

TANO Protocol

Overview

The Omnii-Comm TANO driver supports two models of TANO Remote Terminal Units (RTUs); the Model 5 and the Model 100 "Intelligent" Remote Terminal Unit. The Model 5 is self configuring when reset and determines its message length based on modules it finds where as the Model 100 is configured by downloading configuration information to the RTU. This download process can be automatic when the Omnii-Comm is started or initiated by doing a "special" control as defined later in this document.

Connector Configuration Parameters

RTS ON DelayX10ms

Enter a number from 0 to 255 (0 to 2.55 seconds) to delay sending a message after turning on Request To Send (RTS). Commonly used with modem communication to allow additional time for the modems to synchronize. If connecting to a Model 100 RTU with a baud rate of 9600 this parameter must be set to 5 (50 msec). **This 50 msec delay between messages is required for proper download operation.**

RTS OFF DelayX10ms

Enter a number from 0 to 255 (0 to 2.55 seconds) to keep RTS on after a message has been sent. Commonly used to keep a radio on for a short period of time at the end of a message. Typically, this delay will be set to zero.

Handshake Option

If Full Handshake is selected the Omnii-Comm will assert RTS and wait for CTS before sending a message. RTS will be turned off after the message has been sent. If Constant Carrier is selected the Omnii-Comm will assert RTS when it sends its first message and leave it asserted. It will wait for CTS before sending. If Ignore CTS is selected, RTS will be asserted before sending a message and removed at the end of the message. The CTS input will be ignored. If No Handshake is selected, RTS will be asserted when the Omnii-Comm sends its first message. RTS will not be turned off at the end of the message. The CTS input will be ignored. If Activity Monitor is selected, the Omnii-Comm will check the DCD input before sending a message. If DCD is ON, the Omnii-Comm will delay sending the message. This selection should be Full Handshake for TANO communication.

Retry Count

The number of times a message will be retried before an error is reported.

Option Bit Parameters

Use Radio Key

If checked, Bit 0 in a register specified by the "Radio Key Address" on the Header configuration screen will be turned ON before a message is sent and turned OFF after the message has been completed.

Download on Start

TANO Model 100 RTUs require a "Download" after a complete power failure. Bit 6 of the RTU Status Byte (the first data byte in any message) will be set to indicate that a download is required. If a message is received with this bit set in the RTU Status Byte a download will be automatically started. It may be useful to automatically start a download without powering down the RTU for instance if the configuration file is changed. If this box is checked a "Download" sequence will be performed when the "Start Polling" command is issued to start the Omnii-Comm. It will also be started when the Omnii-Comm automatically starts up after a power outage.

Check Status Byte

All TANO messages have a status byte inserted that reports the status of the RTU. If this box is checked and the status byte is non-zero, the data returned will be marked bad and the RTU Status byte will be written to the Poll Error location. The Download Request bit is always checked regardless of the setting of this option for any Model 100 message.

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Protocol Extension Table Parameters

The Protocol extension table is used to define additional parameters required for TANO operation. Click on the box to enable the Protocol Extension Table. Click on the button to bring up the specific options as detailed below.

Config. Table Data Type

The first two entries are used to define the Data Type and Starting Offset for the "Configuration Information" table used with TANO Model 100 RTUs.

The table can be of any length. The table can be read from anywhere and placed into any Data Type. You can also read the table from RAM or EEPROM. In this case, the first two entries of the extension table are used to specify the memory address of the start of the table. If the first entry is less than 22, then a Data Type and Offset is assumed. If the first entry is 22 or higher, a memory address is assumed. Typically, the Configuration Information table is stored in an area of free RAM memory well above the Omnii-Comm configuration data. This area of RAM memory (addresses \$6000 to \$7FFF) is always reloaded from Serial EEPROM when the Omnii-Comm is powered up. In the example shown below, the Configuration Information table is loaded starting at address \$7000 (by the ORG instruction); the Config Table Data Type and Starting Offset will be set to 112 (=70 hex) and 0 (\$7000).

The Config Table Data Type and Starting Offset must be set to zero for Model 5 RTUs.

The table has the following general format:

```
; Configuration Information for TANO 100 RTU
; Points are defined in the order in which they appear in the table
; The list is terminated with a Point Type = $FF
; If there is a DI associated with a DO then the DI point definition must immediately follow the DO point
definition.
; If there is an AI associated with a TNK the AI point definition must immediately follow the TNK point definition.

                ORG    $7000                This entry determines where the Download will be located in the
                                                Omnii-Comm memory space. It should be placed somewhere in
                                                RAM above the Configuration file which starts at $6000 and
                                                below address $7F00.
;
;---Digital Output Points (DO)
                FCB    $01                Point Type (Always 1 for DO)
                FCB    $01                Group (usually 1)
                FDB    $0194             Set ID
                FDB    $FB2C             Hardware Address
                FCB    $50                Flags    $10=Commandable
;                                                $40=2-bit command
;                                                $50=commandable and 2-bit
;
                FCB    $00                Not used
                FCB    $0C                Output Position
                FCB    $00                Retrieval Position
                FDB    $0194             Associated Status ($0000 if none)
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;---Analog Output (AO or Setpoint)		
FCB	\$08	Point Type (Always 8 for AO)
FCB	\$01	Group (usually 1)
FDB	\$01A2	Set ID
FDB	\$FB24	Hardware Address
FCB	\$50	Flags \$10=Commandable
;		\$40=Dual D/A
;		\$50=commandable and Dual D/A
;		\$80=Bipolar D/A
FCB	\$00	Not used
FCB	\$00	Multiplexer Address
FCB	\$00	Retrieval Position
FDB	\$0000	Spare
;---Analog Input Points (AI)		
FCB	\$07	Point Type (Always 7 for AI)
FCB	\$01	Group (usually 1)
FDB	\$019A	Set ID
FDB	\$FB00	Hardware Address
FCB	\$00	Flags \$00=Normal
;		\$20=Analog Input is bipolar
;		\$40=Analog Input is a temperature
;		associated with a TANK
FCB	\$00	Not used
FCB	\$00	Multiplexer Address
FCB	\$04	Retrieval Position
FDB	\$0000	Associated TANK (\$0000 if none)
;---Digital Input Points (DI)		
FCB	\$00	Point Type (Always 0 for DI)
FCB	\$01	Group (usually 1)
FDB	\$0194	Set ID
FDB	\$FB16	Hardware Address
FCB	\$00	Flags (always 0)
FCB	\$00	Not used
FCB	\$18	Retrieval Bit Position
FCB	\$1E	Retrieval Position
FDB	\$0194	Associated Digital Output (\$0000 if none)
;---Meter (Accumulator) Points (ACC)		
FCB	\$01	Point Type
;		\$03=8-bit hardware
;		\$04=16-bit hardware
FCB	\$01	Group (usually 1)
FDB	\$00C8	Set ID
FDB	\$FB1C	Hardware Address
FCB	\$50	Flags \$10=Commandable
FCB	\$00	Not used
FCB	\$00	Always 00
FCB	\$20	Retrieval Position
FDB	\$0000	Always 00
;---Tank Points (TNK)		
FCB	\$09	Point Type (Always 9 for TANK)
FCB	\$01	Group (usually 1)
FDB	\$0000	Set ID
FDB	\$0000	Hardware Address
FDB	\$0000	Tank Designator
FCB	\$00	Tank Address
FCB	\$00	Retrieval Position
FDB	\$0000	Associated Analog Input (\$0000 if none)
;---End of List		
FCB	\$FF	Must be present!

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The entries in this table and the number of subtables is determined by the hardware configuration of the RTU and will be unique for each installation. Use a text editor such as Notepad to copy and paste subtables as needed for each installation then use AS11 to convert the file to a .S19 file that can be loaded with the Omnii-Config "Download Additional File to RAM" communication option. AS11 is a freeware "assembler" program that is distributed and installed along with the Omnii-Config program. It is started using the AS.BAT file also distributed with Omnii-Config. Copy both AS11.EXE and AS.BAT to a subdirectory on the hard drive along with the ASM file.

For example, if a file is created for a specific location and named EGATECFG.ASM (The .ASM extension is required and file name can be no more than 8 characters) a .LST (listing file) and .S19 (load file) are created by opening a CMD window and navigating to the subdirectory where the files are stored and typing AS EGATECFG and Enter. Open the .LST file with Notepad and look at the end of the listing to insure there are no errors detected. For VISTA users you must run the batch file with administrator rights.

RTU Address for Download

Enter the RTU address that will receive the download. The RTU address is set in a Model 100 with switches on the RTU hardware. This number is entered in decimal.

Page for Download Messages

The Configuration Table is located and all the download messages are pre-built when the TANO connector is initialized at Omnii-Comm startup. These messages are stored in an area of paged RAM. This entry defines the page that will be used. Valid numbers are from 7 to 12. If another protocol is used on another connector that also uses paged RAM, the page numbers must be unique for each connector.

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Poll Table Read Parameters

RTU Address

The Address of the RTU that will respond to this Read Request. Valid addresses are from 0 to 255.

RTU Type

Select the Model number of the RTU that will respond to this poll from the drop-down list. Currently only Model 5 and Model 100 Binary models are supported

Poll Type

Full Report is the only choice. A Full Report returns all data from the RTU that is located in a specified "Group" (see next entry). The number of bytes returned depends on the RTU hardware configuration for Model 5 RTUs and on the Configuration Table entries for Model 100 RTUs.

Group

Specify the Group number for the poll. This us usually 1.

Status Bytes

For Model 5 RTUs the number of Status Bytes expected in the reply. Not used for Model 100. **Note: The RTU Status byte and the first byte of Extended Status are always placed in the first word of status and must be counted in the Extension table.**

Accumulators

For Model 5 RTUs the number of 3-byte accumulators expected in the reply. Not used for Model 100.

Convert to 4 byte

Optionally convert the 3-byte accumulators to 4-byte before storing the data. This option used by both the Model 5 and the Model 100 RTUs. Note, if using 3-byte accumulators, you must have an even number of accumulators defined.

Analog Inputs

For Model 5 RTUs the number of Analog Inputs expected in the response. Not used for Model 100.

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Poll Table Write and Error Parameters

INVALID SELECTION. Cannot Write to TANO RTU using the Poll Table. Writes are sent to the TANO RTU automatically when a database point is changed. Define dummy polling tables to build database points for Analog Out and Digital Out points. The RTU Address and Group used in the dummy read will be used in the control message that is sent to the RTU.

Control Output (Digital Output)

Digital outputs for a Model 5 RTU are numbered according to the control output module position. Each module position can have 2 output relays. Module position 1 are outputs 0 and 1, position 2 is 3 and 4 and so on. Module position 12 would correspond to outputs 22 and 23 and position 16 is 30 and 31.

For Model 100 RTUs, the digital outputs are defined by the Configuration Information that is downloaded to the RTU. At startup, download messages are pre-built and stored. The lowest hardware address for digital output boards is found and stored at this time. When a control output command is received the control "point number" is divided by 8 and added to the lowest hardware address to obtain the hardware address of the desired control output card. Then the Configuration Table is searched to find a matching hardware address and output mask for the commanded point. When a match is found the Set ID found in this table will be used in the message to the RTU. This algorithm effectively "lines up" the digital output number with the physical relay position. Digital output point 0 will control the first relay of the lowest digital output card address, point 1 will control the next relay. Control output point 8 will control the first relay of the next highest digital output card.

Analog Output (Setpoint)

Analog outputs for a Model 5 RTU are numbered according to the analog output module position. Each module position can have 2 analog outputs. Module position 1 corresponds to analog outputs 0 and 1, position 2 is 3 and 4 and so on. An analog output command to the 6th analog output (point number 5) will be sent to the module in position 3.

For Model 100 RTUs, the analog outputs are defined by the Configuration Information that is downloaded to the RTU. The Analog Output Subtable location corresponds to the setpoint number The message to the RTU will use the Set ID found in this subtable

Special Commands

There are 32 "Special" commands defined for the TANO RTUs that allow the user to perform tasks by writing to a control output. Control output points 224 thru 255 have been reserved for this purpose. Control outputs 224 thru 239 are used to send an accumulator reset command to Model 100 RTUs as defined below. Control output 240 thru 255 are reserved for other functions. Currently there are only 3 functions defined.

Output 240 sends a Status Reset message to the RTU
Output 241 starts a Download Sequence (Model 100 only)
Output 242 sends an Extended Status Request message to the RTU
Output 243 thru 255 not defined. Sends a Status Reset message

Reset Accumulator

An accumulator reset for the Model 5 RTU is performed by writing to the accumulator module as if it were a digital output module. If an accumulator is installed in module position 11 then sending a control output to the 20th or 21st control output will reset the accumulator.

Accumulator Reset messages are sent to the Model 100 RTU by writing to control outputs 224 thru 239. Output 224 corresponds to the first accumulator defined in the Configuration Information table, output 225 corresponds to the seconde accumulator defined and so on up to a maximum of 16 accumulators. The Set ID from the Accumulator subtable is used in the message to the RTU.

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Note: System Error Protocol Definitions are the same as Poll Table Write and Error Parameters

Database Extension Table Parameters

Index	Name	Size
0	INVALID SELECTION	