



Radio Voice Transmitter (RVT)
Operating Manual
For
Quick Deploy Stations

FCC Warning:

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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INTRODUCTION

When the FTS voice over radio module (RVT) is attached to an FTS FWS12S data logger, parameters measured and recorded by the data logger can be broadcast over a radio voice channel. The broadcast can be in response to user generated DTMF tones, or can be an alert message that warns of significant changes in some measured parameter.

The alert messages and DTMF responses can be programmed into the voice unit and will be preserved through power interruptions. They can also be downloaded to a computer and saved for reuse or as backups. It is also possible to send saved configurations back to the voice unit. The unit is normally supplied preprogrammed to the user's specifications, but it is possible for the user to alter the programming, should there be a need.

The voice module is packaged in a waterproof and rugged case that will fit into the standard FTS cabinets with keyhole back panels. It has colour coded connectors and cables for simple installation.

QUICK START

Installation

Hardware Mounting

The voice unit is already mounted inside the Quick Deploy Station as shown in Figure 1.

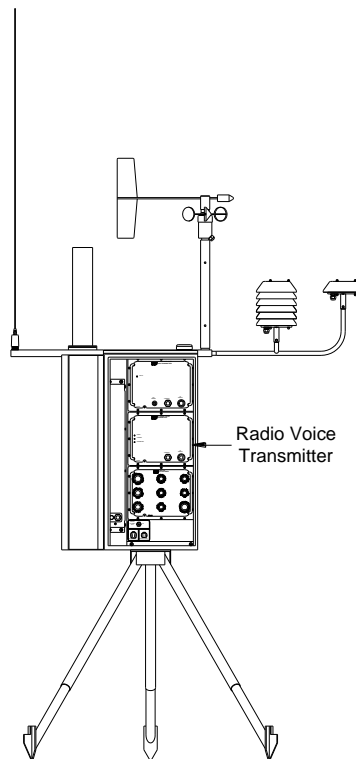


Figure 1: RVT installed in Quick Deploy Weather Station

Antenna

An UHF Connector will be pre-mounted on the sensor mounting bar. Remove the looped antenna from inside the enclosure and mount on top of the UHF connector. Connect the RVT cable to the bottom of the UHF connector and connect the BNC end to the mating connector on the RVT faceplate.

Power

Ensure the power cable from the battery pack is connected to “Battery Power” on the interior electronics enclosure. Also, after setting up the solar panel on rear sensor mounting bar, connect the solar power cable to “Charging Power” on the interior electronics enclosure.

When you turn on the power, the Radio Voice Transmitter will be automatically powered up. The switch on the interior electronics enclosure has three positions:

Position 1: ON – Flip the switch to the right for regular use.

Position 2: OFF – Center the switch when you are no longer using the system or not charging the battery.

Position 3: BATTERY CHARGING ONLY – Flip the switch to the left when you are not using the unit but would like to charge the batteries inside the unit. The solar panel must be connected and there should be sunlight available.

Data Logger

The data logger has two communication ports. The first communications port is the Telemetry port and the second port is the Display port. The RVT can connect to either of these ports. If the RVT is the only communications option on the system then it should connect to the Telemetry port on the data logger. The RVT will have a military connector with a green band attached. Connect the military connector to the Telemetry port of the data logger. This cable will supply power and communications to the data logger.

If there is another communication option such as GOES satellite on the system, then the RVT will connect to the Display port of the data logger. The RVT will have a military connector with an orange band attached. Connect the military connector to the Display port of the data logger.

Your RVT unit should now be operational.

Operation

Your RVT unit will normally come pre-configured and ready to operate. With the RVT there will be a copy of a configuration report that will tell you the frequency of the radio and the tones that have been set up. If your unit was ordered without an installed configuration you will need to configure the unit before operation. (See Advanced Operation & Programming).

Once the unit is powered up, there are three lights on the front panel that indicate the current status of the RVT:

- Power: This flashes slowly if power is present
- Listen: This is lit when listening for DTMF tones. It goes out when the radio is transmitting or the radio power strobe system has turned off the radio.
- Transmit: This indicates that the radio is transmitting.

Testing Operation

To test the unit you will need a handheld radio configured for the same frequency as the radio mounted inside the RVT. Enter a DTMF tone sequence on the handheld radio that matches one of the programmed tone sequences. The unit should broadcast over the radio link the desired data logger parameters. The frequency of the radio inside the voice module and the programmed DTMF tone sequences are listed on the configuration report attached to the voice module.

Accessing the Radio

The radio is mounted inside the voice module. If you need to access the radio for maintenance or to change the frequency you will need to open the unit. Carefully remove the front panel of the voice unit by unscrewing the socket cap screws and lifting the front plate up. This will expose the handheld radio allowing you to remove the radio or change the frequency.

Warning: Do not change the volume level on the radio, as this may affect the correct detection of DTMF tones.

ADVANCED OPERATION & PROGRAMMING

NOTE:

The RVT program makes reference to variables in the FWS12S data logger program. In order to program the RVT you will need access to the data logger program and should have a working knowledge of its operation.

Setup and Programming

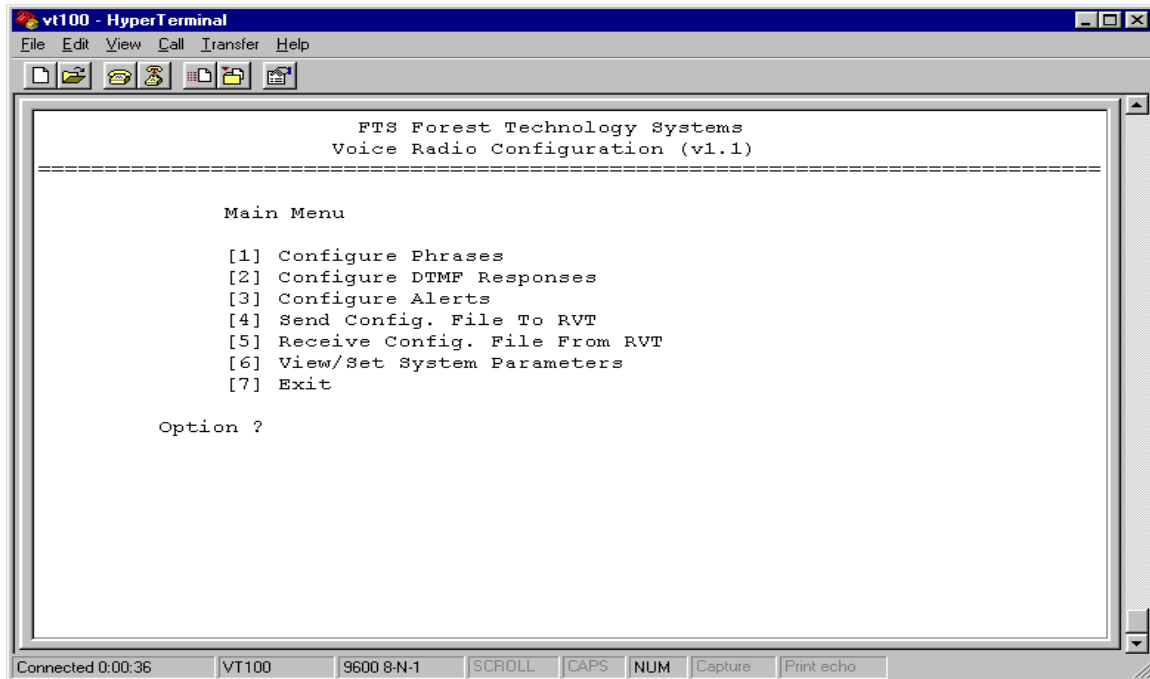
Requirements

In order to program the voice unit you will need the following items:

- A computer running a terminal program that is VT100 compatible
- An RS232 (serial) port on the computer
- The FTS voice module programming cable or FTS display port cable with equivalent adapter cables.

To start communicating with the voice module, apply power and plug the programming cable into the military style connector end on the voice module (orange or green). There is only one military connector end on the voice module, which is used for both programming the RVT and for establishing communications between the data logger and the RVT. Only one of these operations can be performed at one time, therefore you must modify your connection accordingly. The power light on the front panel of the voice module should start flashing if it is getting power. 12VDC power must be applied to the rectangular connector or ring tongue connector on the RVT.

Start the terminal program. Make sure it is set to VT100 emulation, and 9600 baud, 8 data bits, one stop bit, no parity.



Press the <enter> key a couple of times until you get a message presented on the screen. You are now communicating with the voice unit and can proceed with the setup. If you do not get a menu after three or four tries, something is wrong with the connections or the settings for the terminal program. To select one of the main menu options, type the corresponding number followed by <enter>.

Overview of programming

The programming must be done in such a way that anything you need at a higher level has been defined before you need to use it. This means that you must have a phrase (a sequence of words spoken as a group) defined before you can use it in a DTMF response or an alert. The system cannot check for use of invalid logger variable names. A phrase is usually associated with a single sensor, but could refer to several sensors, or none.

The system will not allow you to use words that are not supported by the speech chips, and similarly, you cannot delete a phrase that is still in use by a DTMF or alert message.

The programming environment is a full screen menu system that uses the cursor keys to move around. Because it is emulating a VT100 terminal, some key combinations that are common in Windows (such as shift-tab to move backwards through fields) are not available.

If you have phrases or alerts that are common over several stations then it is possible to save these in a disk file on your computer and load them into several voice modules in order to save setup time. Alternately, you can save the complete setup for each site and download it to the voice module if you need to replace one unit with another. If several stations are set up on the same radio channel the DTMF tone sequences must be unique to the station to avoid having several stations try to reply simultaneously. If they are on different channels, then the DTMF tone sequences could be identical for all stations.

The process for creating a program in the RVT would be as follows:

1. Create Phrases
2. Create DTMF responses
3. Create Alerts

[1] Configure Phrases

The phrase is the fundamental item that everything else is built upon. The phrase defines a group of words and data that are always spoken together. For example, in order to speak an air temperature reading you would create a phrase. When creating the phrase you would include:

1. A name for the phrase (used for reference in DTMF responses and Alerts).
2. Words that are to be spoken when the phrase is referenced. The words that are available for use in the voice unit are listed in the vocabulary list on page 13 of this manual. Included in the words would be a reference to the data logger variable. In the phrase definition below, the data logger contains the variable ATC, which is air temperature. A variable name must have parentheses around it.
3. The speech preference. Currently only English language is available.

A phrase definition could look like:

Name: *AT*
Words: *air temperature (ATC) Celsius*
Speech: *0*

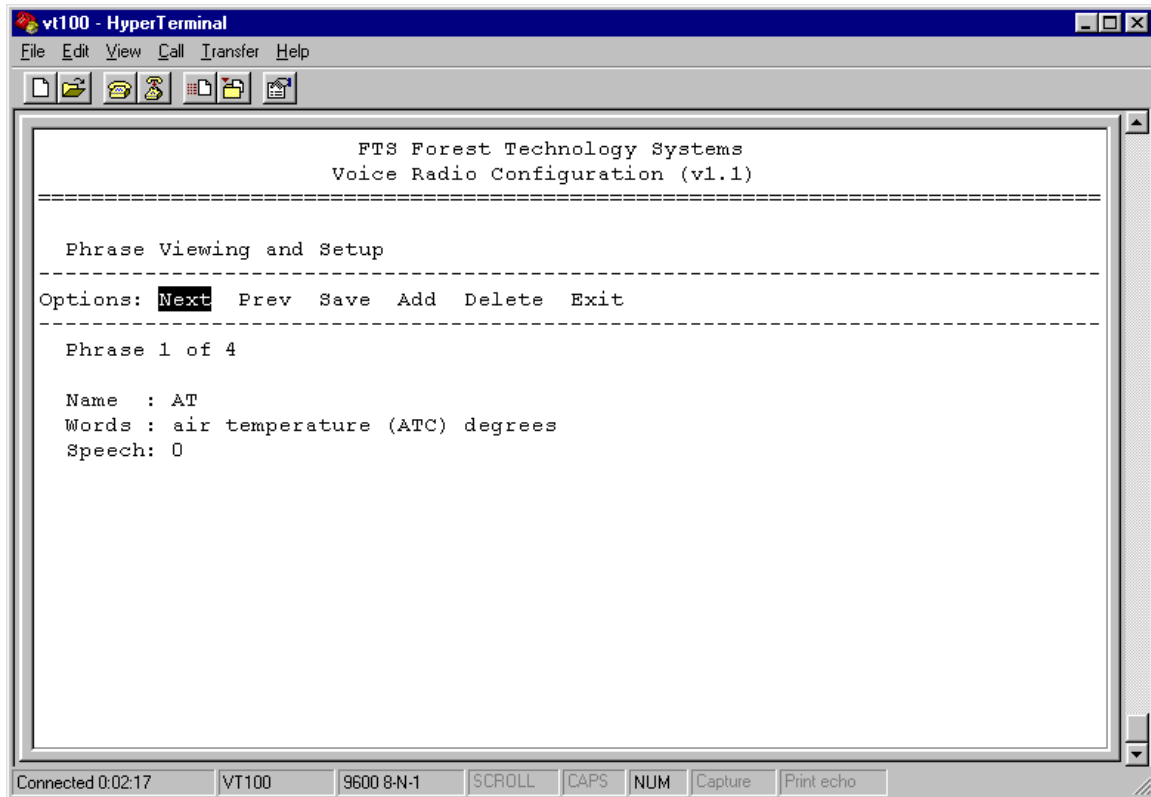
Whenever the phrase name “AT” is encountered in a DTMF or alert, the voice unit will broadcast the defined words. When the variable (ATC) is encountered in the broadcast string, the voice unit will ask the data logger for the current value of ATC, convert this reading to a list of numbers and insert them into the message. If the current air temperature (ATC) is 20.5 degrees Celsius, the spoken response would be “air temperature two zero point five Celsius”. The variable (ATC in the above example) must be a defined variable in the data logger program or be a one of the built in sensors for this to work properly. For further information on data logger programming and definitions of FWS12S built in sensors, please reference the FWS12S Programming manual. Since the logger is not connected during programming the voice unit cannot check for correctness of the variable. Phrase words are not sensitive to upper and lower case letters (“Celsius” or “celsius” in the above example would be treated as being the same), but the VARIABLE IS CASE SENSITIVE and must be spelled identically to be found in the data logger internal lists.

Once a phrase is defined it can be used in any number of DTMF or alert responses.

The same data logger variable can be used in a number of different phrases.

Note that a phrase does not have to make reference to a data logger variable. A phrase can simply broadcast a sequence of words “Wind speed increase”, for example.

When you select [1] Configure Phrases from the main menu you will be prompted with the Phrase Viewing and Setup screen. From this screen you can add, delete, save and view the RVT phrases.



The fields in the “Options:” line are:

- Next - Display the next phrase after the one currently being displayed
- Prev - Display the phrase before the one currently being displayed
- Save - Save the current phrase
- Add - Create a new blank phrase.
- Delete - Delete the current phrase
- Exit - Return to the main menu

The editable fields are:

- **Name**
This is the Name that you will use to refer to this phrase when it is to be used. (AT in the previous example).
- **Words**
This is a list of words and variables that will be spoken whenever the phrase Name is used. The words are not case sensitive, the variables are. Variables must be parenthesized. Note that there are no unit conversions done. The variable is returned in whatever units the logger program is using and is not checked against the words following the variable. A space is required between each word and between a word and the parentheses on either side of a variable. There must not be a space between the parenthesis and the variable.
- **Speech**
Set to 0 for English. This is defined to allow future expansion to other languages.

[2] Configure DTMF Responses

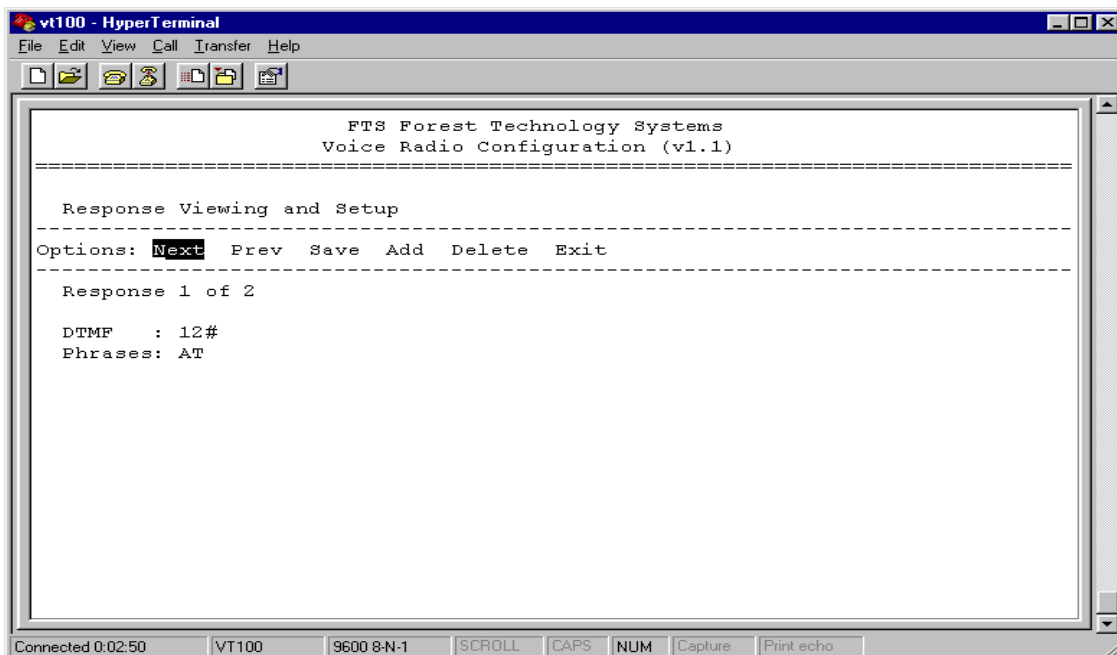
The DTMF response menu ties together a DTMF tone sequence and a list of phrases to be spoken by the RVT when a particular DTMF tone is broadcast to the RVT.

The DTMF tone sequence can be up to 8 tones long. A tone sequence is assumed to have finished if one second has elapsed since the last tone. If a tone sequence is received, but it is not found in the voice module's definitions, then it is ignored. This allows multiple voice units to use the same radio channel.

Most handheld radios cannot determine if the radio channel is in use, so there is a chance that the response transmission may interfere with another user. FTS can supply digital radios that are capable of detecting if a channel is in use and therefore suspending transmission until the channel is free. For further information contact FTS support at 1-800-548-4264.

A minimal response is one phrase. The number of phrases is not limited except by available memory in the voice unit. The amount of memory available is sufficient for most practical applications. No two stations should have the same DTMF code defined if they are used on the same radio channel. If this does happen, they will try and transmit simultaneously when the common code is sent.

When you select [2] Configure DTMF Responses from the main menu you will be prompted with the Response Viewing and Setup screen. From this screen you can add, delete, save and view the RVT DTMF Responses.



The setup parameters are:

DTMF: This is the DTMF tone sequence that will trigger the message. Up to 8 tones in a sequence can be defined. The unit recognizes '0'-'9' and '#'.

Phrases: This is a list of phrases to be spoken when the DTMF tone sequence is recognized. The phrases must have been defined before they can be used here. Multiple phrases can be broadcast for the same DTMF tone. Multiple phrases must be separated by a space.

In the above example the phrase AT "air temperature two zero point five Celsius" will be broadcast when the DTMF tone sequence 12# is recognized. If you previously defined other phrases such as RH and WindSpeed, you could include them in the DTMF Phrases list as follows:

DTMF :12#

Phrases : AT RH WindSpeed

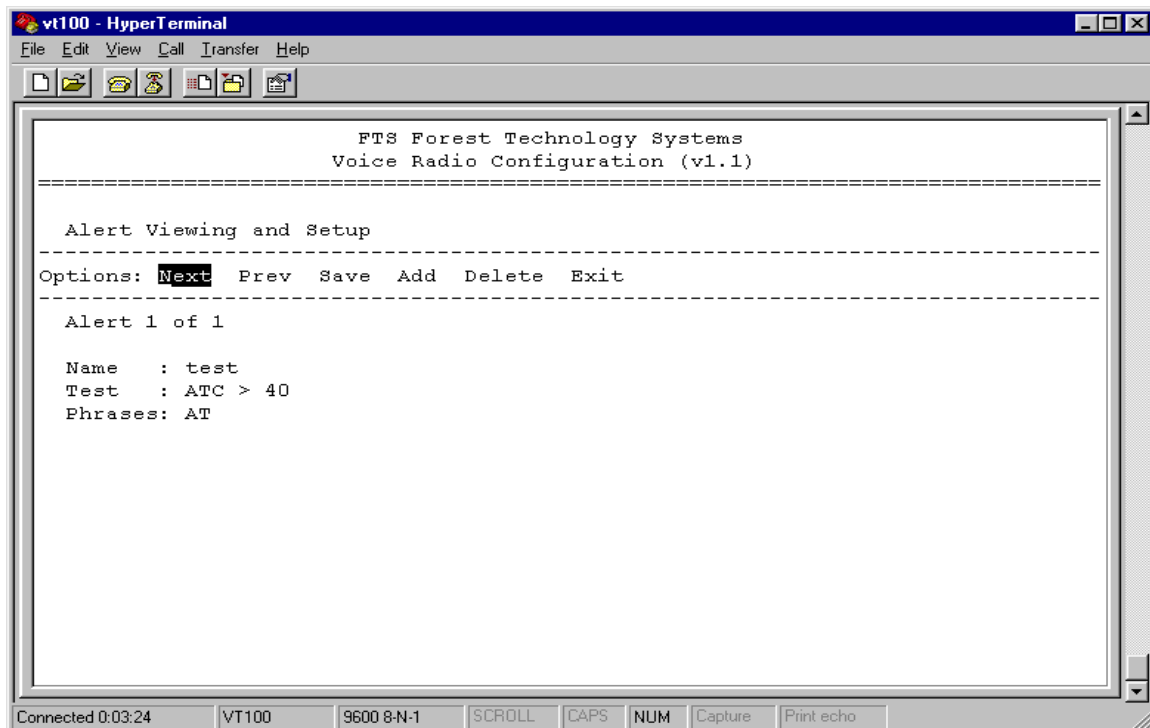
[3] Configure Alerts

An alert definition ties together data from the logger, a test of that data, and the phrases that are to be spoken if the test is passed.

The alert will be spoken as soon as possible after detection. This means that if the voice module is already speaking in response to a DTMF call, it will wait until the radio is finished transmitting, then issue the alert message.

Because some radios do not have a carrier detect output to indicate that the channel is in use, collisions may occur under some circumstances. If the installed radio does provide carrier detect, then collisions will be reduced. An alert will be issued every time the data is sampled and it is found to have met the test. The frequency of alerts is set under [6] View/Set System Parameters.

When you select [3] Configure Alerts from the main menu you will be prompted with the Alert Viewing and Setup screen. From this screen you can add, delete, save and view the RVT Alerts.



Setup parameters are:

- Name: This is a descriptive name for your reference.
- Test : This defines the variables and the test used. Valid tests are <, = >, <=, >=. Only simple tests are allowed (e.g. A<B). Words are not allowed, but numbers and variable names are (ATC > 25.0). All variable names are case sensitive so they must be spelled exactly as they are defined in the data logger, including correct use of upper and lower case. Note that parentheses are not required around the variable name.
- Phrases: This is a list of phrases to be spoken when the test condition is met. The phrases must have been defined before they can be used here.

Note: the alert sample time (see [6] View/Set System Parameters) should be set up to sample the readings from the logger at an interval that meets your performance requirements. The fastest allowed rate is to sample every ten seconds.

[4] Receive Config. File from RVT (Saving a setup to disk)

This allows the current configuration (RVT program) of the voice module to be sent to the terminal program. If capture to a file is enabled in the terminal program just before sending, the configuration will be saved to disk. Remember to close the capture and save the file.

When capturing the current configuration, if the procedure was not followed exactly a number of lines may be captured that are undesired and must be manually deleted before the capture can be saved as a valid configuration file. The unwanted lines will be inserted at the beginning and the end of the capture. At the end of this document there is a Sample RVT configuration file (Appendix). This sample shows a completed configuration file after the unwanted lines have been removed. The unwanted lines will always appear before [Configuration] and after [Alerts]. If no Alerts are defined they lines will appear after [Responses]. Use a standard text editor such as Notepad to edit.

[5] Send Config. File to RVT (Restoring a setup from disk)

A saved file can be sent back to the voice module to reconfigure it in a single step. This is useful if you have a need to swap out units and want to make the replacement work identically to the original one. These files also give another way of editing the configuration information. An example file is given in the Appendix.

Note: Sending a file to the RVT will erase all the existing sections except for the [Configuration] section of the configuration file (see Sample RVT configuration file in the Appendix).

Loading a new configuration file is done through the terminal emulation program. The terminal emulation program should have a file download command for text files. Select the desired text file and download to the RVT. When the file is sent, press the <Ctrl> and 'z' keys simultaneously to let the voice module know you are done sending. There will be a pause of several seconds while the information is processed, then you will be returned to the main menu.

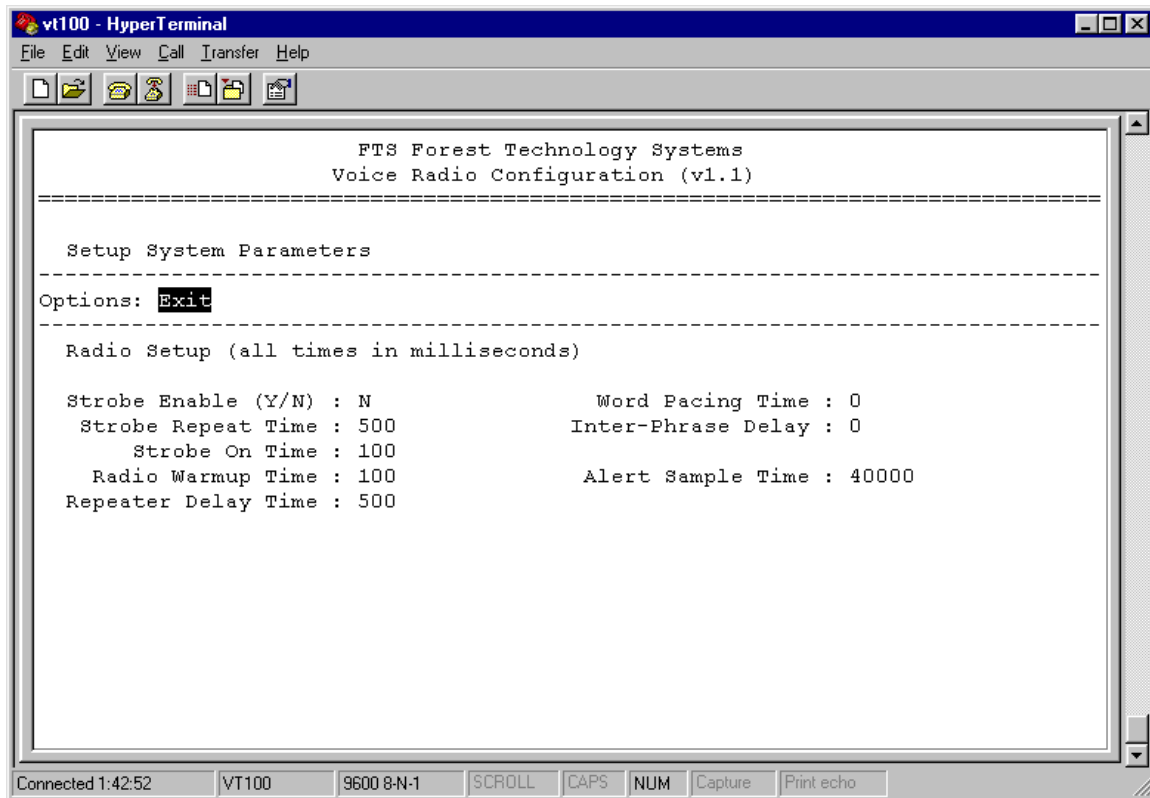
If the voice module has already been configured, then it is only necessary to send the [Phrases:English], [Responses] and [Alerts] sections. The [Configuration] section will be preserved unless the file has this section defined.

It is possible to use the configuration file to set up several units, and then customize each unit using the full screen editor for the DTMF codes or other unique parameters. This reduces the chance of error when setting up a number of units with similar requirements.

[6] View/Set System Parameters

This controls the physical operation of the voice module, rather than individual phrases or responses. This sets up such items as the radio power strobing, the delays required to control repeater turnaround delays, the spacing between spoken words, spacing between spoken phrases and other similar items.

These parameters can be adjusted at any time.



Most of these will have been set up at the factory and should be left alone.

The parameters are:

- **Strobe Enable**
This enables or disables the radio power strobe. The radio power strobe is used to reduce power consumption. Not all radios can use this function. DTMF recognition is affected by radio power strobing, but alert generation is not. This will be set at the time of manufacture and should not be altered unless a new radio is installed.
- **Strobe Repeat Time**
This is the number of milliseconds from one radio power on to the next. If this is made too large, the unit will not be listening for DTMF tones most of the time, and they may be missed. If there are no DTMF responses needed, set this to a larger value. Alerts will always be issued and are not affected by this setting. The minimum allowed value is 200 ms. The setting for this varies with the radio, and will normally be set at the time of manufacture.

- **Strobe On Time**
This controls how long the radio receiver is powered up to check for DTMF tones. The minimum value is 100 ms. The setting for this varies with the radio, and will normally be set at the time of manufacture.
- **Radio Warmup Time**
This is how long it takes for the radio to become ready after power up. This will be set by FTS to the correct value for the radio installed in your unit.
- **Repeater Delay Time**
This is the length of time needed for a repeater to recognize the transmission and prepare to repeat. It may be necessary to adjust this value to meet the requirements of your radio repeaters.
- **Word Pacing Time**
Puts silence between each word in a phrase. By increasing this time, the words are spoken further apart.
- **Inter-Phrase Delay**
This inserts silence between phrases to make them easier to separate when listening.
- **Alert Sample Time**
This sets how frequently the logger is checked for alert conditions. The minimum time that can be set is 10000 ms (10 seconds). The maximum time can be every 24 hours. Use as slow a rate as possible, for two reasons – frequent calls to the logger will slow its response to other activities, and the other is that an alert will be issued every time the alert condition is met. This means if you set the sample rate to 10 seconds, it could possibly issue an alert every 10 seconds.

[7] Exit

This immediately terminates the terminal mode and the voice unit returns to scanning for DTMF tones and alerts.

Vocabulary

The following list gives all the numbers, letters and words available for use:

0	d	m	s
1	decrease	main	sample
2	degrees	maximum	second
3	depth	mbar	soil
4	direction	mercury	solar
5	dissolved	meter	specific
6	e	meters	speed
7	f	microsiemens	square
8	fahrenheit	miles	squared
9	fuel	milligrams	station
a	g	millimeters	supply
above	gust	minimum	t
air	h	- (minus)	telemetry
alarm	high	moisture	temperature
alert	hour	n	turbidity
and	humidity	number	u
average	i	o	under
b	inches	of	v
backup	increase	over	vector
barometric	j	oxygen	voltage
battery	k	over	volts
below	kilometers	p	w
bottle	kilopascals	peak	water
c	l	per	watts
Celsius	level	% (per cent)	wind
Centimeters	limit	. (point)	x
change	liter	power	y
conductance	low	pressure	zed (English/Canadian 'z')
conductivity		q	zee (American 'z')
		r	
		radiation	
		rain	
		range	

Specifications

Environmental:

- Temperature range –30 to +60°C
- Weatherproof/waterproof
- Corrosion resistant in outdoor conditions

Note: Specifications are for the FTS manufactured RVT. Radio specifications may vary.

Operating Voltage Range:

- 12 - 20 V DC

Communications protocols:

RS232 FTS telemetry format to logger

RS232 VT100 terminal emulation at 9600 baud, 8 data bits, 1 stop bit, no parity to laptop or PC

(The RVT automatically detects the protocol)

Dimensions:

10.0" wide by 8.0" high by 5.6" deep

Weight:

With typical radio installed, approximately 7.5 lb. (3.4 kg)

Maintenance

The voice module should be serviced as per the terms of a standard maintenance agreement.

Appendix

Sample RVT configuration file

```
[Configuration]
RadioStrobeEnable=off
RadioStrobeRepeatTime=500
RadioStrobeOnTime=100
RadioStrobeWarmUpTime=100
RadioRepeaterDelay=500
WordPacing=0
InterPhraseDelay=0
AlertSampleTime=60000

[Phrases:English]
AirTemp=air temperature (ATF) degrees
AirAlert=alert air temperature (ATF) degrees
WS=speed (WSM) miles per hour
WD=direction (Dir) degrees
FM=fuel moisture (Fsm) %
FT=fuel temperature (FTF) degrees
RainTotal=rain (RNIN) inches
Srad=solar_radiation (SR) watts_per_square_meter
Telem=(Telem) volts

[Responses]
2317=Raintotal WS WD AirTemp FT Rh Telem FM Srad
2318=WS WD

[Alerts]
all=(ATF > 0) AirAlert
```

