APPENDIX

STI TaitP25.EXE

STI Driver for Tait 9100 P25 Mobile Radio

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Overview

Warning: *The wall mounted power supply provided with the Tait radio kit can be used only for reception tests. It can not be used when the radio is transmitting. A fused 10 Amp circuit must be provided to the radio before energizing the transmitter.*

The TaitP25.EXE driver is compatible with the Tait 9100 radio. The driver sets the frequency of the Tait 9100 radio and requests signal measurements which can include signal strength (RSSI), bit error rate (BER) and quality of service (QOS). The Tait 9100 is used by this driver in receive mode only.

The driver program completely automates the drive test measurement process. The driver can sequentially set the frequency of one or more channels and read RSSI, BER and QOS data errors from each when the channels are broadcasting the P25 1011 Hz test tone.

These readings are formatted into a log file record which is sent to the main Field Test 6 program, displayed and saved into the measurement database. This measurement process is repeated continuously, stopped only by clicking the Stop Receiver button on the receiver driver window in the lower right-hand corner of the Field Test 6 Data Acquisition window.

RSSI

RSSI measurements with the Tait 9100 radio can be made on a modulated or unmodulated signal. The logged values are in dBm.

BER

BER measurements are made in the Tait 9100 radio by comparing an expected 1011 Hz signal with the corrected one from the radio. The values logged are in percent errors.

1011 Hz Test Tone Note: The specific continuous 1011 Hz test tone required is defined in TIA-102 with status bits set to IDLE, binary 11. If the infrastructure is sending status bits set to BUSY, binary 01, the base line BER will be 1.39%.

QOS

Quality Of Service (QOS) measurements made by the Tait 9100 radio are an indication of the number of errors being corrected by the vocoder in the radio. QOS is approximately, but not exactly, equal to 100 – BER. QOS can be measured on any well modulated continuous audio signal and does not require the 1011 Hz test tone. The logged values are in percent.

The TaitP25.EXE driver is compatible with the STI Press to Talk Option 31. See the PTTSwitch8.PDF manual for more information.

This document is installed with other STI manuals at C:\STI6\Manuals\Drivers.

TM9000 Radio Initial Setup

The Tait TM9100 mobile radio as shipped from STI has been initialized with settings necessary to start testing with Field Test 6 and the TaitP25.EXE driver. Included with the driver is a Tait TM9100 Programming CD containing the Tait Programming Application. The Tait programming application must be used if it is necessary to reset the initial radio settings. To use the Tait programming application:

1. Insert the *Tait TM9100 & TP9100 Programming CD* and install the *Programming Application* by selecting the *Download* link.
2. Start the programming application and select File Open. Browse to and open the file at *C:\STI Rec Files\TM9000-P25_xxxTest.p91p* where *XXX* indicated the frequency band of the radio (VHF, UHF or 800).
3. Select the *Specifications* item in the left column of the programming application.
4. In the *Band* drop down box on the right, select the frequency band applicable for the radio you are using.
5. Connect the programming cable between the computer serial port and the TM9100 microphone connector.
6. Select *Program* in the bar at the top of the programming application and wait for the TM9100 programming to finish.

TaitP25 Test Operation

The operation of the Tait 9100 radio during testing is controlled, by the TaitP25.EXE driver through the RS232 port in the microphone connector. Commands and settings sent to the radio are contained in two text files. Tait 9100 Radio specific settings and commands are externalized in these files so changes to the radio test setup can be accommodated by editing these files. Project specific settings are set in receiver setup files, <name>.REC files located in the *C:\STI Projects\<Current Project>* directory. Global settings, used across all projects, are in the TaitP25.INI. This file is installed along with the driver and is maintained by the driver. It is located in the *C:\STI REC Files* directory.

Physical Connections

1. Connect the RS232 to RJ45 adaptor from the laptop serial port to the microphone connector on the Tait 9100 front panel. (In some cases an RJ11 to RJ45 adaptor may be needed.)

   Note: A RS232 to USB adaptor is supplied for laptops with no serial port. If it is used, drivers for this adaptor must be installed. The drivers are included on a separate disk.

2. Connect the antenna to the BNC connector on the radio.

Test Startup

The STI TaitP25 driver testing process proceeds through the 4 phases of Test Startup, Initialization, Test Cycle and Shut Down as described below.

Before starting the test the STI TaitP25.EXE driver searches the serial ports to find the Tait 9100 radio. Commands with known responses are used for the start up phase. Upon successful communication with the radio, the Comm Port parameters are saved for future use.

If the receiver is not found an error message is displayed. In this case the radio should be power cycled to make sure it was not left in a non-responsive state. Also check the power and serial cable connections to the radio.

Initialization

After the radio is found on a comm port, initialization commands are sent to the radio to set reception parameters and put the radio in test mode. These commands prepare the radio for the repeated test cycle. Parameters such as initial frequency, IF bandwidth, the expected test signal parameters are sent to the radio.

The Test Cycle

During the test cycle the following commands are sent to the radio.

1. Set frequency
2. Start measurement reporting. The measurement report response contains values for RSSI, BER and QOS.
3. *Select* the measurement report to use.
4. Parse the *selected* measurement report into its required RSSI, BER and/or QOS values.
   NOTE: The STI TaitP25.EXE driver will select the nth measurement message to parse where n can be the first, second, third etc message from the radio on the current frequency. See the <name>.REC file section below for details.
5. Shut down measurement reporting.
6. Repeat 1 through 5 above for each frequency in the [Freq List] section of the <name>.REC file.
7. Format measured values and send them to the main program for logging and display.

This process is repeated continuously until the Stop Receiver control is selected by the user.

To make minimize test cycle time the commands in the test cycle are the minimum necessary to accomplish a set of measurements on a channel.

Shut Down

When the user selects the Stop Receiver control, a reset command is sent to the radio which reboots the radio. Most errors will also cause the reset command to be sent during shut down.

NOTE: If an unexpected error occurs the radio reset command may not be sent. In this case the user must manually power the radio down and back up before it will communicate with the driver.

<name>.REC File

The <*name*>*.REC* file contains the project specific settings that control the testing process. When selected during the creation of a new project, the <*name*>*.REC* file is copied from the *C:\STI REC Files* directory into the new project directory. A number, usually "0" is added to the file name as a prefix. The copy of the <*name*>*.REC* file, located in the *C:\STI Projects\<new project>* directory is used by the new project.

To edit the setup file for the current project, select *Proj Setup* then *Edit .REC*. When the Notepad window opens, select the large control in middle labeled *Click Here to Edit the Current Receive Setup File: ….* When editing is complete select *File* then *Save* to save your changes.

Caution: Once data has been acquired in a project, do not change the number of entries in the [Freq List] section. Changes in the number of frequencies will cause the current project and its database to be reset with the new field structure. Existing measurement data will be lost.

See Chapter 2, *Setting Up Your System,* for additional details on the <*Name*>*.REC* file.

The <*name*>*.REC* file for the TaitP25.EXE driver contains three sections:

[Compatibility]
[Global Settings]
[Freq List]

[Compatibility]

The [Compatibility] section is used by Field Test 6 and must contain the name of the receiver driver with which this .REC file is compatible. For this driver there are three lines indicating compatibility which should not be changed.

Driver = TaitP25.EXE
File Version = 5
File Version 6 = True

[Global Settings]

The [Global Settings] section sets parameters that are used internally by the driver. Global Setting parameters include:

Default BER Value=8

When errors are too high to be decoded the radio returns a negative value. The default BER Value parameter replaces

these readings. A value between 6 and 10 is appropriate and indicates a non-intelligible signal.

The default value for Default BER is 8%.

Default QOS Value=88

The QOS value is an indicator of the number of errors corrected by the vocoder in the radio. When errors are too high to be decoded the radio returns a negative value. The default QOS value parameter replaces these readings in the measurement database. A value between 85 and 90 is appropriate and indicates a non-correctable signal.

The default value for Default QOS is 88%.

Message Count=1

The Tait 9100 internally computes a weighted average of BER over a period of about 1 second. This means that values returned may be influenced by previous readings. The Message Count parameter is used to reduce this affect. This value causes values from the Nth UY message returned from the radio to be logged in the measurement database.

For example when Message Count=2 values from the second UY message will be logged.

The default value for Message Count is 1.

Message Rate=1000

The Tait 9100 internally computes a weighted average BER over a period of about 1 second. The Message Rate parameter determines the time between reports sent to the over the serial interface to the TaitP25.EXE driver. A value of 1000 ms or greater will substantially reduce the effect of any previous value. The minimum value for Message Rate is 500 ms.

The default value for Message Rate is 1000 ms.

P25 Mod=1

The P25 Mod parameter sets the expected modulation of the transmitted signal that is to be demodulated by the radio. Some modulation choices may not be available by some of the Tait 9100 radios. The available choices can be set by setting the following values.

P25 Mod=1 Sets the demodulation to C4FM.

P25 Mod=2 Sets the demodulation to CQPSK.

P25 Mod=3 Sets the demodulation to Wide Pulse.

P25 Mod=4 Sets the demodulation to TSM NB.

The default value for P25 Mod is 1 which is sets to C4FM.

[Freq List]

Entries in the [Freq List] section have a direct correlation to measurement fields in the measurement database located at *C:\STI Projects\<Project Name>\<Project Name>.MDB*. The [Freq List] section sets the frequencies to be tuned and which of the measurements types are to be logged. The format of lines in the [Freq List] section is as follows. *Note:* The Comma character is a delimiter and must be used only for separating fields in the line.

<Line Number>=<Name of Channel>,<Measurement>,<Signal Display Bottom>,<Signal Display Top>

Where:

<Measurement>

can be any of the following values

<Frequency in MHz> or 'BER' or 'QOS'.

A frequency in the Measurement field sets the radio frequency for the following measurements and results in logging an RSSI measurement. It must appear in the [Freq List] prior to any BER or QOS measurements for that frequency.

<Name of Channel>

The Name of Channel field is text that indicates the name of the parameter being measured and logged. This name will be used for database field and file names so it should be restricted to Windows file name characters.

<Frequency>

A frequency value in the <Measurement> field sets the frequency of the radio and results in logging an RSSI value in dBm. At least one line containing a frequency parameter and a resulting RSSI value is required.

"BER"

BER is a parameter for the <Measurement> field which causes the BER value to be logged for the current frequency. The line containing the BER parameter is optional if logging of BER is not required.

"QOS"

QOS is a parameter for the <Measurement> field which causes the QOS value to be logged for the current frequency. The line containing the QOS parameter is optional if logging of QOS is not required.

TaitP25_Exmpl.REC

TaitP25_Exmpl.REC is an example receiver setup file for the Tait 9100 Radio.

Two frequencies are being tested. BER and QOS will be logged for each frequency.

In addition the signal display bar chart will display values of BER from 0% at the bottom and 25% at the top of the chart and QOS values will be displayed from 75% at the bottom to 100% at the top. The RSSI values will be displayed according to the Signal Display Bottom and Signal Display Top values set in Field Test 6.

```
[Compatibility]
File Version=5
File Version 6=True
Driver=Tait25.exe

[Global Settings]
P25 Mod=1
Default BER=8
Default QOS=88
Message Count=1
Message Rate=1000

[Freq List]
;Format: <linenum>=<field name>,<frequency Mhz/’BER’/’QOS’>
[<BarMin>,<BarMax>]
1=Ch1-RSSI,853.000
2=Ch1-BER,BER,0,25
3=Ch1-QOS,QOS,75,100
4=Ch2-RSSI,865.0125
5=Ch2-BER,BER,0,25
6=Ch2-QOS,QOS,75,100
```

TaitP25.INI File

The TaitP25.INI file contains 6 sections which list the commands used to control the test functions performed by the radio. The TaitP25.INI file should not be modified by the user without direct support from Survey Technologies, Inc.

[Serial Port Settings]

The [Serial Port Settings] section is initialized and maintained by the TaitP25.EXE driver. The last good serial port settings are saved in this section.

[Global Settings]

The [Global Settings] section contains basic command parameters for the Tait 9100 API protocol including command line termination characters.

Also included is a setting, Freq Format=ASCII which may need to be changed to Freq Format=HEX for compatibility with some early 800 MHz radios.

[CommTest Commands]

The [CommTest Commands] section contains commands to test Comm Ports for connection to the Tait 9100 radio and to initialize communication with the radio.

[Initial Commands]

The [Initial Commands] section contains commands to initialize the radio for the continuous test loop process . Initial transmit and receive frequencies are set, test mode is set, the IF bandwidth is set to medium, APCO P25 mode is set and the P25 modulation is set.

[Loop Commands]

The [Loop Commands] section contains the minimum set of commands necessary to continuously set channel frequency, start measurement responses, read the nth response, and turn off measurement responses. See the Test Cycle and <name>.REC File, Global Settings sections above for more details.

[Quit Commands]

The [Quit Commands] section contains the Tait 9100 reset command. This command is sent every time the TaitP25.EXE driver is shut down either under user control or through an error handled by the driver.

Note: It takes the 9100 radio a few seconds to complete the reset process. The TaitP25.EXE driver should not be restarted until the 9100 has completed the reset process and is ready to communicate.

Note: If the TaitP25.EXE driver exits due to an unhandled error the 9100 radio may need to be manually reset by cycling the power.

V6TaitP25.INI

Below is an example of the V6TaitP25.INI file. It is located in the C:\STI REC Files directory.

```
[Serial Port Settings]
Forced Port Search=
Baud Sequence=4800,9600,19200,38400
Port=COM5
Baud=19200
Settings=n,8,1
Handshake= 0

[Global Settings]
CCDI Term=13,46
CCR Term=13
Freq Format=ASCII

[CommTest Commands]
1=q0            'Get Model
2=q3            'Get Version Info
3=q4            'Get SN
4=f00           'Switch to CCR

[Initial Commands]
1=R<F>          'Set Rec Freq
2=T<F>          'Set Tran Freq
3=UZA1          'Enable Test Mode
4=P1            'Transmit Power Very Low
5=H2            'Set Medium Bandwidth
6=UZB1          'Set APCO Mode
7=UC<MOD>       'Set P25 Modulation (See .REC File)

[Loop Commands]
1=R<F>          'Set Frequency (See .REC File)
2=UY<RATE>      'Set Reporting (See .REC File)
3=READ          'Driver Command to Parse Nth UY Response
4=UY0           'Cancel Reporting

[Quit Commands]
1=^             'Reset Radio
```

Technical Support

Survey Technologies is available for consultation regarding system operation during the one year warranty period. Often questions can be resolved by a phone call or email. When questions about system operation are more complex, we will need access to several setup and diagnostic files in the STI-9400 that give us important information on how the system is operating.

These files can be easily packaged into a zip file for emailing to us. You can use the export support function found from the main menu by selecting **Proj Setup** then **General** then the **Support** tab. In the **Create Support File** box first select the location you want the support file placed. **My Desktop** is recommended for convenience. A list of projects in the computer is on the right. Select the project that you were working with when the problem occurred then select **Apply**.

A zip type file of the form <Project Name>-spt.zip will be placed in the selected location. This file can be emailed to us at:

support@surveytech.com

Include in the cover message, a complete description of the problem that you are having including the details of any error messages that you observe.

In the unlikely event that Field Test 6 will not start you can complete the identical steps using the Project Copy utility program located in the Survey Technologies program group.

We will respond to your request for support as soon as possible.