WIRELESS MATRIX

IPANYWHERE®

# Terrestrial Processor Assisted Connector Installation and Configuration Manual Version 2.2X

*IP Anywhere TPAC Configuration Manual*

# FCC RF EXPOSURE INFORMATION

***Please read this information before use***

In August 1996 the Federal Communications Commission (FCC) of the United States with its action in Report and Order FCC 96-326 adopted an updated safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC regulated transmitters. Those guidelines are consistent with the safety standard previously set by both U.S. and international standards bodies. The design of this device complies with the FCC guidelines and these international standards.

Use only the supplied or an approved antenna. Unauthorized antennas, modifications, or attachments could impair call quality, damage the phone, or result in violation of FCC regulations.

All persons must be at least 20 cm from the antenna when the transmitter is operating and must not be co-located or operating in conjunction with any other antenna or transmitter in order to comply with FCC RF exposure requirements.

*For more information about RF exposure, please visit the FCC website at www.fcc.gov*

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# About This Manual

The Terrestrial Processor Assisted Connector (TPAC) Installation and Configuration Manual will assist the user to understand the fundamentals of TPAC configuration and operation. The manual assumes that the user has basic knowledge of serial communication, end devices and electrical installation and wiring.

# Conventions

The Terrestrial Processor Assisted Connector will be referred to as the **TPAC** from this point forward.

TPAC configuration commands are displayed in bold type followed by < >. The < > brackets indicate a variable should be entered.

Example: **GDN ADd <pid><index><address><f1><f2><f3><f4><type>**

The TPAC interface uses minimum truncation. This means that only the letters that are capitalized need to be entered when programming the TPAC. The TPAC is not case sensitive. The menu structure in the TPAC configuration contains headings and subheadings. The command tree will be displayed as follows.

```
RTU
    DEBug        OFF
    MAXRetries   2
    RXTimeout    1

    COMM
        Baud        9600
        DataBits    8
        Parity      None
        StopBits    1
```

Commands are entered as follows; to change the RTU debug settings type.
**RTU DEBug** on

# 1 INTRODUCTION

The terrestrial processor assisted connector (TPAC) is a device that is an interface between an end-device and the Wireless Matrix IP Anywhere service. A terrestrial communications medium is an integral part of the TPAC. The term “terrestrial” is used to differentiate the communication network from a “space” (satellite) network. Examples of terrestrial networks are the public switched telephone network (PSTN), public cell-based wireless packet data networks (DataTAC, Mobitex, GPRS, CDPD), public wired packet data networks (Datapac, the Internet) and private wired and wireless networks.

The TPAC collects data from an end-device such as an RTU or PLC and passes the data to IP Anywhere using the terrestrial data network. The TPAC can communicate with numerous end-devices in the device’s native protocol via an RS-232 or RS-485 serial communication link. RS-422 and other physical layers are supported with converters. The TPAC provides timed reports, reports by exception and reports on demand.

An I/O point is a measured or stored value in an end-device. The TPAC can read an I/O point using the device communications protocol. An I/O point can also be internal to the TPAC or signals on the general-purpose I/O lines on the TPAC. The TPAC stores a list of I/O points that it needs to access.

## 1.1 TPAC Features

- The TPAC can communicate with an end device using its native protocol.
- The TPAC has an integral RIM DataTAC transceiver for communications.
- The TPAC can report data on a scheduled interval, real time events or on demand.
- The TPAC responds to a remote “DEMAND POLL” request by reading the current I/O values from the remote site and sending updated values to the GDN.
- The I/O points and alarm set points can be edited remotely over the communications network.
- The TPAC can store I/O points in multiple poll sets. Each poll set has its own report time and interval and can be adjusted remotely.
- The TPAC can minimize power consumption by entering a low power “sleep” mode.
- The TPAC can poll RS-232 and RS485 serial end-devices for I/O points.
- The TPAC can interface directly to transmitters (1-5 volts, 4-20 mA, digital) for I/O.
- During a poll operation the TPAC read the I/O points from a specified poll-set. The unit will send a report to IP Anywhere if:
    - A report is scheduled
    - An analog I/O value crosses the preset alarm limits
    - An analog I/O value changes by more than a preset dead band
    - A discrete value either changes state or transitions to a specific state

# 2 TPAC Specifications

Figure 1: Operating and environmental specifications

| | |
|---|---|
| Input voltage | 9-28 VDC |
| Receive current (Vin=12V) | 80 mA |
| Transmit current (Vin=12V) | 1 A |
| Sleep mode current (Vin=12V) | 1 mA |
| Operating temperature | -30 to 70 °C |
| Vibration | TBD |
| Serial ports | 3 (2xRS232 + 1xRS485) |
| Dimensions | 200 x 140 x 90 mm (7.9 x 5.5 x 3.5”) |
| Mounting holes | 180 x 93 mm (7.1 x 3.7”) |
| Weight | 2 kg (4.25 lbs.) |

Figure 2: RF Specifications

| | |
|---|---|
| RF network | DataTAC |
| FCC approval (pending) | P5I-907-FNN-A |
| Canada RSS-119 approval (pending) | TBD |
| Transmit frequency range | 806 to 821 MHz |
| Receive frequency range | 851 to 870 MHz |
| Transmit power (Conducted) | 60 to 2000 mW (17.8 to 33 dBm) |
| Antenna gain (transmit band) | 1.15 to 2.4 dBi |
| Maximum ERP | 34.2 dBm |
| Antenna | ¼ wave dipole, 868 MHz center frequency |
| Antenna cable | 20 cm (8”) RG174 coax (integral with antenna) |
| RF connector | MMCX |

Figure 3: Terminal Blocks (TB1 and TB2)

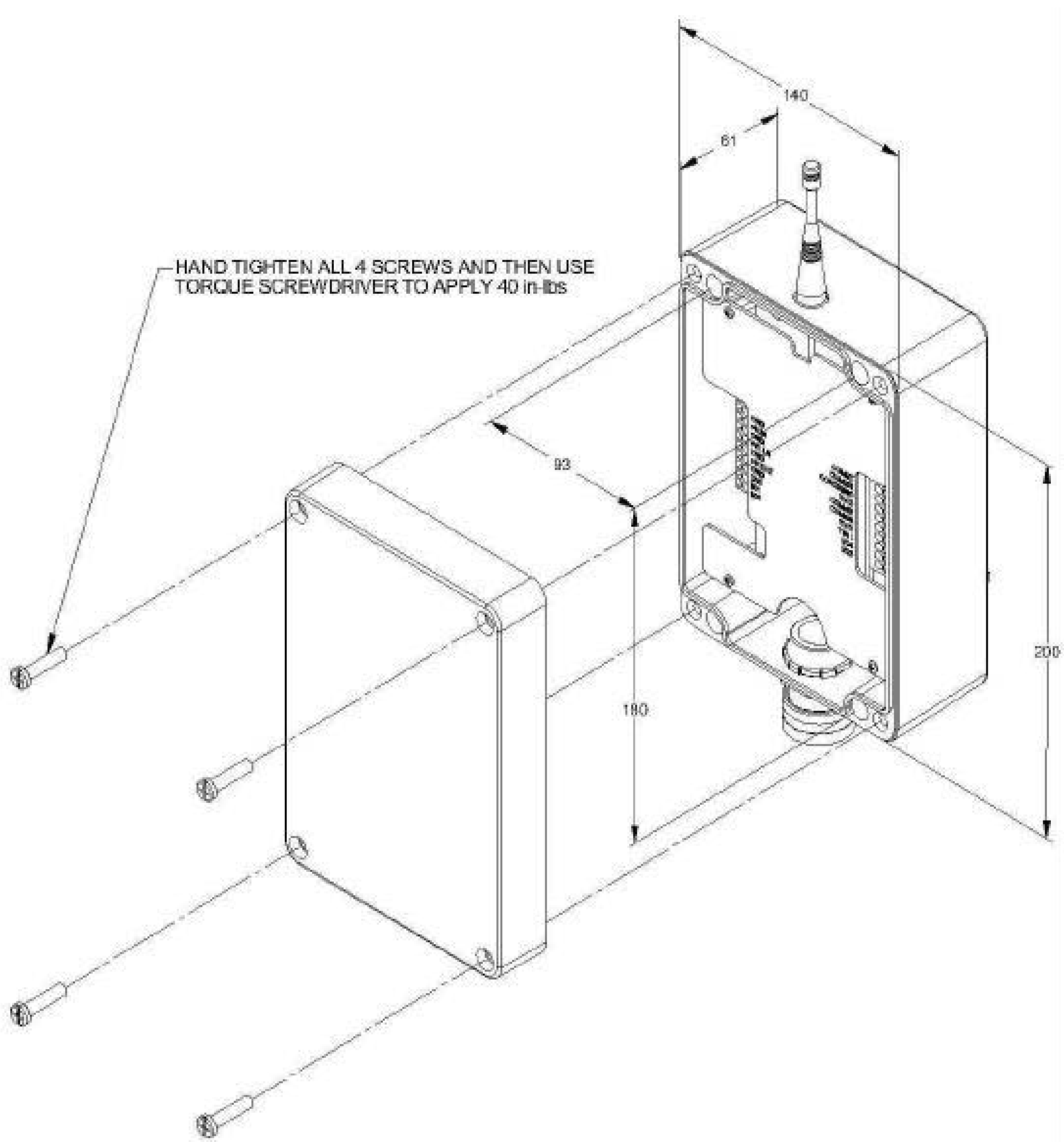
| TB1 Pin | Description |
|---|---|
| 1 | GND: ground |
| 2 | + Vin: 9 to 28 VDC |
| 3 | GND: ground |
| 4 | Wake: ground to wake PAC |
| 5 | GND: ground |
| 6 | + Vext: source < 200 mA @Vin |
| 7 | GND: ground |
| 8 | DI/O: discrete input/output |
| 9 | I/O1: input/output |
| 10 | I/O2: input/output |

| TB2 Pin | Description |
|---|---|
| 10 | COM2T: RS232 transmit |
| 9 | COM2R: RS232 receive |
| 8 | COM2Ring: RS232 ring |
| 7 | GND: ground |
| 6 | COM4B: RS485 B |
| 5 | COM4A: RS485 A |
| 4 | GND: ground |
| 3 | TIN1: timer/pulse input |
| 2 | I/O4: input/output |
| 1 | I/O3: input/output |

Figure 4: TPAC configuration port (3-pin header: J4)

| J4 Pin | Description |
|---|---|
| 1 | COM2T: RS232 transmit |
| 2 | COM2R: RS232 receive |
| 3 | GND: ground |

Figure 5: TPAC Mechanical Drawing



## 2.1 Installation Considerations

**Mounting:**

- The TPAC has mounting holes beneath the cover of the enclosure. The mounting holes are spaced 93 x 180 mm. The mounting holes are 7.5 mm in diameter and the access holes are 11 mm in diameter. The TPAC can be mounted to a panel using appropriate screws for the panel material.
- The TPAC should be mounted with the antenna vertical on the top of the enclosure. The conduit entry/cable seal should point down.
- Ensure end devices are within an acceptable distance from the TPAC.

**Power:**

- The TPAC requires 9-28 VDC to operate. Maximum current draw is 1 A.
- Power is applied at the Vin and GND terminals.
- The metal case of the TPAC must be grounded at one of the mounting holes.
- The TPAC can put itself into a sleep mode to conserve power. The minimum duty cycle is 30 seconds per day. Current draw in sleep mode is under 1 mA.

**Terrestrial network:**

- Prior to installing a TPAC with a DataTAC communication module, check the Motient or Bell Mobility coverage map to ensure the site is in range of the network.
- If the site is near the edge of coverage, a site survey may be necessary to verify coverage and determine the optimal place to install the TPAC.
- Install the TPAC so there are minimal obstructions between the TPAC and the nearest network tower. Network towers are concentrated in urban centers.
- There is a small green LED at the top of the TPAC printed circuit board. The LED will illuminate when the TPAC is in coverage of the network. The TPAC must be commissioned before the LED will function.
- The TPAC displays network signal strength on the configuration port when it boots.

**Other Wiring:**

- The serial connection to the end device is made using the terminal blocks for COM2 (RS232) or COM4 (RS485).
- The terminal WK LN can be shorted to ground to manually wake the TPAC from sleep mode.
- The terminal +V EXT can be used to supply power to an external device. The voltage is the same as supplied to +V IN. Current is limited to 200 mA. The TPAC controls whether power is available at the terminal.
- The terminal DI/O can be used as a digital input or output.
- Analog inputs (4-20 mA or 1-5 V) can be wired into the terminals labeled I/O1 to I/O4. Digital inputs can be wired into the I/O terminals too.
- The terminal TIN1 can be used as a pulse counter, frequency counter or digital input.
- Refer to the wiring diagram that is specific to the application.

# 3 TPAC Configuration

The TPAC needs to be configured to function properly. The TPAC is shipped with factory default settings. The configuration can be modified via the communication network or locally using a programming cable from a PC to the TPAC. A site information sheet should be prepared prior to configuring the TPAC.

## 3.1 Interfacing to a TPAC

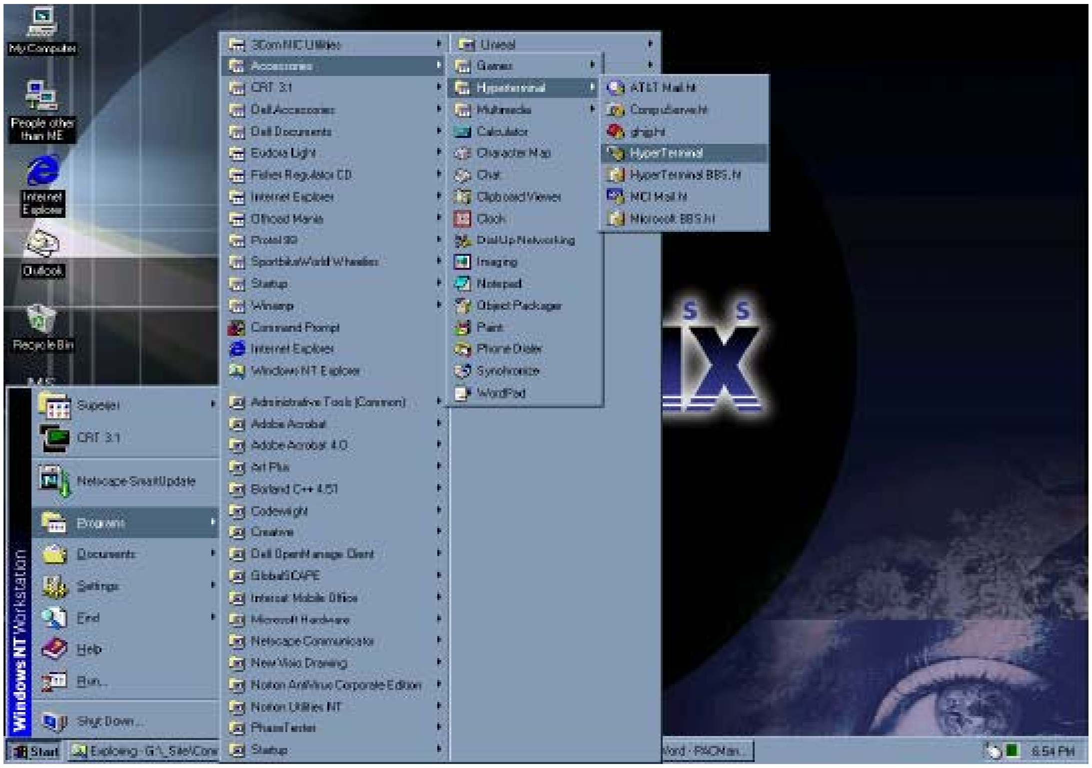
A Wireless Matrix TPAC programming cable is required to configure the TPAC using a local PC. The cable is a 3-wire cable with a D9 female on one end and a 3-position Molex connector on the other end. Connect the 3-position connector to the 3-position header (J4) on the TPAC interface board. Connect the D9 female connector to the serial port on a PC.

Start a PC terminal emulation program, such as HyperTerminal. Specify the local serial port and set the communication parameters to **9600 bits/s, 8 data-bits, no parity, and no flow control**. Disconnect from the port and then reconnect to the port so the settings take affect. (See the next section for setting up HyperTerminal).

Apply power to the TPAC to begin the configuration session.

The following figures give step by step instructions to set up HyperTerminal. Some users may prefer to use a different terminal program.

Figure 6: Starting HyperTerminal




Enter a name for the connection.

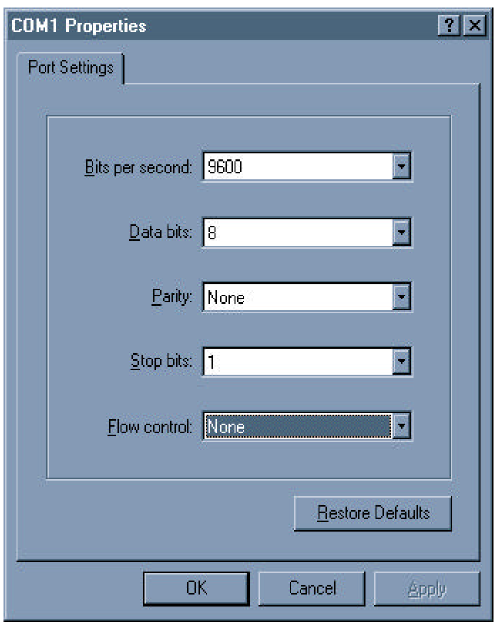
Figure 7: Naming the connection

Select the COM port for the serial port connected to the TPAC.

Figure 8: Choose a COM port


Specify the communication settings, as shown below.

Figure 9: Specify port settings

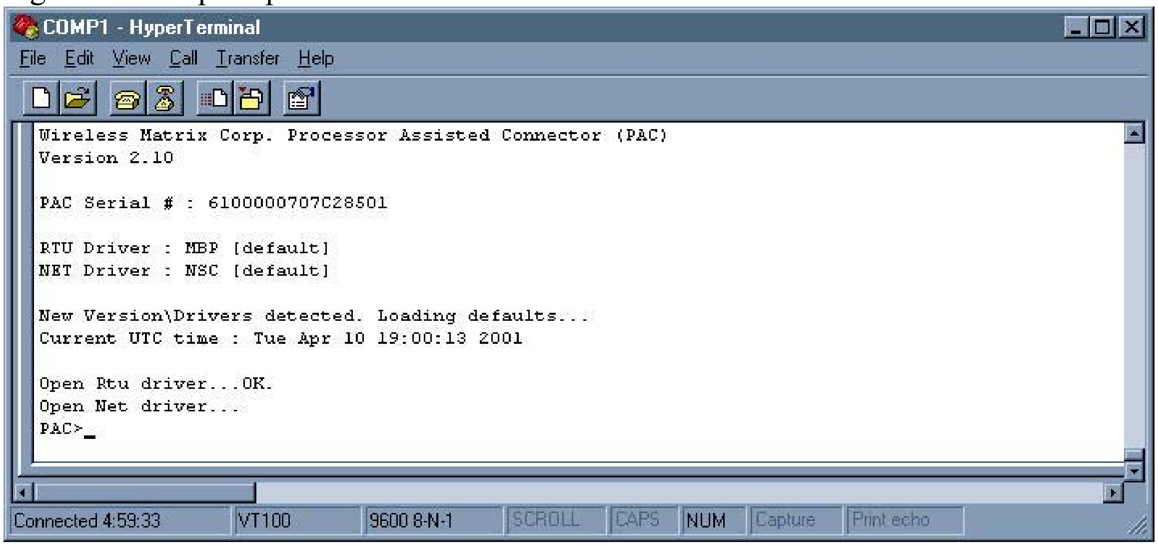



Click the OK button. Then click on the Call Disconnect and then Call Connect buttons. (New port settings do not take effect until the session has been disconnected and reconnected.)

Hit <enter> and the PAC> prompt should appear. .
The TPAC is ready for configuration.

Save the settings so the session is available in the future. The session is saved using the File|Save menu option. The settings for the session can be viewed or changed using the File|Properties menu option.

Figure 7: PAC prompt




If the prompt PAC> does not appear on the screen, the TPAC may be in sleep mode. Try cycling the power or shorting the WK LN terminal to the GND terminal to wake the TPAC.

## 3.2 TPAC User Interface

This section assumes the programmer has the basic understanding of the TPAC functionality and the end devices connected to the TPAC. The TPAC is configured using the PAC command line interface. The PAC command line interface has a tree structure and uses minimum truncation so only letters necessary to make the command unique need to be entered. The manual shows the necessary characters in capital letters. The PAC command line interface is not case sensitive. When the TPAC powers up, the terminal screen displays the firmware version, electronic serial number and the network and RTU drivers that are loaded.

### 3.2.1 General PAC Commands

The following list of general PAC commands:

**HALT** – Halt execution of the PAC. This is useful when configuring the PAC.

**RUN** – Start PAC execution.

**SHow** – Display the entire PAC configuration.

**SHow PAC** – Display the parameters that are applicable to the PAC application.

**SHow RTU** – Display the parameters that are applicable to the RTU or end-device.

**SHow NET** – Display the parameters that are applicable to the network device (Radio).

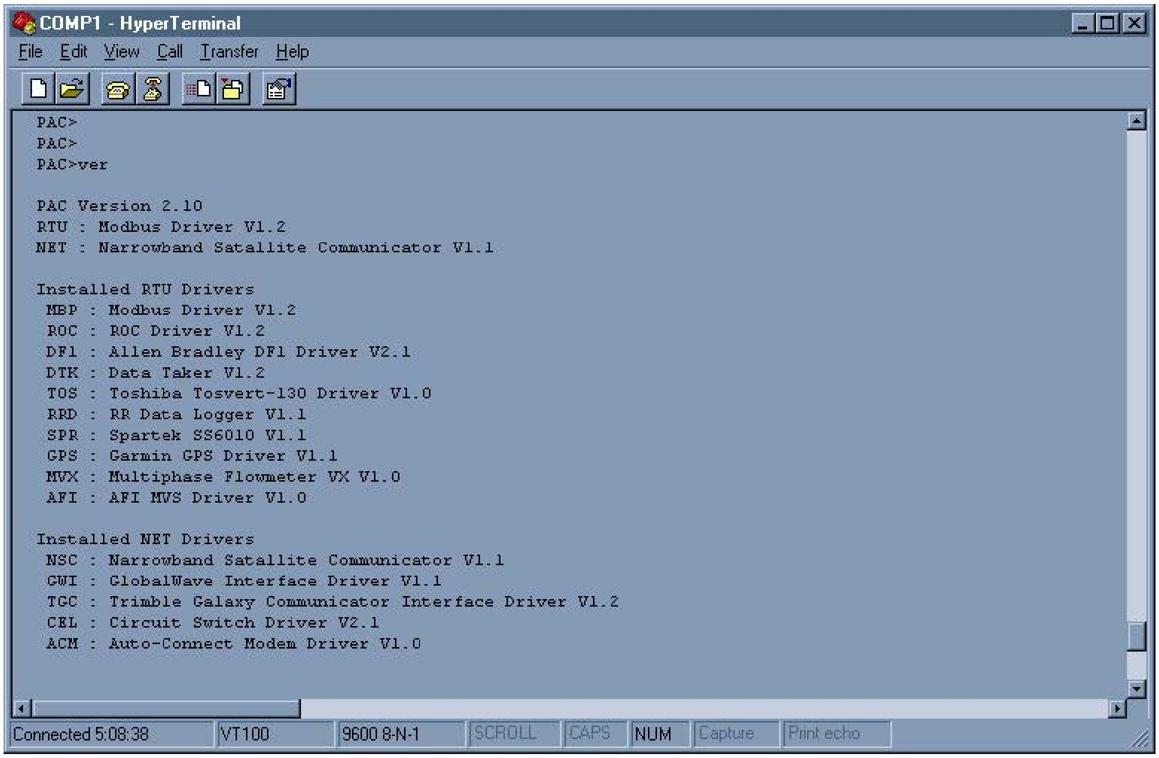
**HElp** – List all the commands and the format for each command.

**WRite** – Save the current configuration in non-volatile memory.

**REBOOT** – Restart the PAC as if power was first applied. The PAC will start with the configuration stored in non-volatile memory. The PAC will start in RUN mode.

**VERsion** – Display the firmware version and the loaded and available drivers. See the following screen capture.

Figure 10: Display the version




### 3.2.2 Setting PAC Values

The "SHow" command displays all the PAC settings. The settings are displayed as a tree of main settings with sub settings. To set a specific value, the complete path to the setting must be given.

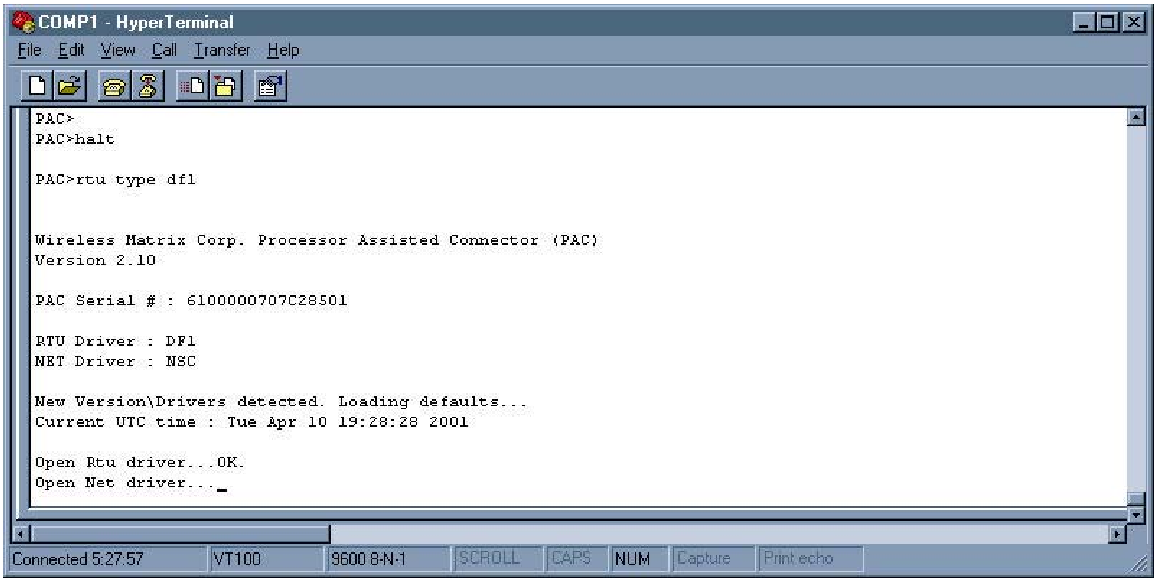
For example, to set the RTU's baudrate, issue the command…

RTU COMM BAUD <baud rate>

### 3.2.3 Loading Drivers

The default RTU driver in the PAC is Modbus. The network driver for a TPAC with a DataTAC module is Radio Access Protocol (RAP). A new RTU driver can be specified if necessary. This should be done before any other settings are changed. When a drivers is changed, the PAC will reboot and set default values for the new driver. For example, type RTU TYPE DF1 to load the DF1 driver. This will change the RTU driver to DF1, save the RTU driver and cause the PAC to reboot and restore relevant values for the DF1 driver.

Figure 11: Load new RTU drivers




Type VER to list all drivers. Type RTU TYPE to list the RTU drivers. Type NET TYPE to list the network drivers. The PAC must be Halted before changing a driver. See the following figures for examples.

Figure 12: RTU Types

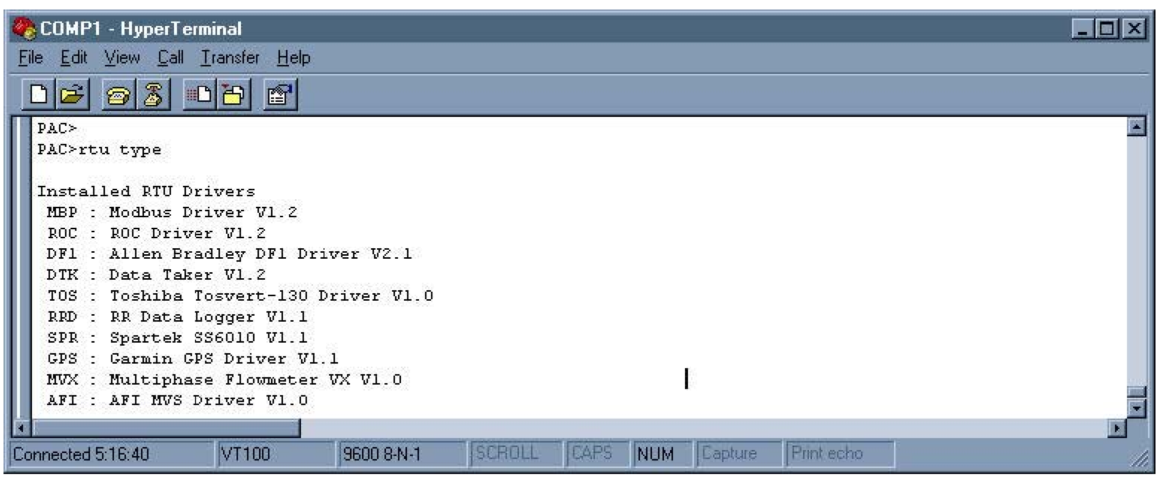
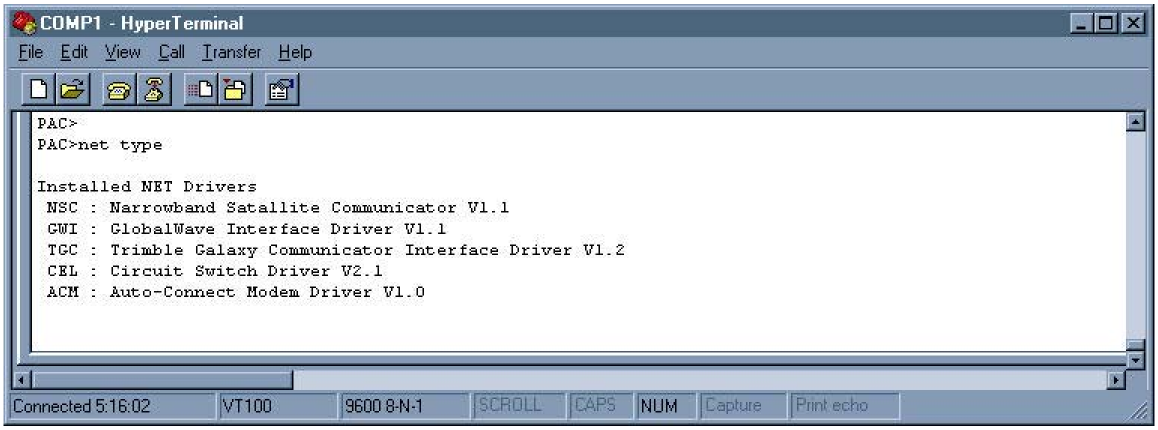


Figure 13: Network Types




**Ensure that the proper drivers are loaded before continuing with the configuration.**

### 3.2.4 Displaying and Setting the System Time

Time is tracked in GMT in the PAC. The PAC can display or set time in the local time, if an offset from GMT is defined. Define the time zone offset before setting the time.

Time values are set as follows:

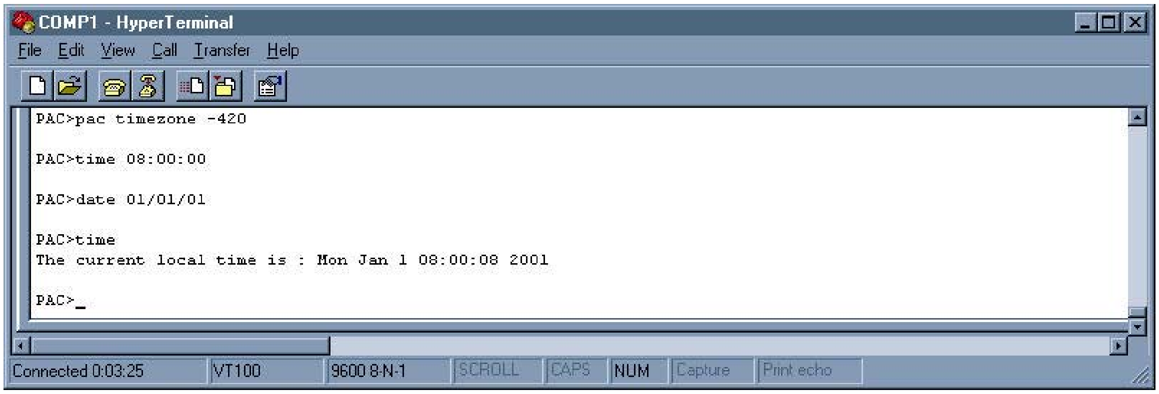
**TIme** or **DAte –** Display the current local time or date.

**PAC TIMEZone <+/- minutes>** – The TIMEZONE setting is in the PAC submenu so PAC must be entered before TIMEZone. Enter the time zone offset in minutes. For example, the time in Alberta is GMT minus seven hours so enter –420. Disregard daylight savings time when the time zone is offset is entered. For example, in Alberta the time zone offset is always entered as –7 hours even though the local time is only –6 hours during daylight savings time.

**TIme <HH:MM:SS>** – The command and format to set the time. The PAC time is set to local time if a time zone offset is defined. Setting the correct time is important for scheduled reports.

**DAte <MM:DD:YY>** – The command and format to set the date in the PAC. Note the order.

Figure 14: Setting the system time




### 3.2.5 PAC Application Commands

The default values in the PAC configuration are usually acceptable. The following list of commands is used to configure the PAC global settings.
**Note**: The parameters inside the brackets < > must be entered. The symbol "|" is "or" so on | off indicates "on" or "off" is entered.

**PAC RPTBack <on | off>** – Report-back causes the PAC to send an acknowledgement back to the GDN that a message was received successfully. Recommended state of this flag is always ON.

**PAC RPTMode <0:Compact| 10:GDN 11:|PSTN>** – This determines the size and format of the message. GDN (10) is used for normal operation in the TPAC and most other network drivers. Compact (0) is only used for the Vistar terminal to limit packet size. PSTN (11) is used for dial-up applications. Type 11 uses the PAC serial number as an encrypted password and identification. The serial number also used as an address when a group of PACs share a network connection such as multiple PACs on one IP address.

**PAC LOWpower <on | off>** – The PAC can be set to enter a low power mode in between poll and report tasks. The option is used to conserve power on a remote site.

**PAC TAG <0…>** – The tag is set to the external serial number on the PAC label.

**PAC IPDelay <0…>** – Inter-point delay is the number of seconds to wait between polling successive I/O points.

**PAC DEbug <on | off>** – The PAC will show application-level messages. This is one of several levels of message detail available via the PAC command line interface.

**PAC AWAKE <…35…>** – The minimum number of seconds that the PAC is awake when low power is enabled.

**PAC ARChive <on | off>** – This setting is for Wireless Matrix configuration only. The default is ON and it should be left ON.

**PAC POW <0…>** – Pause on wake-up. This setting delays the PAC from polling for a set amount of time in seconds. This is used to provide transmitters time to stabilize when using the PAC on-board I/O. This setting is also used when the communication device needs a delay to "key up" after receiving DTR.

**WRite –** Save the current settings in non-volatile memory so they are available the next time the PAC powers up.

**Version –** Display the current PAC firmware version and list the drivers that are available. Note that each driver has a separate version number.

**RTU <open | close>** – Open or close the RTU driver.

**ZAP** – This command will erase the PAC configuration and I/O point list from non-volatile memory. The PAC will boot with a default configuration unless a WRITE command is issued before the PAC is powered down.
**ZAP cfg –** This command only erases the configuration of the PAC.
**ZAP gdn –** This command only erases the I/O point database list in the PAC.

**Poll <pid>** – PAC will poll the specified poll-set <pid>.

**REPort <pid>** – PAC will send report for the specified poll-set <pid>.

**DOWNLOAD** – This command is used to upgrade the PAC firmware. Do not use this command unless you have the tools to upgrade the PAC firmware. Cancel by command by cycling power to the PAC prior the starting the code download.

## 3.3 I/O Point Database

The PAC maintains a list of all the I/O points it needs to access. Each point can have alarms associated with it. See the sections on alarms. PAC version 2.1x and later can access up to 340 I/O points. I/O points are usually added remotely through the GDN but points can be added locally. Each I/O point has a list of parameters associated with it. The parameters define the context the PAC needs to access the I/O point correctly. Two parameters, poll-set ID (PID) and index are common to all I/O points. The remaining parameters are specific to the driver. Some I/O points are internal to the PAC.

The poll-set ID is a reference number used to group I/O points. Poll and report events are based on the poll-set ID. For example, all I/O points with poll-set id 1 are a group and will be polled and reported together. Valid poll-set ID numbers are 1-254 (255 is reserved for internal points).

The index is a unique number that identifies the I/O point within the PAC. If a new I/O point is added with the same index as an existing I/O point, the new point will overwrite the existing point. Valid index numbers are 1-127 and 256-1200 (128-255 are reserved for PAC internal I/O points).

The following commands are used to create and modify the I/O list. The I/O list is set up differently for each RTU Driver. See the RTU driver section for the appropriate setup. The commands for configuring I/O points are:

**GDN LIst <pid>** – This command will list the I/O points in the poll-set. Valid values for <pid> are 1-255. Type "GDN LIST 255" to display the internal I/O points. Type "GDN LIST" without a number to list all the I/O points except PAC internal I/O points (PID 255).

**GDN ADd <pid><index><address><f1><f2><f3><f4><type>** – Use this command to add or modify an I/O point. Specify a unique index to add a point. Specify the index of an existing point to modify the point. Refer to the appropriate RTU driver section for a definition of the <address>, <f1>, <f2>, <f3> and <f4> parameters. The **<type>** parameter can be one of the following: 1=discrete 2=char 3=uchar 4=int 5=uint 6=long 7=ulong 8=float

**GDN REad <index>** – Read the current value of the specified I/O point.

**GDN WRite <index> <value>** – Write a new value to the specified I/O point.

**GDN DElete <index>** – Erase the specified I/O point from the PAC.

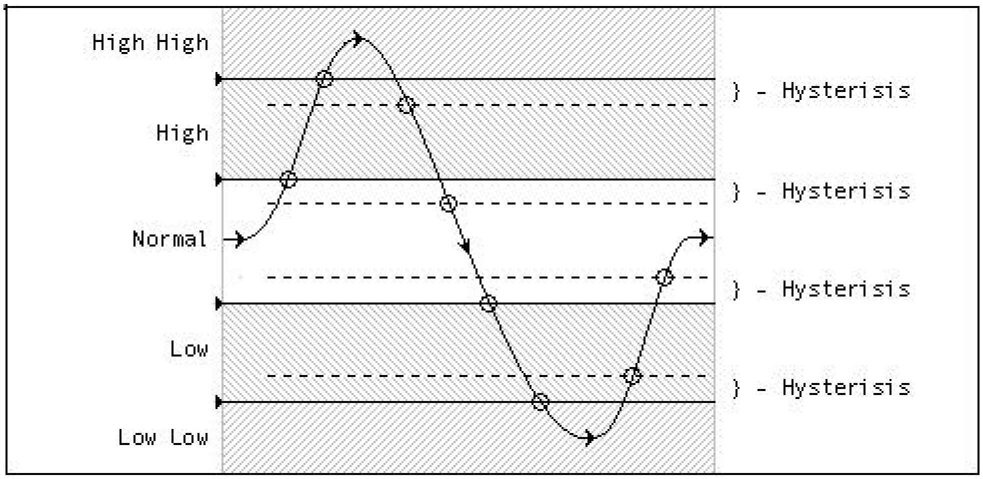
## 3.4 Alarms

An alarm is a threshold value specific to an I/O point. The alarm values are stored in the PAC. If the PAC reads the value of an I/O point and determines the value has crossed the threshold, the PAC will send an alarm-report. The alarm-report contains the values of all the I/O points in the poll-set. The PAC sends an alarm report when the value crosses into the alarm region and another report when the value crosses out of the alarm region. Alarms are normally added remotely through IP Anywhere when a site is commissioned.

Each I/O point can have 4 alarm thresholds High-High, High, Low, Low-Low and a hysterisis. Hysterisis changes the alarm threshold for an I/O point to cross out of the alarm region. The threshold is modified by the value of the hysterisis. Hysterisis is used to prevent excessive alarm reports from an I/O value that is close to the threshold and is bouncing back and forth across the threshold.

Example: A high alarm is set to 10 and the hysterisis is set to 2. If the measured value rises to 11, an alarm will occur and an alarm report is sent. The I/O point will not return to normal until the value drops below 8. If the value drops from 11 to 9 and then returns to 11, the I/O point stays in alarm condition and an alarm report not sent.

Figure 15: Alarm Hysterisis




"O" denotes a limit transition

The following command is used to enter an alarm.

**GDN ALarm <index> <HH | *> <H | *> <L | *> <LL | *> <HYS | *>** – This command enters alarm thresholds for the specified I/O point. Enter * in place of a value if the alarm or hysterisis not specified. HH denotes the high-high alarm threshold, H denotes the high alarm threshold, L denotes the low alarm threshold, LL denotes the low-low alarm threshold and HYS denotes hysterisis.

### 3.4.1 Deadband Alarms

A dead-band alarm monitors a single I/O point for a change that is greater then the specified threshold. Dead-band alarms are not relevant when low-power is enabled.

Dead-band alarms can be added via the command line interface using the following format.

**GDN ALARM DB <index> <Npoints> <DB Value>** – The command sets a dead-band alarm for the specified I/O point. <DB Value> is the dead-band or change threshold. <Npoints> determines the mode of the dead band alarm as shown below:

> Npoints = 0 – Dead-band from last reported value. An alarm report is sent when a new I/O value differs from the last reported value by more then the dead-band.
>
> Npoints = 1 – Dead-band from last sampled value. An alarm report is sent when a new I/O value differs from the previous value by more then the dead-band.

Npoints > 1 – Dead-band from average value. An alarm report is sent when a new I/O value differs from the average of the previous <Npoints> values by more then the dead-band.

Disable a dead-band alarm by setting the alarm dead-band value to zero.

### 3.5 Scheduling

Scheduling is one of the most important features of the PAC. Two important scheduling concepts are start time and interval time.

Start Time - This is the date and time the PAC will start the event. This is usually set in the past so the event will start immediately. It can be set in the future if necessary, but this is not recommended.

Interval time - The interval determines how frequently the PAC will execute an event, beginning from the start time.

Two types of events to schedule in the PAC are polls and reports.

A poll event causes the PAC to request data from an end-device. If low power is enabled the PAC will sleep in between polls to conserve power. The poll interval depends on how time critical it is to know of changes in the data being polled versus the available power on site.

A report event causes the PAC to poll for the latest values and send the values to IP Anywhere.

The following commands are used to configure an event.

**EVENT SET <index> <type> <pid> <start> <interval>** – This command will create a new event or modify of an existing event.

| | |
|---|---|
| Index | There are 16 available event records, 1 - 16 are valid |
| Type | Available event types are<br>POLL - Read IO Pollset<br>REPORT - Read IO Pollset, and<br>STATUS - Request status from NET (communicator)<br>REBOOT - Restart application. |
| PID | For POLL/REPORT events, a pollset id must be specified. For STATUS/REBOOT events, no PID should be given. |
| Start | The start time for the event. Long format:<br>MM/DD/YY HH:MM:SS<br>Where: MM = month (1-12); DD = day (1-31); YY = year (00-99); HH = hour (00-23); MM = minute (00-59); SS=seconds (00-59)<br>Brief formats: |

| | |
|---|---|
| | HH:MM:SS – Default start date = 01/01/80<br>HH:MM – Default start date = 01/01/80; Default second = 00. |
| Interval | Time between events. Long format:<br>DD HH:MM:SS<br>Where DD = days (00-99)<br>Brief format.<br>HH:MM:SS – Default days = 00<br>HH:MM – Default days = 00, Default seconds = 00. |

**EVENT DELETE <index>** – This command disables an event.

**EVENT LIST** – This command displays all active events.

Note: Short forms can be used to modify existing events.

Event set <index> int DD HH:MM:SS
Event set <index> st MM/DD/YY HH:MM:SS
Event set <index> pid 1-254

# 4 TPAC Network Drivers and Settings

The TPAC network driver is type “RIM”. Display the network settings by typing “SHOW NET”. This section contains detailed information to configure the network driver.

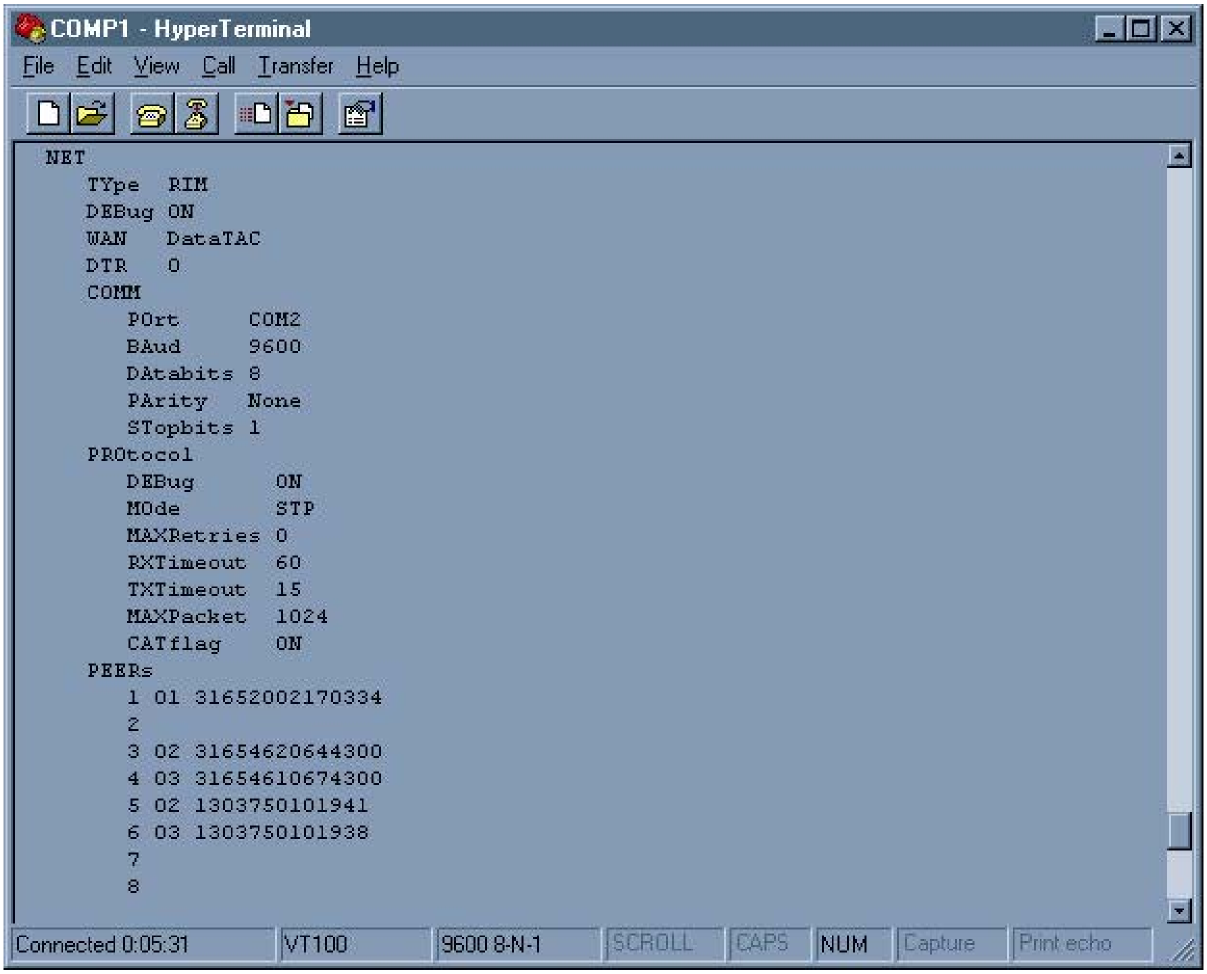
**NET**

**TYpe RIM** – Type "NET TYPE" to list all the available drivers in the PAC. Only the “RIM” network driver is relevant to the TPAC.
**DEbug <on | off>** – Turn on this level of debug to view network-level application messages. The messages can help with troubleshooting.
**WAN <DataTAC | Mobitex>** – Specify the wireless network. The default is DataTAC.
**DTR <0 | 1>** – Specify the active state of the DTR connection. The default is 0.
**COMM**
- **POrt <COM1 | COM2 | COM4>** – COM1 must be used for the TPAC.
- **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
- **DAtabits <7 | 8>**
- **PArity <None | Even | Odd>**
- **STopbits <1 | 2>**

**PROtocol** – The network protocol settings are shown below.
- **DEbug <on | off>** – Turn on this level of debug to view network protocol level application messages.
- **MOde <STP | FAD | APL> –** The mode defines the protocol that the network driver will use to communicate. The TPAC uses mode STP.
- **MAXRetries <0>** – The maximum number of messages sent to network before aborting the attempt. The default is 0.
- **RXTimeout <sec>** – Incoming packet fragment timeout. The number of seconds the PAC will wait before discarding a broken or incomplete message. The default is 60.
- **TXTimeout <sec>** – Packet Acknowledgement timeout. The number of seconds that the PAC will wait for a message acknowledgement from the GDN before re-sending the message.
- **MAXPacketsize <bytes>** – The maximum number of bytes that the network can support in a single packet.

**PEERs –** This setting allows Direct Connect and Remote Console Programming. This setting does not apply to the TPAC.

Figure 16: Network settings display



# 5 TPAC RTU Drivers and Settings

The RTU driver is one of the first parameters that should be set when configuring a TPAC. Select the appropriate driver for the application.

The TPAC is capable of polling many different devices. Some of the most common TPAC RTU drivers are Modbus (RTU, ASCII, Daniel, Modicon and Enron), ROC Protocol and Allen Bradley DF1. New drivers are added frequently. The different drivers do not have all the same configuration parameters. List the available drivers in the TPAC by typing "RTU TYPE". This section contains detailed information to configure each driver.

A list of common commands and settings for all RTU drivers follows. “RTU” must be entered at the start of all commands specific to the RTU section. The PAC must be halted to load a new RTU driver.

**RTU**

- **TYpe <rtu>** – Type "RTU TYPE" to list the available drivers**.** Change the RTU driver by specifying the 3-letter acronym for the new driver. This will cause the PAC to reboot and load default values for all RTU parameters. All settings will be lost.
- **DEbug <on | off>** – Turn on this level of debug to view RTU-level application messages. The messages can help with troubleshooting.
- **COMM –** The PAC communication settings must match the RTU settings.
    - **POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
    - **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
    - **DAtabits <7 | 8>**
    - **PArity <None | Even | Odd>**
    - **STopbits <1 | 2>**

## 5.1 MODBUS Driver

RTU Driver : Modbus Driver V1.2
KeyCode : MBP

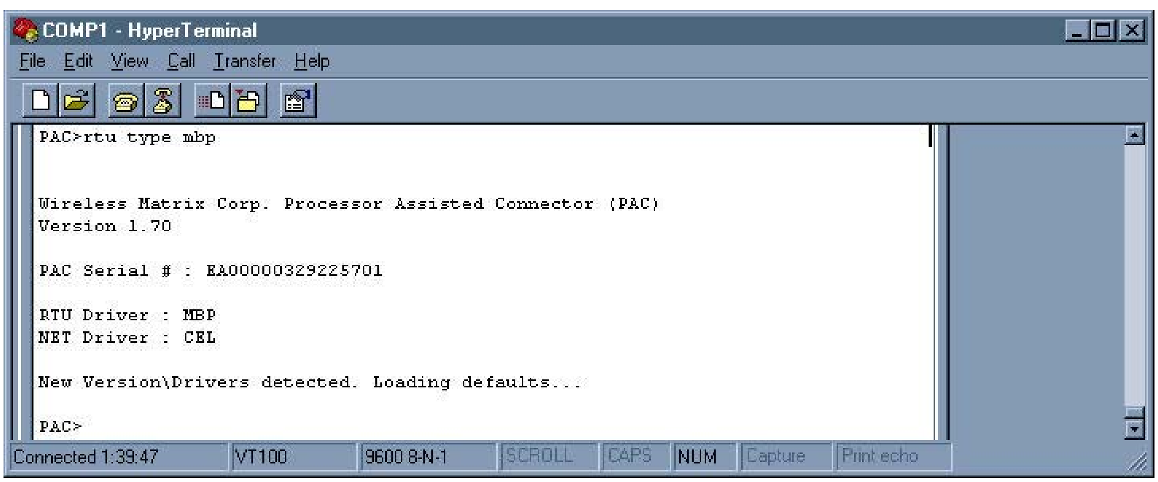
The Modbus protocol driver has the following settings:

**RTU**

- **TYpe MBP** – Set the RTU driver to Modbus.
- **ASCii <off | on>** – The default is "off". Set ASCII "off" for binary (RTU) Modbus. Set ASCII "on" for ASCII Modbus.
- **DEbug <off | on>**
- **MAXRetries <2>** – The default is 2.
- **RXTimeout <2>** – The default is 2.
- **BYTEswap <off | on>** – The default is "off". It should be enabled for devices that provide Intel byte order.
- **COMM**
  - **POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
  - **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
  - **DAtabits <7 | 8>**
  - **PArity <None | Even | Odd>**
  - **STopbits <1 | 2>**

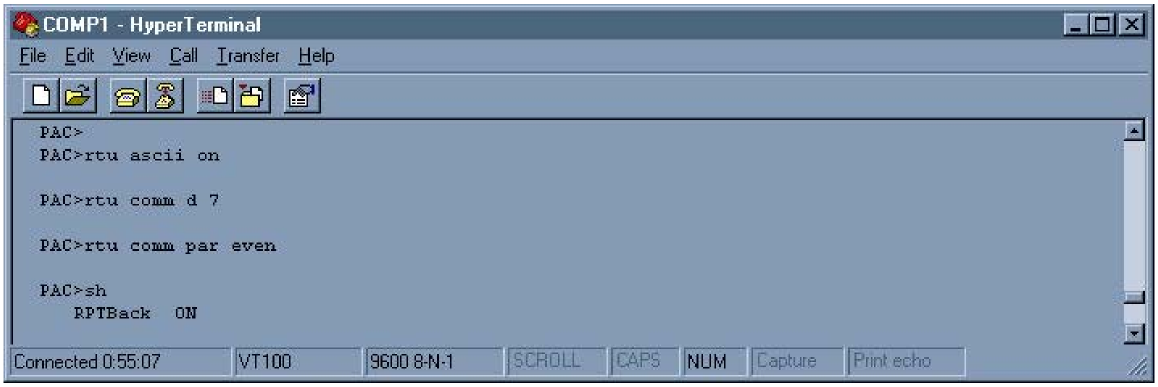
The Modbus driver is the default driver on a new TPAC. The Modbus driver in the TPAC supports ASCII and RTU (binary) modes. This driver will be explained in more detail then other drivers because it is the most common end device protocol. The following figure shows the Modbus (MBP) driver being set.

Figure 17: Select the Modbus driver



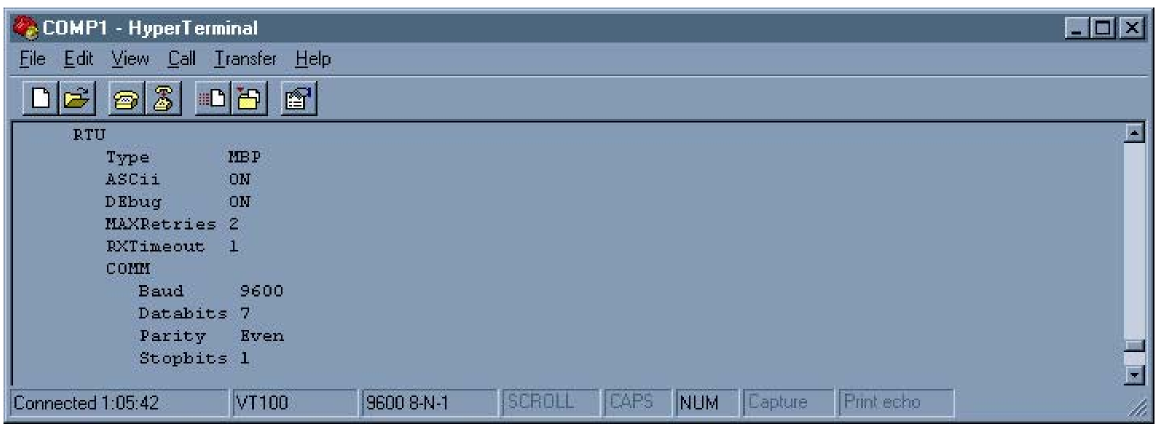

After a new driver is specified, the TPAC reboots and the defaults for the new protocol are loaded. Modify the default parameters to match the protocol of the end-device. The next figure shows an example of a TPAC configuration for Modbus ASCII, 9600 baud, 7 data bits, and even parity.

Figure 18: Configure TPAC for Modbus ASCII



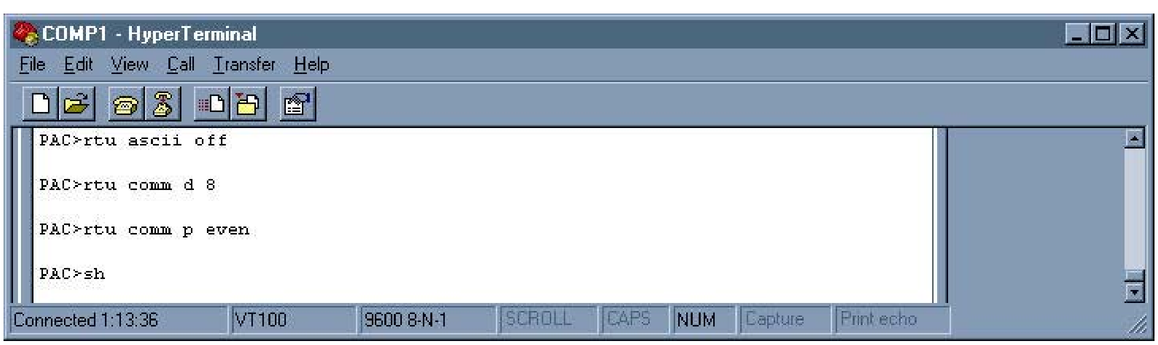

Check the parameters by typing "SHow".

Figure 19: Check Settings for Modbus ASCII



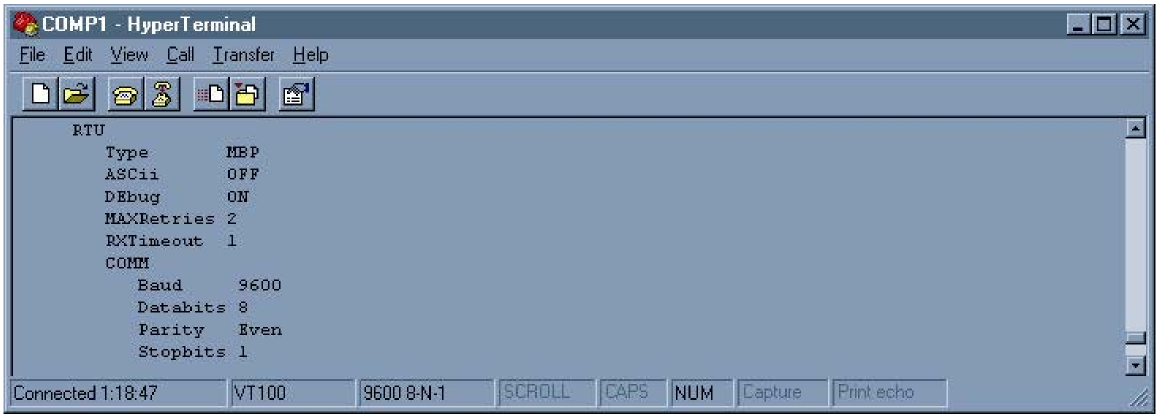

Verify the settings are correct and type "WRite" to save the settings to non-volatile memory. The next figure is an example of a TPAC configuration for Modbus RTU, 9600 baud, 8 data bits, and even parity.

Figure 20: Configure TPAC for Modbus RTU



Check the parameters by typing "SHow".

Figure 21: Check Settings for Modbus RTU




Verify the settings are correct and type "WRite" to save the settings to non-volatile memory.

**MBP Driver I/O Configuration**

I/O points for Modbus are determined by the Modbus register number and type. Add or modify and I/O point to the TPAC with the following command and the parameters.

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

TPAC I/O point definition for the Modbus driver.

| | |
|---|---|
| pid | Choose the pollset that that the point is to be added to. (1-254) |
| index | Unique index number of the I/O point (1-127, 256-1200) (128-255 are reserved for PAC internal I/O points). If the I/O point index exists, the new settings will over-write the old settings. |
| address | The Modbus slave address (1-255) of the end-device |
| f1 | The Modbus register series (Daniel: 700, 1000, 5000, 7000 \| Modicon: 0, 10000, 30000, 40000) |
| f2 | The register offset from the series in f1. For example, if the Modbus register is 40003, enter 40000 in f1 and 3 in f2. |
| f3 | Number of registers in a block for a BLOB;<br>Or the archive record number, found in 3004, for Daniel archives;<br>Or enter 0. |
| f4 | The maximum number of registers that can be polled in one block for a BLOB;<br>Or bit number (mask a single bit) within integer register;<br>Or the archive record number for Daniel;<br>Or enter 0. |
| type | 1=discrete; 2=char; 3=uchar; 4=int; 5=uint; 6=long; 7=ulong; 8=float; 9 =blob; |

## 5.2 ROC Protocol Driver

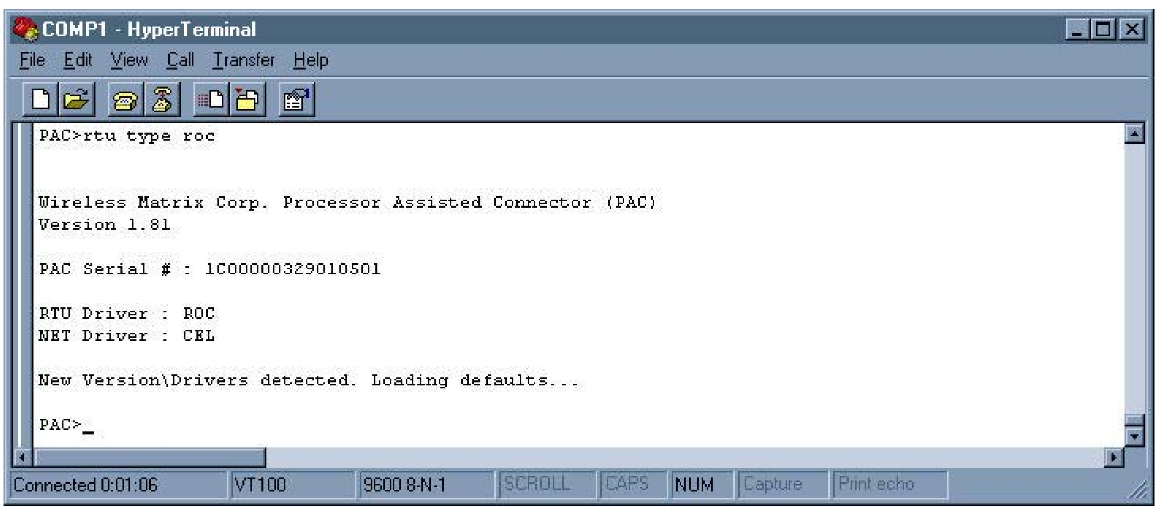
RTU Driver : ROC Driver V1.2
KeyCode : ROC

The ROC protocol driver has the following settings:

**RTU**

- **TYpe ROC** – Set the RTU driver to ROC protocol.
- **DEbug <off | on>**
- **MAXRetries <3>** – The default is 3.
- **RXTimeout <2>** – The default is 2.
- **Unit <240>** – This is the unit number of the PAC. The default is 240.
- **Group <240>** – This is the group number of the PAC. The default is 240.
- **COMM**
  - **POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
  - **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
  - **DAtabits <7 | 8>**
  - **PArity <None | Even | Odd>**
  - **STopbits <1 | 2>**

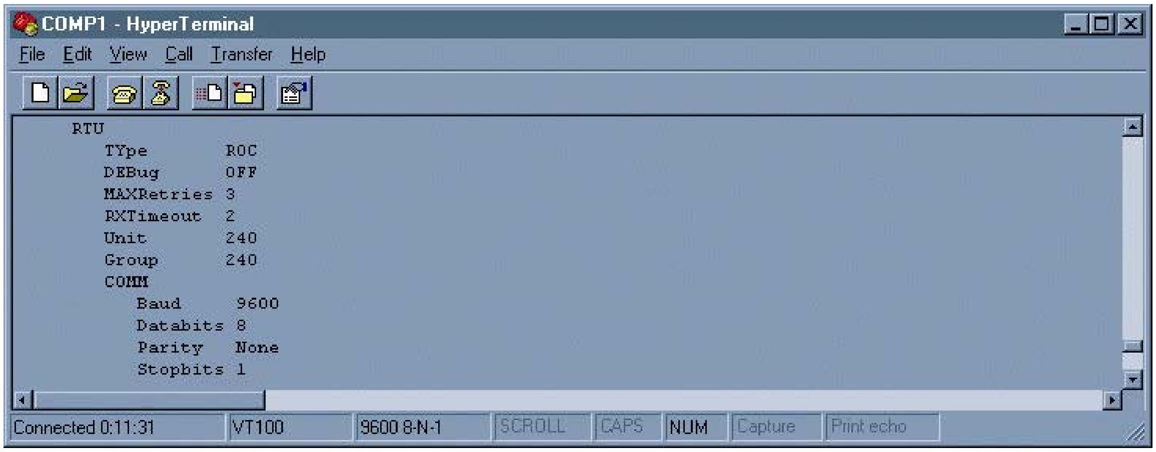
Figure 22: Select the ROC Driver




After a new driver is specified, the TPAC reboots and the defaults for the new protocol are loaded. Modify the default parameters to match the protocol of the end-device. Two unique parameters for the ROC driver are "Unit" and "Group". These define the address the TPAC uses to identify itself. The ROC response to a poll from the TPAC is addressed to the TPAC unit address and group number. The unit address and group number both default to 240, which works for most applications.

Most ROC devices have default communication settings of 9600 bits per second, 8 data bits, no parity and 1 stop bit. If the communication is not working, use ROCLINK of GV101 to verify the ROC settings. The next figure shows a sample ROC configuration.

Figure 23: ROC Configuration




**ROC Driver I/O Configuration**
Add or modify and I/O point to the TPAC with the following command and the parameters.

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

The following table describes the parameters that are necessary to configure a ROC I/O point. A ROC protocol manual may be required to determine the parameter numbers and point types.

ROC I/O Point configuration

| Address (ROC address) | F1 (ROC group number) | F2 (Point type) | F3 | F4 |
|---|---|---|---|---|
| Address | Group | 1-DI | Location 0-68 | Parameter # |
| | | 2-DO | | |
| | | 3-AI | | |
| | | 4-AO | | |
| | | 5-PI | | |
| | | 6-Pid | PID # 0-3 | Parameter # |
| | | 7-AGA config. | Flow Run #0-XX | Parameter # |
| | | 10-AGA flow | | |
| | | 17-Soft points | Softpoint # 0-31 | Data # |
| | | 256-History | History point # 0-89 | # of days before yesterday (yesterday=0) |

Other point types can be used for various user programs.

The following table correlates ROC data types to PAC data types.

PAC - ROC data type comparison

| PAC data types | ROC Data Type |
|---|---|
| 1 – Discrete | UC |
| 2 – Char | SC |
| 3 – Unsigned char | UC |
| 4 – Integer | SI |
| 5 – Unsigned integer | UI |
| 6 – LONG | SL |
| 7 – Unsigned long | UL |
| 8 – Float | FL |
| Not supported | AC |
| Not supported | BN |
| Not supported | TLP |

## 5.3 Allen Bradley DF1 Driver

RTU Driver : Allen Bradley DF1 Driver V2.1
KeyCode :DF1

This driver will interface to a PLC that supports the Allen Bradley DF1 Protocol. The PAC implements a subset of the commands transported via DF1 so support is restricted to PLCs which use the "Protected Typed Logical Read/Write" commands.

The list of PLCs, tested and verified, follows:
- SLC 500 Series
- Micrologix 1500

The DF1 protocol driver has the following settings:
**RTU**

**TYpe DF1** – Set the RTU driver to DF1 protocol.
**DEbug <off | on>**
**ADDress <1>** – The master address. Default is 1.
**DUPlex <full | half>** – The default is full duplex mode.
**CHKsum <CRC | BCC>** – The method of error checking. The default is CRC.
**MAXRetries <2>** – The default is 2.
**RXTimeout <1>** – The default is 1.
**COMM**

**POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
**BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
**DAtabits <7 | 8>**
**PArity <None | Even | Odd>**
**STopbits <1 | 2>**

**DF1 Driver I/O Configuration**

IO Point Configuration:
The DF1 protocol uses a single byte (0-255) to address a particular device on a DF1 network. The DF1 protocol has two modes, full duplex and half duplex. The mode depends on the PLC network configuration. In half duplex mode, many PLCs may be present on the network and each must be properly addressed to elicit the correct response. In full duplex mode, only one PLC is connected and the address is irrelevant. However, when the address does not match the PLC station number, there are occasional pauses in the response from the PLC. Wireless Matrix recommends that the address always match the PLC station address.

I/O Addressing:
Almost all data within the PLC is addressable. The DF1 driver implements a standard address scheme to access all data. The scheme is based upon the specifications for the SLC500 series and Micrologix 1000 series. The following is the address format.

TN:E.S/B

| Component | Description |
|---|---|
| T | File Type |
| N | File number |
| E | Element number |
| S | Sub-element number |
| B | Bit number |

In all Allan Bradley references, a letter or letters specify the file type. The following is a list of those representations

| File Type | Description | F1 |
|---|---|---|
| S | Status file | 132 |
| B | Bit file | 133 |
| T | Timer file | 134 |
| C | Counter file | 135 |
| R | Control file | 136 |
| N | Integer file | 137 |
| F | Floating point file | 138 |
| O | Output file | 139 |
| I | Input file | 140 |
| St | String file | 141 |
| A | ASCII file | 142 |

**Note:** Some file types do not support all address components. Further, some components may be omitted.

To translate from the Allen Bradley addressing scheme to the one used by the PAC, use the format below:

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

| Field | Description |
|---|---|
| Address | PLC (Station) Address |
| F1 | Bit Number *& File Type |
| F2 | File Number |
| F3 | Element Number |
| F4 | Sub-element Number |
| Type | (element dependant) |

***Note**: If a bit number is not desired disregard the bit number in F1.Some addressing requires a specific bit address. This is accomplished by utilizing the following format for the F1 field.

YYXXX : YY - Bit number
: XXX - File type

Example:

| DF1 Address | F1 | F2 | F3 | F4 | Type |
|---|---|---|---|---|---|
| F8:4 | 138 | 8 | 4 | 0 | Float |
| N7:3 | 137 | 7 | 3 | 0 | Int |
| N7:3/4 | 04137 | 7 | 3 | 0 | Disc |

## 5.4 DataTaker Driver

RTU Driver : Data Taker V1.2
KeyCode : DTK

**RTU**

**TYpe DTK** – Set the RTU driver to DataTaker.
**DEbug <off | on>**
**MAXRetries <2>** – The default is 2.
**RXTimeout <1>** – The default is 1.
**COMM**
  **POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
  **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
  **DAtabits <7 | 8>**
  **PArity <None | Even | Odd>**
  **STopbits <1 | 2>**

**DTK Driver I/O Configuration**

To translate add or modify I/O points for the DataTaker use the format:

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

GDN IO Point Definition for DataTaker DT800

| IO Point Definition | Usage |
|---|---|
| Address | Channel Address |
| F1 | Channel Type |
| F2 | Channel Modifier #1 |
| F3 | Channel Modifier #2 |
| F4 | Channel Modifier #3 |
| Type | See below |

IO Point types
- Analog input/output: Float
- Digital input/output:
  - State I/O: Discrete
  - Nibble/Byte I/O: Unsigned Char
  - Word: Unsigned Integer
  - Counter: Unsigned Integer
- Miscellaneous
  - Channel Variable: Float
  - System Variable: Float
  - System Time: Unsigned Long

Channel Types

ANALOG INPUTS:

| Type | Measurement | Description | Command | Channel Modifiers | | |
|---|---|---|---|---|---|---|
| | | | | F2 | F3 | F4 |
| 0 | Voltage | no zero correction | V | - | - | Note 1 |
| 1 | Voltage | zero correction | VNC | - | - | Note 1 |
| 2 | Current | w/ external shunt | I | - | - | Note 1 |
| 3 | Current | 4-20mA current loop | L | - | - | Note 1 |
| 4 | Resistance | by 2,3,or 4 wire method | R | - | - | Note 1 |
| 5 | Conductivity | by 2,3,or 4 wire method | CO | - | - | Note 1 |
| 6 | Bridge | 4-wire, quarter, half, full | BGI | - | - | Note 1 |
| 7 | Radiometric | 4&6 wire bridges | BGV | - | - | Note 1 |
| 8 | Temperature | Thermocouple | T[c] | Note 2a | - | Note 1 |
| 9 | Temperature | Platinum RTD | PT[n] | Note 2b | - | Note 1 |
| 10 | Temperature | Nickel RTD | NI | - | - | Note 1 |
| 11 | Temperature | Copper RTD | CU | - | - | Note 1 |
| 12 | Temperature | YS Series | YS[n] | Note 2b | - | Note 1 |
| 13 | Temperature | AD Series | AD[n] | Note 2b | - | Note 1 |
| 14 | Temperature | LM Series | LM[n] | Note 2b | - | Note 1 |
| 15 | Temperature | TMP Series | TMP[n] | Note 2b | - | Note 1 |
| 16 | Temperature | Diode Type | DIODE | - | - | Note 1 |

**Note 1:** F4 selects the channel usage

| | |
|---|---|
| 0 : Basic connection | i.e.: 1V |
| 1 : Positive terminal connection | i.e.: 1+V |
| 2 : Negative terminal connection | i.e.: 1-V |
| 3 : Default excitation applied | i.e.: 1*V |
| 4 : Return common terminal | i.e.: 1#V |

**Note 2:** F2 selects temperature sensor sub-type
2a : Selects Thermocouple type {1=A, 2=B, 3=C, 4=D,…}
2b : Selects sensor sub-type number {Addr=5, F1=12, F2=16 } = "5YS16"

ANALOG OUTPUTS :

| Type | Measurement | Description | Command | Channel Modifiers | | |
|---|---|---|---|---|---|---|
| | | | | F2 | F3 | F4 |
| 32 | Voltage | Voltage | VO | - | - | Note 3 |

**Note 3:** F4 selects the channel variable to store the output value into. Without this, the analog output voltage cannot be read back. i.e. (Addr = 7, F1=32, F4=200} = " 7VO(=200CV) = x"

DIGITAL INPUTS:

| Type | Measurement | Description | Command | Channel Modifiers | | |
|---|---|---|---|---|---|---|
| | | | | F2 | F3 | F4 |
| 64 | State | 1 -Bit Input | DS | - | - | - |
| 65 | Nibble | 4 -Bit Input | DN | - | - | - |
| 66 | Byte | 8 -Bit Input | DB | - | - | - |
| 67 | Word | 16 -Bit Input | DW | - | - | - |
| 68 | Counter | 16 -Bit Up Counter | C | - | - | - |

DIGITAL OUTPUTS :

| Type | Measurement | Description | Command | Channel Modifiers | | |
|---|---|---|---|---|---|---|
| | | | | F2 | F3 | F4 |
| 96 | State | 1 -Bit Output | DSO | - | - | - |
| 97 | Nibble | 4 -Bit Output | DNO | - | - | - |
| 98 | Byte | 8 -Bit Output | DBO | - | - | - |

MISCELLANEOUS:

| Type | Measurement | Description | Command | Channel Modifiers | | |
|---|---|---|---|---|---|---|
| | | | | F2 | F3 | F4 |
| 255 | Channel Variable | Internal register | CV | - | - | - |
| 254 | System Variable | Internal Maintenance | SV | - | - | - |
| 253 | System Timer | Internal Timers | ST | - | - | - |

## 5.5 Toshiba Tosvert-130 Driver

RTU Driver : Toshiba Tosvert-130 Driver V1.0
KeyCode : TOS

This driver controls the Toshiba Tosvert-130 Transistor inverter. While there are various models in the Tosvert-130 product line, the driver was designed for the G3 series. Other models may be supported, but have not been tested.

**RTU**

**TYpe TOS** – Set the RTU driver to the Toshiba Tosvert-130 Transistor inverter.
**DEbug <off | on>**
**CHKsum <off | on>** – The default is on.
**MAXRetries <2>** – The default is 2.
**RXTimeout <2>** – The default is 1.
**COMM**
  **POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
  **BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
  **DAtabits <7 | 8>**
  **PArity <None | Even | Odd>**
  **STopbits <1 | 2>**

**TOS Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | | |
|---|---|---|
| Address : | Inverter Number (INVNO) | |
| F1 : | Bank (0…4) | Bank 0 : RAM<br>Bank 1 : EEPROM<br>Bank 2 : Internal ROM<br>Bank 3 : External ROM<br>Bank 4 : Option Bus |
| F2 : | Address (0…0xFFFF) | See Manual |
| F3 : | Mask (0…0xFFFF) | A mask value of 0 will be interpreted as "NO MASK". |
| Type : | (See below) | |

Supported Point Types :

Discrete: Read / Write a single bit from bank memory F3 (Mask) is interpreted as the bit number (F3=4 gives mask = 00010000)

Char, U_Char: Read / Write a single character from bank memory. As the Tosvert's memory is built around 2-byte data. It is recommended that Integer data be used.

Int, U_Int: Read / Write a 2-byte data location

Other formats:

Long, U_Long: Supported, but data is truncated to 2-bytes
Float : Supported. but data is converted from a 2-byte integer.

Mask usage:

Other than discrete point types, which return a single bit value 0 or 1, other point type may also use the mask setting. In its simplest use, the mask can be used to limit data written to the memory location. (Mask = 0x00FF will limit data to the range 0…255) The mask may also be used to isolate bits in a word, so that other data within the word is not corrupted.(Mask = 0x00C0 will only read / write bits 7 and 6)

## 5.6 Spartek SS6010 Driver

RTU Driver : Spartek Systems V1.2
KeyCode : SPR

This driver will interface to the Spartek Systems SS6010 and 6010A down-hole recorder as laid out in a document supplied by Spartek.

Driver Configuration (with default values):

**RTU**

**TYpe SPR** – Set the RTU driver to the Spartek Systems SS6010 and 6010A.
**DEbug <off | on>**
**MAXRetries <2>** – The default is 2.
**RXTimeout <2>** – The default is 2.
**COMM**

**POrt < COM2>** – The RTU driver must use COM2 (RS232).
**BAud <9600>**
**DAtabits <8>**
**PArity <None>**
**STopbits <1>**

**SPR Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | |
|---|---|
| Address : | not used. |
| F1 : | Point Index - See table below |
| F2 : | not used |
| F3 : | not used |
| F4 : | not used |
| Type : | See table below |

SS6010

| F1 | Point Description | Point Type |
|---|---|---|
| 0 | Serial Number | Unsigned Long |
| 1 | Elapsed time in secs | Unsigned Long |
| 2 | Pressure | Float |
| 3 | Temperature | Float |
| 4 | Tool Configuration | Unsigned Long |
| 5 | Raw pressure | Unsigned Long |
| 6 | Raw temperature | Unsigned Long |
| 7 | Tool Status | Unsigned Long |

SS6010a

| F1 | Point Description | Point Type |
|---|---|---|
| 0 | Serial # | Unsigned Long |
| 1 | Time | Unsigned Long |
| 2 | Date | Unsigned Long |
| 3 | Rawdata1 | Unsigned Long |
| 4 | Rawdata2 | Unsigned Long |
| 5 | Rawdata3 | Unsigned Long |
| 6 | Rawdata4 | Unsigned Long |
| 7 | Computed Pressure 1 | Float |
| 8 | Computed Temperature 1 | Float |
| 9 | Computed Pressure 2 | Float |
| 10 | Computed Temperature 2 | Float |
| 11 | Computed Pressure 3 | Float |
| 12 | Computed Temperature 3 | Float |
| 13 | Configuration | Unsigned Long |
| 14 | Status | Unsigned Long |

## 5.7 Garmin GPS Driver

RTU Driver : Garmin GPS 25/35 Driver V2.0
KeyCode : GPS

The Garmin GPS driver uses the "Phase Output Data Binary Format" for its communications with the RTU. As the binary format messages are transmitted on TXD2/RXD2, the cables must be connected as follows

| PAC | GPS |
|---|---|
| RS232-RX Pin 2 | TXD2 (Purple) |
| RS232-TX Pin 3 | RXD2 (Green) |
| Vdc | Vin (Red) |
| GND | GND (Black) |

**RTU**

**TYpe SPR** – Set the RTU driver to the Spartek Systems SS6010 and 6010A.
**DEbug <off | on>**
**RXTimeout <5>** – The default is 5.
**COMM**
 **POrt < COM2>** – The RTU driver must use COM2 (RS232).
 **BAud <4800>**
 **DAtabits <8>**
 **PArity <None>**
 **STopbits <1>**

**Note**: These phase output data records can be disabled (via the $PGRMC1command). Ensure the command "$PGRMC1,1,2<CR><LF>" is issued on the command port, prior to commissioning. This will ensure these reports are generated at regular intervals.

**GPS Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point definitions

| | |
|---|---|
| Address : | not used. |
| F1 : | 40 This corresponds to (0x28) = Position record id |
| F2 : | Point Index - See table below |
| F3 : | not used |
| F4 : | not used |
| Type : | See table below |

| F1 | F2 | Type | |
|---|---|---|---|
| 40 | 0 | UInt | GPS Fix (0=Invalid, 1=Invalid, 2=2D, 3=3D, ...) (see appendix C) |
| 40 | 1 | FL | GPS Latitude (deg) (+ == North, - == South) |
| 40 | 2 | FL | GPS Longitude (deg) (+ == East, - == West) |
| 40 | 3 | FL | GPS Altitude (mt) |
| 40 | 4 | FL | Velocity : Latitude (mt/sec) |
| 40 | 5 | FL | Velocity Longitude (mt/sec) |
| 40 | 6 | FL | Velocity : Altitude (mt/sec) |

## 5.8 Delimited ASCII Driver

RTU Driver : Delimited ASCII Driver V1.0
KeyCode : DAD

The DAD driver is designed to receive an ASCII delimited string. The driver does not send queries to the end device. The driver is designed to receive data only.

The Driver can be set up to accept all type of delimitation. Commas and spaces are usually the most common. Also the number of expected values can be entered to filter invalid data.

Driver Configuration (with default values):

**RTU**

**TYpe DAD** – Set the RTU driver to the delimited ASCII.
**DEbug <off | on>**
**RXTimeout <10>** – The default is 10. This timeout must be set longer than the interval that the device sends the data.
**DELimiter <32>** – This number represents the decimal equivalent of an ASCII character (44=, (comma) and 32= (space))
**NVALues <0>** – The number of expected values can be entered to filter invalid data. If the number is not known the it can be left as 0.
**COMM**
**POrt <COM1 | COM2 | COM4>** – The RTU driver must use COM2 (RS232) or COM4 (RS485). COM1 is the network port for the TPAC.
**BAud <1200 | 2400 | 4800 | 9600 | 14400 | 19200 | 28800 | 38400>**
**DAtabits <7 | 8>**
**PArity <None | Even | Odd>**
**STopbits <1 | 2>**

**DAD Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | |
|---|---|
| Address : | not used. |
| F1 : | Point Index -= the place that the desired value holds in the expected string of values |
| F2 : | not used |
| F3 : | not used |
| F4 : | not used |
| Type : | Float |

## 5.9 AFI MVS Driver

RTU Driver : AFI MVS Driver V1.1
KeyCode : AFI

The AFI Driver is functionally equivalent to Modbus (See Modbus). The difference lies in the auto-time synchronization feature. Two items must be properly configured for the AFI auto-time synchronization feature to work properly.

To enable the feature, a point must be added as follows.

| PID | INDEX | ADDRESS | F1 | F2 | F3 | F4 | TYPE |
|---|---|---|---|---|---|---|---|
| ? | ? | ? | 40000 | 502 | 0 | 0 | (UINT) |

The point must also be included in a pollset, which is polled on a regular basis. It is suggested to use poll-set 2 and schedule the record to be read hourly. If ever this register returns with either bit0, or bit1 set (=1), a time synchronization is required and the driver will write the correct time to the AFI's date/time registers automatically.

In order for the correct LOCAL time to be written to the AFI meter, the correct TIMEZone must be configured in the PAC.

Driver configuration is the same as Modbus.

**RTU**

**TYpe AFI** – Set the RTU driver to AFI.

## 5.10 Pressure Trax ILI Technologies Driver

RTU Driver : ILI Technologies : PressureTrax V1.1
KeyCode : PRT

Driver configuration:

**RTU**

**TYpe PRT** – Set the RTU driver to the PressureTrax.
**DEbug <off | on>**
**RXTimeout <8>** – The default is 5.
**MAXRetries <2>** – The default is 2.
**COMM**
**POrt < COM2>** – The RTU driver must use COM2 (RS232).
**BAud <4800>**
**DAtabits <8>**
**PArity <None>**
**STopbits <1>**

**PRT Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | |
|---|---|
| Address : | not used. |
| F1 : | Point Index - See table below |
| F2 : | not used |
| F3 : | not used |
| F4 : | not used |
| Type : | See table below |

| F1 | Type | Data form PRT |
|---|---|---|
| 1 | Uint | Current raw pressure data Channel 1 |
| 2 | Uint | Current raw pressure data Channel 2 |
| 3 | Uint | Current raw pressure data Channel 3 |
| 4 | Blob | EEPROM Data block [ 128 bytes] |
| 5 | Blob | SRAM Block #0 [1024 bytes] |
| 6 | Blob | SRAM Block #1 [1024 bytes] |

## 5.11 ABB PowerPlus Alpha Driver

RTU Driver : ABB PowerPlus Alpha Driver V1.0
KeyCode : ABB

Driver configuration:

**RTU**

**TYpe ABB** – Set the RTU driver to the ABB.
**DEbug <off | on>**
**RXTimeout <1>** – The default is 1.
**MAXRetries <8>** – The default is 8.
**PWord <0>** – The default is 0.
**BM <off | on>** – The default is off.
**COMM**

**POrt < COM2>** – The RTU driver must use COM2 (RS232).
**BAud <1200>**
**DAtabits <8>**
**PArity <None>**
**STopbits <1>**

**ABB Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

## 5.12 Environmental Systems Corporation (ESC) Data Logger Driver

RTU Driver : Environmental Systems Data Logger 8816 V1.0
KeyCode : ESC

The driver was tested with the Model 8816 Data Logger

Driver configuration:

**RTU**

- **TYpe ESC** – Set the RTU driver to the ESC data logger.
- **DEbug <off | on>**
- **MAXRetries <2>** – The default is 2.
- **COMM**
  - **POrt < COM2>** – The RTU driver must use COM2 (RS232).
  - **BAud <9600>**
  - **DAtabits <8>**
  - **PArity <None>**
  - **STopbits <1>**

**ESC Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

GDN IO Point Definition

| Address | RTU Address |
|---|---|
| F1 | Command |
| F2 | see below |
| F3 | see below |
| F4 | see below |

Supported commands and configuration.

| | |
|---|---|
| F1 | 10 = Poll Hourly Averages |
| F2 | Channel # |
| F3 | Hour |
| F4 | 0:Relative offset, 1:Absolute time |
| TYPE | FLOAT |

(i.e. F3=1, F4=0 would request the last hour's average)
(i.e. F3=7, F4=1 would request 07:00 average)

| | |
|---|---|
| F1 | 11 Poll Hourly Averages (Raw) |
| F2 | Channel # |
| F3 | Hour |

| | |
|---|---|
| F4 | 0:Relative offset, 1:Absolute time |
| TYPE | INT |

| | |
|---|---|
| F1 | 23 Poll Digital Input Status |
| F2 | Line number |
| TYPE | DISCRETE |

| | |
|---|---|
| F1 | 45 Poll Calibration results |
| F2 | Channel # |
| F3 | Phase (0:"ZERO", 1:"SPAN") |
| TYPE | FLOAT |

| | |
|---|---|
| F1 | 54 Poll Auxiliary Averages |
| F2 | Channel # |
| F3 | Hour/Min |
| F4 | 0:Relative offset, 1:Absolute time |
| TYPE | FLOAT |

| | |
|---|---|
| F1 | 55 Poll Auxiliary Averages |
| F2 | Channel # |
| F3 | Hour/Min |
| F4 | 0:Relative offset, 1:Absolute time |
| TYPE | INT |

| | |
|---|---|
| F1 | 56 : Poll Averages |
| F2 | Channel # |
| F3 | Interval (minutes) |
| TYPE | FLOAT |

| | |
|---|---|
| F1 | 66 Poll Most recent base average |
| F2 | Channel # |
| TYPE | INT |

| | |
|---|---|
| F1 | 0202 Set Time |
| TYPE | ULONG |

Reading this IO point will trigger a time set command. The PAC current local time is sent to the RTU. Note: As time synchronization between the PAC and the RTU is VERY important. It is recommended that this point be placed in separate pollset, which execute once per day.

| | |
|---|---|
| F1 | 0505 Power Failure Log (Most recent) |
| F2 | 0:Failure Down Time, 1:Failure Up Time |
| TYPE | ULONG |

| | |
|---|---|
| F1 | 0910 Poll Most recent instantaneous reading |

| | |
|---|---|
| F2 | Channel # |
| TYPE | FLOAT |

| | |
|---|---|
| F1 | 1212 Get current RTU time |
| TYPE | ULONG |

| | |
|---|---|
| F1 | 1516 Switch digital output control relay |
| F2 | Line number |
| TYPE | DISCRETE |

Note : This is a write-only point. The PAC will maintain the last value sent as long as power is maintained. Sleep or any power loss will invalidate this point, and a default value of OFF is returned.

## 5.13 Grant DataLogger 1000 series Squirrel Meter Driver

RTU Driver : 1000 Squirrels Datalogger V1.0
KeyCode : 1KS

This driver will interface to the Grant "1000 Squirrels" Datalogger.

Driver configuration:

**RTU**

**TYpe 1KS** – Set the RTU driver to the Grant data logger.
**DEbug <off | on>**
**RXTimeout <2000>**
**MAXRetries <2>**
**COMM**
**POrt < COM2>** – The RTU driver must use COM2 (RS232).
**BAud <9600>**
**DAtabits <8>**
**PArity <None>**
**STopbits <1>**

**IKS Driver I/O Configuration**

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | |
|---|---|
| Address : | not used |
| F1 : | Command |
| F2 : | see below. |
| F3 : | see below |
| F4 : | not used. |
| Type : | see below. |

Channel Data

| | |
|---|---|
| F1 | 72 - Channel Data |
| F2 | Channel # [1…n] |
| F3 | Event bit [0…n] Signal channel only. |
| F4 | not used. |
| Type | Float - Calculated using channel configuration data<br>Int - Raw data.<br>UInt - Pulse counter channels.<br>Discrete - Event bit (use F3 to determine bit offset) |

Supply Voltage

| | |
|---|---|
| F1 | 86 – Supply Voltage |
| F2 | 1 = Battery voltage<br>2 = External supply voltage |
| F3 | not used. |
| F4 | not used. |
| Type | Float |

Reset Pulse Counter

| | |
|---|---|
| F1 | 83 - Reset Pulse counter |
| F2 | not used. |
| F3 | not used. |
| F4 | not used. |
| Type | Discrete. |

Reading this point will reset the pulse counters. If the reset was successful, this point type will return a value of 1

## 5.14 Bristol Babcock BSA Driver

RTU Driver : Bristol Babcock Protocol V1.0
KeyCode : BSA

This driver controls the Toshiba Tosvert-130 Transistor inverter. While there are various models in the Tosvert-130 product line, the driver was designed for the G3 series. Other models may be supported, but have not been tested.

Configuration of the driver is as follows.
Driver Configuration (with default values):
KeyCode : BSA

This driver will interface to a Teleflow RTU (Model 3530) via the BSAP protocol.

Driver Configuration (with default values):

**RTU**

- **TYpe BSA** – Set the RTU driver to the Bristol Babcock BSA.
- **DEbug <off | on>**
- **COMM**
  - **POrt < COM2>** – The RTU driver must use COM2 (RS232).
  - **BAud <9600>**
  - **DAtabits <8>**
  - **PArity <None>**
  - **STopbits <1>**

**BSA Driver I/O Configuration**
The user needs knowledge of the Bristol Babcock configuration to configure I/O points in the PAC.

Only two BSAP commands have been implemented.
Remote Database Access - Read by Data Array Number.
Remote Database Access - Write by Data Array Number.

**GDN ADd <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

IO Point Configuration

| | |
|---|---|
| Address : | RTU Address. |
| F1 | Array index. |
| F2 : | Column |
| F3 | Row |
| F4 | Bit index (Discrete only) |
| Type | Float / Discrete |

# 6 I/O Functionality and Configuration

The TPAC has seven terminals that can be used for general-purpose I/O. The TPAC has an internal temperature sensor and an optional atmospheric pressure sensor. This section describes the options available for each channel and the configuration of the channels.

I/O board points should be added with 9xx index to differentiate from external I/O points. Use the following command to add points to access the internal I/O.

**GDN ADd INT <pid> <index> <address> <f1> <f2> <f3> <f4> <type>**

**NOTE:** PAC POW (Pause on wakeup) is recommended to allow transmitters to stabilize after wake up. 1 to 2 seconds should be sufficient but each transmitter is different, so test new a transmitter before installation.

## 6.1 I/O1-I/O4

The four terminals labeled I/O1-I/O4 can be configured 3 different ways.

### 6.1.1 Analog (1-5V)

**GDN ADD INT ? 9xx 1 0 0 0 0 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 (1-4) |
| F1 | 0 |
| F2 | 0 |
| F3 | 0 |
| F4 | 0 |
| Point type | Float |

### 6.1.2 Analog (4-20mA)

**GDN ADD INT ? 9xx 1 0 255 0 0 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 (1-4) |
| F1 | 0 (Identifies analog input) |
| F2 | 255 (Enable current measurement) |
| F3 | 0 |
| F4 | 0 |
| Point type | float |

### 6.1.3 Digital input

The digital input can be used for a 0-12 VDC input where 0 is OFF and a voltage above 2.5 volts is ON. If the input is not driven low, an external pull-down resistor to ground is required. A 1/4 watt 10k ohm resistor is sufficient.

**GDN ADD INT ? 9xx 1 0 0 0 0 discrete**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 (1-4) |
| F1 | 0 |
| F2 | 0 |
| F3 | 0 |
| F4 | 0 |
| Point type | Discrete |

## 6.2 TIN1

The terminal labeled TIN1 is designed for time measurements or discrete inputs. It can be configured four different ways.

### 6.2.1 Digital (Off, On)

The digital input can be used for a 0-12 VDC input where 0 is OFF and a voltage above 2.5 volts is ON. This set up requires an external pull-down resistor if the input is not pulled low by the end device. A 1/4 watt 10k ohm resistor is sufficient.

**GDN ADD INT ? 9xx 1 0 0 0 0 discrete**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 |
| F1 | 0 |
| F2 | 0 |
| F3 | 0 |
| F4 | 0 |
| Point type | discrete |

### 6.2.2 Pulse Counter

**GDN ADD INT ? 9xx 1 2 0 255 6 uint**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 |
| F1 | 2 (Identifies pulse counter) |
| F2 | 0 |
| F3 | 255 (Enable 2 kΩ pull-up resistor) |
| F4 | 6 (De-bounce interval of 24 µs (6 x 4µs)) |
| Point type | Uint |

### 6.2.3 RPM meter

**GDN ADD INT ? 9xx 1 3 5 255 6 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 |
| F1 | 3 (Identifies RPM meter) |
| F2 | 5 (Sampling interval: 0 instantaneous value, 1 and greater indicates the sample rate. For example, 5 indicates a calculation every 5 seconds.) |
| F3 | 255 (Enable 2 kΩ pull-up resistor) |
| F4 | 6 (De-bounce interval of 24 µs (6 x 4µs)) |
| Point type | Float |

### 6.2.4 Frequency Meter (kHz)

**GDN ADD INT ? 9xx 1 4 5 255 6 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 1 |
| F1 | 4 (Identifies frequency (in kHz) meter) |
| F2 | 5 (Sampling interval: 0 instantaneous value, 1 and greater indicates the sample rate. For example, 5 indicates a calculation every 5 seconds.) |
| F3 | 255 (Enable 2 kΩ pull-up resistor) |
| F4 | 6 (De-bounce interval of 24 µs (6 x 4µs)) |
| Point type | float |

## 6.3 Temperature and Pressure

The temperature in °C is available on the TPAC. The atmospheric pressure in kPa is an option on the TPAC.

### 6.3.1 Temperature in °C

**GDN ADD INT ? 9xx 7 0 0 0 0 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 7 (Identifies temperature measurement) |
| F1 | 0 |
| F2 | 0 |
| F3 | 0 |
| F4 | 0 |
| Point type | float |

### 6.3.2 Barometric Pressure (kPa)

**GDN ADD INT ? 9xx 8 0 1042 0 0 float**

| | |
|---|---|
| PID | ? |
| Point index | 9xx |
| Address (channel number) | 8 (Identifies barometric pressure measurement) |
| F1 | 0 |
| F2 | A correction for altitude, in meters, can be entered in F2. (1042 for Calgary) |
| F4 | 0 |
| Point type | float |

# Appendix A

**Text file configuration.**

A text file can be created to simplify configuration if multiple units will have the same configuration. Create a text file using notepad or another text editor. Within the text file, enter the commands to configure the PAC followed by the <enter> key. Use a terminal program transfer or send the text file to the TPAC. In HyperTerminal, this option is found under the menu heading “Transfer | Send Text File”.

An example of a text file is:
PAC DEBUG ON<enter>
PAC TIMEZONE -420<enter>

Do not use text files to change load new drivers. Loading drivers cause the TPAC to reboot and the configuration will be lost.

**Upgrading PAC firmware**.

Any TPAC with a firmware version above 2.2X can be upgraded from a PC. The upgrade software and latest firmware are available from Wireless Matrix Corporation upon request.