list of event types and the data associated with each can be found in Appendix C

4.4.1 STATUS CHANGE

A Status Change event message will be generated whenever the SER card detects that an input point has changed state. The message will contain the current state of the point, the point number, and the time of the event. It should be noted that while the numbering convention for status points is usually 1 - 32, the point number is contained in a 5 bit field which yields a number in the range of 0 - 31.

4.4.2 ON SCAN

An On Scan event message is generated whenever the SER card receives a command to start SER processing for an individual point. The message will contain the current state of the point, the point number, and the time of the event.

4.4.3 OFF SCAN

An On Scan event message is generated whenever the SER card receives a command to stop SER processing for an individual point. The message will contain the current state of the point, the point number, and the time of the event.

4.4.4 CHATTER ON SCAN

A Chatter On Scan event message is generated whenever the SER card determines the it is time to start SER processing for a point that has been disabled due to a chattering input. This event will always occur on a one second boundary because the SER card is looking for a one second period in which the number of input transitions is less than the chatter count. The message will contain the current state of the point, the point number, and the time of the event.

4.4.5 CHATTER OFF SCAN

A Chatter Off Scan event message is generated whenever the SER card removes a point from scan due to a chattering input. The message will contain the current state of the point, the point number, and the time of the event.

4.4.6 POWER ON RESET

A Power On Reset event message is generated when the SER card is powered up, or has gone through a reset sequence. The only time this event should be generated is when power is applied to the Quantum controller or the SER card is plugged into a “hot” I/O slot. If this event message is generated at any other time, it indicates that the watch-dog timer in the SER card has detected an internal failure of the card and the card should be removed for repair. The message will contain a point number of zero, and the time of the event.

4.4.7 RS-485 TIME SYNC SIGNAL LOCK

A Time Sync Signal Lock event message is generated when the SER card has received a time sync signal over the RS-485 port and is currently locked to that signal. The message will contain a point number of zero, and the time of the event.

4.4.8 RS-485 TIME SYNC SIGNAL LOST

A Time Sync Signal Lost event message is generated when the SER card has not received a time sync signal for a period of one minute. The message will contain a point number of zero, and the time of the event.

4.4.9 SOE BUFFER OVERFLOW

An SOE Buffer Overflow event message is generated whenever the event buffer is full and a new event is generated. The SER card will overwrite the oldest event with the new event and then overwrite the next oldest event with the SOE Buffer Overflow event message. The buffer output pointer is then adjusted so that the next event read will be the SOE Buffer Overflow event. The message will contain a point number of zero, and the time of the event.

4.4.10 SCAN BUFFER OVERFLOW

The Scan Buffer Overflow event message indicates an internal error in the SER card. If this event message is received please contact the factory for help. The message will contain a point number of zero, and the time of the event.

4.4.11 TIME RESYNC OLD TIME

The Time Resync Old Time event message is generated whenever a time sync message is received that contains a time that differs from the SER cards time by more than 1 millisecond. This message contains the current time of the SER clock. This message will be followed by a Time Resync New Time event message, which will contain the new time that the SER clock has been set to, and a Time Resync New Date message.

4.4.12 TIME SYNC NEW TIME

The Time Resync New Time message is generated whenever a time sync message is received that contains a time that differs from the SER cards time by more than 1 millisecond. This message contains the new time of the SER clock. This message will be preceded by a Time Resync Old Time event message, which

will contain the old time that the SER clock was set to, and will be followed by a Time Resync New Date message.

4.4.13 HOURLY TIME UPDATE

An Hourly Time Update event message will be generated at the beginning of each hour. The purpose of this message is to provide a way to determine that all of the cards in the system are functioning properly and to provide hour, day, month and year information. The time data contained in all of the previous messages contains hour, minute, second and millisecond time data. By inserting an hourly entry into the event buffer that contains hour, day, month and year information, a complete time stamp can be generated for all events.

4.4.14 TIME SYNC NEW DATE

The Time Resync New Date message is generated whenever a time sync message is received that contains a time that differs from the SER cards time by more than 1 millisecond. This message contains the new date of the SER clock. A Time Resync Old Time event message, which will contain the old time that the SER clock was set to, and a Time Sync New Time Message will precede this message.

4.4.15 RECONFIGURE

The Reconfigure message is generated whenever any of the SER card configuration registers have been changed.

4.4.16 RESTART DATE

A Restart Date event message is generated when the ProTime Module has been powered up and the non-volatile memory was found to be good. The message will contain the time when the SER card lost power.

4.4.17 RESTART TIME

A Restart Time event message is generated when the ProTime Module has been powered up and the non-volatile memory was found to be good. The message will contain the time when the SER card lost power.

5 SNTP SERVER

The Simple Network Time Protocol (SNTP) is used to synchronize computer clocks across the Internet. When synchronized to either an IRIG-B time source or a GPS 300 00 GPS receiver the ProTime SER can provide stratum 1 timing accuracy.

APPENDIX A

SER CARD HARDWARE SPECIFICATIONS

32 Status input points per SER module
24VDC, 48VDC and 125VDC Inputs available
Battery backup of event data
Synchronization to external time standard
1ms resolution time stamps
6000 event buffer in SER module
Each point may be configured individually with the following parameters:

- Contact Filter Time (0-65535ms)
- Contact Debounce Time (0-65535ms)
- Chatter Count (0-255) per minute
- Scan Status (0-On 1-Off)
- Point Description (32 Characters)
- Off State Description (16 Characters)
- On State Description (16 Characters)

Events reported by SER module:

- Status Change
- Point Off Scan
- Point On Scan
- Chatter Off Scan (if chatter count per minute exceeded)
- Chatter On Scan (if chatter stopped)
- Power On Reset (after SER module is power-cycled)
- Time Sync Signal Lost
- Time Sync Signal Lock
- SOE Buffer Overflow (more than 6000 events present in module)
- Time Resync Old Time
- Time Resync New Time
- Hourly Time Update
- Time Resync New Date
- Reconfigure
- Output Point Change
- Restart Date (after SER module is power cycled)
- Restart Time (after SER module is power cycled)

Status Inputs	Minimum On Voltage	Minimum On Current	Maximum On Current
125VDC	70VDC	0.4mA	2.0mA @ 140VDC
48VDC	27VDC	0.8mA	3.5mA @ 56VDC
24VDC	15VDC	1.2mA	5.3mA @ 28VDC

APPENDIX B

REGISTER ASSIGNMENT

Register	Data Type	Description
		POINT DATA
000001	Bit	Data Buffer Ready
000002	Bit	Data Buffer Acknowledge
000003	Bit	Reconfigure
000004	Bit	Write time to real time clock
000005	Bit	Read time from real time clock
100001 – 100032	Bit	Input Point Data
		CONFIGURATION DATA
400001	Integer	Time Sync Master 0 = Slave 1 = Master
400002	Integer	GPS Offset – Time offset from UCT (+/- 12 Hours)
400003	Integer	IRIG-B Offset – Time offset from UCT (+/- 12 Hours)
400004	Integer	Buffer Type (0 – 3)
400005	Integer	Delay Time (0 – 65,535)
400006	Integer	Daylight Saving Time Select 0 = Standard Time 1 = Custom Daylight Saving Time Calculation 2 = USA Daylight Saving Time Calculation 3 = Canada Daylight Saving Time Calculation 4 = Mexico Daylight Saving Time Calculation 5 = Great Britain Daylight Saving Time Calculation 6 = France Daylight Saving Time Calculation 7 = Germany Daylight Saving Time Calculation 8 = Spain Daylight Saving Time Calculation 9 = Italy Daylight Saving Time Calculation 10 = Israel Daylight Saving Time Calculation
400007	Integer	Daylight Saving Time Start Month (1 – 12)
400008	Integer	Daylight Saving Time Start Day (1 – 31)
400009	Integer	Daylight Saving Time Start Hour (0 – 23)
400010	Integer	Daylight Saving Time Stop Month (1 – 12)
400011	Integer	Daylight Saving Time Stop Day (1 – 31)
400012	Integer	Daylight Saving Time Stop Hour (0 – 23)
400013	Integer	Hourly Time Update 0 = Disabled 1 = Enabled
400014	Integer	RS-232 Baud Rate 0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 6 = 19200
400015	Integer	RS-232 Parity 0 = No Parity

		1 = Even Parity
		2 = Odd Parity
400016	Integer	RS-232 Response Delay (0 – 65,535 mS)
400017	Integer	RS-485 Baud Rate
		0 = 300
		1 = 600
		2 = 1200
		3 = 2400
		4 = 4800
		5 = 9600
		6 = 19200
		7 = 38400
		8 = 57600
		9 = 115200
400018	Integer	RS-485 Parity
		0 = No Parity
		1 = Even Parity
		2 = Odd Parity
400019	Integer	RS-485 Response Delay (0 – 65,535 mS)
400020	Byte	MAC Address MSB (Read Only)
400021	Byte	MAC Address (Read Only)
400022	Byte	MAC Address (Read Only)
400023	Byte	MAC Address (Read Only)
400024	Byte	MAC Address (Read Only)
400025	Byte	MAC Address LSB (Read Only)
400026	Integer	IP Configuration
		0 = Manual
		1 = Boot P
		2 = DHCP
400027	Byte	IP Address MSB (0 – 255)
400028	Byte	IP Address (0 – 255)
400029	Byte	IP Address (0 – 255)
400030	Byte	IP Address LSB (0 – 255)
400031	Byte	Subnet Mask MSB (0 – 255)
400032	Byte	Subnet Mask (0 – 255)
400033	Byte	Subnet Mask (0 – 255)
400034	Byte	Subnet Mask LSB (0 – 255)
400035	Byte	Gateway Address MSB (0 – 255)
400036	Byte	Gateway Address (0 – 255)
400037	Byte	Gateway Address (0 – 255)
400038	Byte	Gateway Address LSB (0 – 255)
400039 – 400046	Char Array	Module Name (16 Characters – 8 Registers)
400047	Integer	Ethernet Speed
		0 = Auto Negotiate
		1 = 10 Mbs
		2 = 100 Mbs
400048	Integer	Filter Inputs
		0 = 1X Registers read inputs directly
		1 = 1X Registers read digital filter
400049	Integer	Software Version
400050	Integer	Modbus Address
		EVENT DATA
400101	Integer	Module Address

400102	Integer	Buffer Type (0 – 3)
400103	Integer	Number of Events in Buffer
400104	Integer	Reserved
400105	Integer	Reserved
400106	Integer	Number of Events still to be downloaded
400107	Integer	Reserved
400108	Integer	Reserved
400109	Integer	Reserved
400110	Integer	ProTime Software Version Number
400111 – 400200	Integer Array	Event Data

TIME DATA

400201	Integer	Time Source Bits 0 - 3 0 = Internal Oscillator 1 = GPS 2 = IRIG 4 = RS-485
400202	Integer	Reserved
400203	Integer	Day of Week (1 – 7)
400204	Integer	Month (1 – 12)
400205	Integer	Day (1 – 31)
400206	Integer	Year (1984 – 2200)
400207	Integer	Hour (0 – 23)
400208	Integer	Minute (0 – 59)
400209	Integer	Second (0 – 59)
400210	Integer	GPS Status
400211	Integer	Number of Satellites
400212	Float	Latitude (ddmm.mmm) (Plus = North Latitude Minus = South Latitude)
400214	Float	Longitude (dddmm.mmm) (Plus = East Longitude Minus- = West Longitude)
400216	Float	Altitude (-9999.9 - +99999.9 meters)
400218	Float	Speed (0 – 999 knots)
400220	Float	Course (0 – 359.9 degrees)
400222	Integer	Time Quality 0 = Good (Less than 1mS error) 1 = Fair (Less than 50mS error) 2 = Poor (Greater than 50mS error) 3 = Bad (No precision time reference found)
400223	Integer	Daylight Saving Time 0 = Standard Time 1 = Daylight Saving Time

Input Point Data

400251	Integer	Inputs 1 - 16
400252	Integer	Inputs 17 – 32
400253	Integer	AND Mask Points 1 – 16
400254	Integer	AND Mask Points 17 – 32
400255	Integer	XOR Mask Points 1 – 16

400256	Integer	XOR Mask Points 17 – 32
400257	Integer	Masked Result Points 1 – 16
400258	Integer	Masked Result Points 17 - 32
		Point Accumulator Data
400259 - 400290	Integer	Input Point Accumulator Values (Point 1 – Point 32)
		SER Configuration Data
400301 – 400332	Integer Array	Input Filter Values (0 – 65,535 mS)
400333 – 400364	Integer Array	Input Debounce Values (0 – 65,535 mS)
400365 – 400396	Integer Array	Input Chatter Count (0 – 255)
400397 – 400428	Integer Array	Input Disable 0 = Point Enabled 1 = Point Disabled
400429 – 400940	Char Array	Point Descriptions – 32 characters in each description. Each description uses 16 registers.
400941 – 401196	Char Array	Off Descriptions – 16 characters in each description. Each description uses 8 registers.
401197 – 401452	Char Array	On Descriptions – 16 characters in each description. Each description uses 8 registers.
		Network Time Protocol Statistics
401501 - 401524	Integer Array	Hourly Totals of NTP Requests
401525 - 401548	Integer Array	Hourly Totals of Web Requests

APPENDIX C

EVENT BUFFER DEFINITIONS

Event Types

1 Status Change
2 On Scan
3 Off Scan
4 Chatter On Scan
5 Chatter Off Scan
6 Power On Reset
7 RS-485 Time Sync Lock
8 RS-485 Time Sync Fail
9 Event Buffer Overflow
11 Time Re-sync Old Time
12 Time Re-sync New Time
13 Hourly Time Update
14 Time Re-sync New Date
15 Reconfigure
17 Restart Date
18 Restart Time
19 Power Fail
20 GPS Time Sync Lock
21 GPS Time Sync Fail
22 IRIG-B Time Sync Lock
23 IRIG-B Time Sync Fail

Buffer Type 0

Event types 0 – 12, 16, 18

Register 1	Bit 0 – 4	Event Type
	Bit 5 – 9	Point Number (0 – 31)
	Bit 10	Current Status
Register 2	Bit 0 – 9	Millisecond (0 – 999)
	Bit 10 – 15	Second (0 – 59)
Register 3	Bit 0 – 5	Minute (0 – 59)
	Bit 8 – 12	Hour (0 – 23)
	Bit 13	Daylight Saving Time
		0 = Standard Time
		1 = Daylight Saving Time
	Bit 14 – 15	Time Quality
		00 – Good (Error < 1 mS)
		01 – Fair (Error < 50 mS)
		10 – Poor (Error > 50 mS)
		11 – Bad (No precision time reference)

Event types 13 – 15, 17

Register 1	Bit 0 – 4	Event Type
	Bit 5 – 9	Point Number (0 – 31)
	Bit 10	Current Status
Register 2	Bit 0 – 3	Month (1 – 12)

	Bit 4 - 8	Day (1 – 31)
Register 3	Bit 0 – 12	Year (0 – 4095)
	Bit 13	Daylight Saving Time
		0 = Standard Time
		1 = Daylight Saving Time
	Bit 14 – 15	Time Quality
		00 – Good (Error < 1 mS)
		01 – Fair (Error < 50 mS)
		10 – Poor (Error > 50 mS)
		11 – Bad (No precision time reference)

Note: Register 1 bit fields 8 - 13, Point Number and Current Status, are only valid for event types 1 – 5 & 16. All other event types indicate card level conditions and these bit fields will contain zeros.

Buffer Type 1

Register 1	Event Type
Register 2	Point Number
Register 3	Reserved
Register 4	Current State
Register 5	Millisecond
Register 6	Second
Register 7	Minute
Register 8	Hour
Register 9	Day
Register 10	Month
Register 11	Year
Register 12	Time Quality
Register 13	Daylight Saving Time

Buffer Type 2

Register 1	Bit 0 – 4	Event Type
	Bit 5 – 9	Point Number (0 – 31)
	Bit 10	Current Status
Register 2	Bit 0 – 9	Millisecond (0 – 999)
	Bit 10 – 15	Second (0 – 59)
	Bit 13	Daylight Saving Time
		0 = Standard Time
		1 = Daylight Saving Time
	Bit 14 – 15	Time Quality
		00 – Good (Error < 1 mS)
		01 – Fair (Error < 50 mS)
		10 – Poor (Error > 50 mS)
		11 – Bad (No precision time reference)
Register 3 - 4	Bit 0 – 5	32 Bit long integer. Number of seconds since January 1, 1984

Buffer Type 3

Register 1 – 90 Null terminated ASCII string describing the event.