Advanced Telemetry Systems

R4520C

(Models: R4520CD or R4520CLD)

**Receiver/Datalogger, 12 table version
for use with ATS Coded Transmitters**

User Manual

Introduction:

The R4520C is a receiver - data logger combination.

The R4520C can store 98304 Stationary data blocks, or 49152 Aerial data blocks. For Aerial Data, an extra data block is needed for GPS information. The data is stored to memory using a looping format. If the data set is maxed out, the newest data will overwrite the oldest data block.

The Receiver uses DSP (Digital Signal Processing) technology to achieve a better sensitivity, and to help filter out noise. The DSP is using the audio signal from the R4520C and digitally sampling the signal. When the signal has been digitized, mathematical calculations are then used to identify signals.

The C suffix indicates the software in this receiver is programmed to detect pulse coded tags.

A pulse coded tag is a transmitter using multiple pulses repeated at a specific pulse rate. The multiple pulses are used to provide specific ID's allowing multiple transmitters to be present on the same frequency. A pulse burst consists of a single wide pulse followed by two narrow pulses.

On each tuned in frequency, the R4520C has the ability to modify its audio output. In addition to the audio playing every signal the receiver is picking up, it can be used to filter out pulse coded tags. The audio can be programmed to broadcast only one pulse coded tag for individual tracking with or without background or it can be programmed to play only the background. When it is selected to play only the background it silences all the currently deciphered pulse coded signals. This is helpful when there are multiple pulse coded tags being picked up on the same frequency at the same time.

Class B Device Statement: (Section 15.105 (b) of the FCC Rules)

> %Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

  o Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
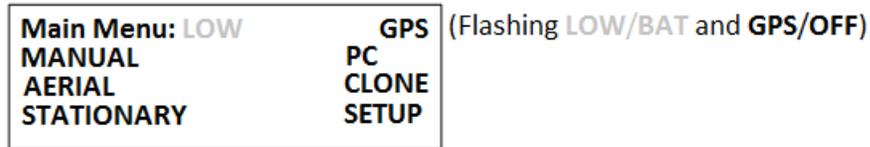 o Consult the dealer or an experienced radio/TV technician for help.+

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Getting Started:

When you first turn on the power, the receiver will display Advanced Telemetry Systems, the receiver model and the two version numbers of the receiver software. The display will then go to the main menu:

```
Main Menu: LOW        GPS
MANUAL               PC
AERIAL               CLONE
STATIONARY           SETUP
```
(Flashing LOW/BAT and **GPS/OFF**)

Menu Items:

Low Battery indicator: This flashes LOW / BAT when the supply voltage drops below 11.5 volts. This indicator will be absent if the supply voltage is greater than the 11.5V

GPS indicator: The status of the GPS is displayed in the upper right corner of the screen. The messages indicate the following:

GPS (non flashing) . The GPS is on, and there is a valid GPS fix.
GPS / **OFF** . The GPS is turned OFF.
NO / **FIX** . The GPS is attempting to acquire a valid GPS fix.
GPS / **ERR** . The GPS has not been able to get a valid GPS fix within 5 minutes.
NO / **GPS** . The GPS has not been able to get a valid GPS fix after 15 minutes, or there is no signal out of the GPS, or the GPS is turned OFF.

If a valid GPS fix is found during NO / FIX, GPS / ERR, or NO / GPS the indicator will change to a non flashing GPS indicator.

MANUAL: This mode can be used to check out tags or to check on an individual frequency. Frequency scanning is not available in this mode. To save a target in the manual mode, **Record** would need to be activated.

AERIAL: Designed for tag location using aircraft. While scanning a table, no information will be recorded unless **Hold** is activated. The **Hold** button is used to toggle between scanning the frequency table, and to hold the scanning of the frequency table. When **Hold** is activated, the scanning of the frequency table stops and is held for the frequency shown in the screen. In **Hold**, all available information will be continually stored. Tag ID, frequency, signal strength and time are stored to memory when the operator exits **Hold** or activates **Record.** In **Hold**, **Record** needs to be activated when no ID is detected but a Tag can be heard. Aircraft location is also recorded if GPS is activated. An optional GPS antenna is required to use the GPS feature.

STATIONARY: This mode is used to monitor tags passing a site or presence / absence of tags. The time, frequency, signal strength, tag ID, and the number of valid tag ID detections per store period are stored. Scanning is enabled, GPS is disabled.

PC: Used to off load data, send/receive frequency tables and to send / receive receiver programming parameters. The supplied ATSWinRec software and serial cable must be used with this option.

CLONE: Using the optional blue cable, frequency tables and default settings may be cloned from one receiver to another receiver.

SETUP: Used to access the SETUP Menu.

Receiver Controls:

Receiver controls are shown in the figure below. Most are self explanatory. The RF Gain control is normally set to full clockwise for maximum sensitivity. RF Gain may be reduced for close in searching or while direction finding. The Audio control should be set for a comfortable level. Its setting does not affect detection sensitivity. Any monaural headset with a 0.25 inch jack may be used. Most users prefer headsets with muffs to reduce external noise from wind or aircraft. Inserting the headset jack disables the internal speaker.

The AUX connector is used to interface antenna switches or other controlled devices.
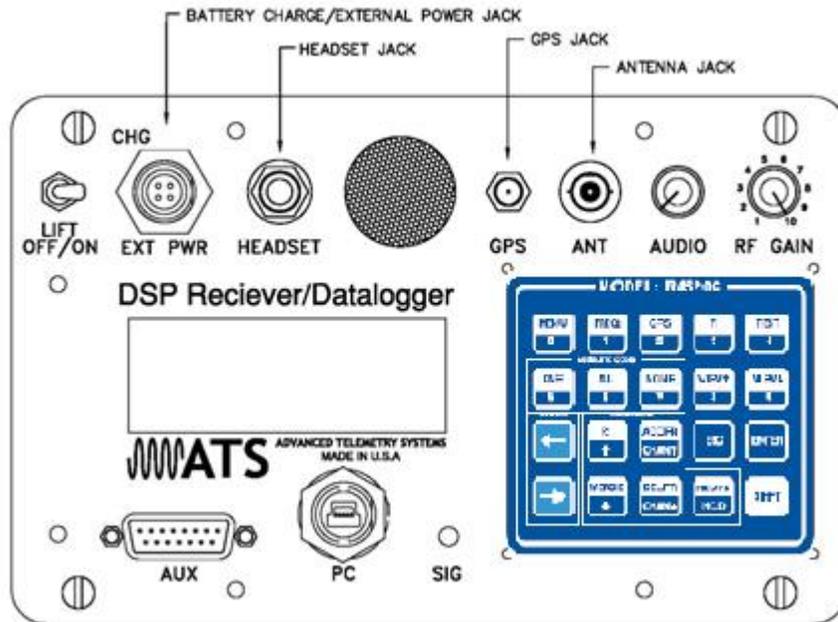
Most input and control of the receiver is done through the keypad. The keypad is shown below:
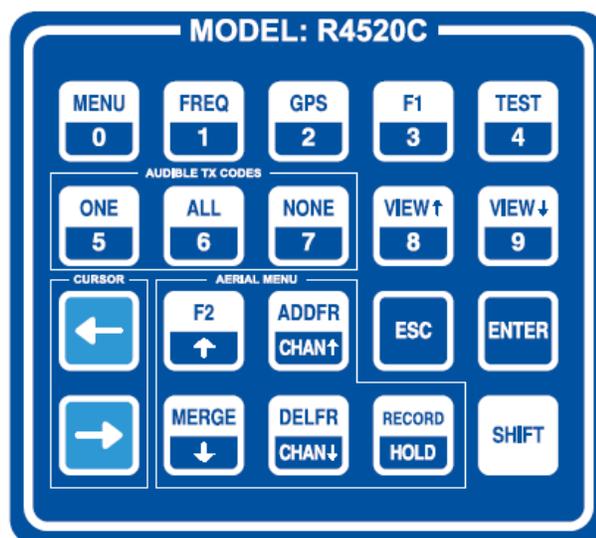
At startup the cursor will be on the MANUAL position.

To maneuver through the Menu items, use the ➡️ or the ⬅️ keys to move the cursor to one of the menu items. Both keys move the cursor. One does it in a forward direction ➡️ and the other ⬅️ is in a reverse direction.

Once the cursor is on the desired menu item, pressing *"ENTER"* will activate that item.

To access the upper functions on the keypad first press the *"SHIFT"* key followed by the desired function key.

Note: The *"SHIFT"* key will not be activated if pressed simultaneously with another key.

Pressing the wrong key or entering invalid data will produce the response:

NOT an Option

or

Out of Range

Functions:

MENU . Enters the Main Menu.

FREQ . Enters the Frequency Menu.

GPS . Enters the GPS Menu.

TEST . Tests internal Battery Voltage Level or External Power Supply Voltage Level.

ONE . Singles out one code to be played by the audio as it is decoded while it silences all other decoded codes. This is done in Manual and Aerial Hold modes.

ALL . Turns off any audio filters that had been enabled so all codes will be played by the audio. This is done in Manual and Aerial Hold modes.

NONE . Silences all codes to be played by the audio as they are decoded. This is done in Manual and Aerial Hold modes.

VIEW⬆. Scrolls the detected tag IDs displayed on the screen up by one line. This is done in Manual and Aerial Hold modes when the list of detected tag IDs is greater than six.

VIEW⬇ . Scrolls the detected tag IDs displayed on the screen down by one line. This is done in Manual and Aerial Hold modes when the list of detected tag IDs is greater than six.

ADDFR . Adds a frequency while Aerial Scanning.

MERGE . Merges frequency tables for Aerial or Stationary Scanning.

DELFR . Deletes a frequency while Aerial Scanning.

RECORD . Used to manually record information.

← → - These keys are used to navigate through the screen menus.

↑ - Used to tune the frequency up in Aerial or Manual mode, also used in toggling some of the menu options.

↓ - Used to tune the frequency down in Aerial or Manual mode, also used in toggling some of the menu options.

CHAN↑ - Scrolls the channel up by one frequency channel in the table.

CHAN↓ - Scrolls the channel down by one frequency channel in the table.

HOLD – Pauses the frequency table scan.

ESC – Exits the current screen or mode.

ENTER – Accepts the current task and moves to the next.

SHIFT – Activates the upper functions so the next key pressed will be interpreted as the function listed on the top half of the pressed key.

F1, F2 . Currently not in use.

1.0 FREQ - Frequency Entry Mode   [FREQ 1]

Stationary Mode and Aerial Mode will not function if there are no frequencies in the table selected to scan. The frequencies should be entered into the frequency table or tables first.

The frequencies entered in the R4520C are 6 digit numbers. For frequencies below 100 MHz, the frequencies are entered as 5 digit numbers. For example, a frequency of 151.183 MHz will be entered as 151183. A frequency of 48.655 MHz will be entered as 48655.

From the Program menu screen, press the *"SHIFT"* key followed by pressing the *"FREQ"* key.

Screen 1

```
Freq Entry Mode:
Table #            1
Chan Qty      18
```
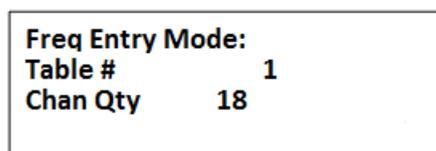
Table # :   Selects the frequency table that you will be storing your radio tagsqfrequencies. There are twelve tables available. Table 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12.

Chan Qty :   The number of frequency entries you will be using for the radio tags in this table. Note the first channel is Channel (00). There are 50 channels available for each frequency table.

After entering the Chan Qty, the screen will change to entering the frequencies.

Screen 2

```
FR 1(00):164000
```
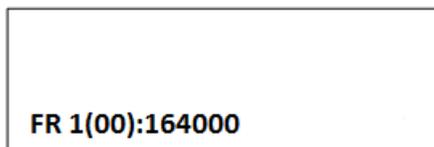
(The default frequency will be the lowest frequency of the receiver)

FR1 indicates frequency table 1.

(00) represents the first frequency in the list. The next frequency will be FR1(01), and so on.

The cursor defaults to the 1 MHz position. Use the [→] and the [←] keys to move the cursor to the digit that needs changing. When a number is entered in one location, the cursor will move to the right by one. Pressing *"ENTER"* will store the frequency, and move to the next frequency position in the table. When all the frequencies are entered, the screen will jump back to the Main Menu.

If you have overlapping frequencies (i.e. 148.000-151.999), move the cursor to the 10 MHz position. Then enter the desired numeric value.

You may use the *%CHAN↑*+ [ADDFR CHAN↑] and *%CHAN↓*+[DELFR CHAN↓] keys at any time to scroll through the channels. These keys can be used to make corrections or change an individual channel frequency.

2.0 Main Menu

Main Menu: LOW	GPS	(Flashing LOW/BAT and GPS/OFF)
MANUAL	PC	
AERIAL	CLONE	
STATIONARY	SETUP	

Move the cursor with the ➡ or the ⬅ keys to navigate through the menu items. Once you have the cursor positioned over your selection press "*Enter*" to activate it.

2.1 SETUP Menu

Move the cursor to the **Setup** item and press *"ENTER"*. The "Setup Menu" is used to set the clock, default settings, backlight and stationary hold delay.

Note: This mode is addressed first because setting the defaults first will make starting Aerial or Stationary modes much easier and also reduce the potential for errors.

This is the view of the "Setup Menu":

Setup Menu:	LOW	(Flashing LOW/BAT)
Clock	Memory	
Defaults	Stat Hold	
Backlight	Ext Data	

2.1.1 Clock

When the cursor is positioned on **Clock,** press *"ENTER"* and make sure the time is correct.

Here is an example of the "Clock Menu":

Year	11
Julian Day	056
Hour	13
Minutes	16

You can press *"ENTER"* to go through each setting, or use the ➡ and the ⬅ keys to jump to a specific spot. The keys will loop through the settings, one in one direction, and the other key in another direction.

To change the numeric value, use the numeric digits on the keypad, or you can use the and keys to increment the numeric value, up or down. For the R4520C to accept a value, press *"ENTER"*. After the Minutes have been entered, the menu will return to the "Setup Menu". If no changes are needed in the "Clock Menu", pressing *"ESC"* will return you to the "Setup Menu"

2.1.2 Defaults

Move the cursor to the **Defaults** item and press *"ENTER"*. There will be a number of different screens to go through depending on your screen selections. Pressing *"ESC"* will bring you back to the previous screen.

```
Defaults Menu:

Aerial Defaults
Stationary Defaults
```
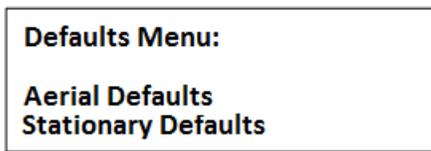
2.1.2.1 Aerial Defaults

Move the cursor to the **Aerial Defaults** item and press *"ENTER"*. This menu option sets the default options for aerial tracking, setting the defaults in this option helps reduce unwanted changes or mistakes in having to set the parameters during the tracking survey.

Screen 1

```
Aerial Defaults
Table #            1
Scan Rate      002.5
Time Out       001.0
```

Table #:   Selects the frequency table used for scanning. Twelve tables are available. Multiple tables are used to optimize Aerial surveys in multiple locations.

Scan Rate: Sets the amount of time the R4520C will stop on each frequency while attempting to detect tags. The number after the decimal point may be a 0 or a 5 to allow half second increments.

Time Out: The amount of time the receiver will stay on a Frequency while attempting to detect a tag. If no tag is detected in the Time Out period, the receiver will advance to the next frequency in its frequency table. This feature allows faster scanning by truncating the scan time if no tag is detected in the Time Out period. The user defines the parameter (e.g. 003 . 300 seconds). Refer to section **14.0** for information on setting the Time Out value.

Screen 2

```
Aerial Defaults
GPS            YES
```

GPS**:**   Sets whether the GPS receiver is on or off when an Aerial Scan starts. An optional GPS antenna must be connected to the R4520C for this option to work.

2.1.2.2 Stationary Defaults

Move the cursor to the **Stationary Defaults** item and press *"ENTER"*. There will be a number of different screens to go through when entering the stationary defaults, depending on your screen selections. Pressing %*ESC*+will bring you back to the previous screen.

Screen 1

```
Stationary Defaults:
Time Out          003    sec
Scan Time         010    sec
Store Rate        0010   min
```
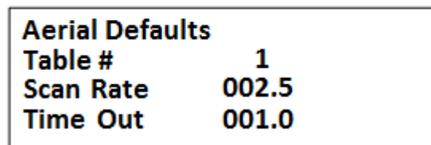
Time Out: The amount of time the receiver will stay on a Frequency while attempting to detect a tag. If no tag is detected in the Time Out period, the receiver will advance to the next frequency in its frequency table. This feature allows faster scanning by truncating the scan time if no tag is detected in the Time Out period. The user defines the parameter (e.g. 003 . 300 seconds). Refer to section **14.0** for information on setting the Time Out value.

Scan Time: The amount of time to hold on a frequency and attempt to detect tags. The Scan time will override the Time Out time, if a pulse has been detected during the Time Out period. The Scan Time is set to whatever you need this set at (e.g. 003 . 300) seconds. Refer to section **15.0** for information on setting the Scan Time value.

Store Rate: This defines how often a tags detection will be stored for each antenna. For example if the Store Rate is set to 10 minutes and a scan time of 15 seconds, its presence will only be recorded once during that 10 minute period. The data stored will include the time stamp of the strongest signal strength measured in one 15 second scan time during the 10 minute scan period. Stored with it will be all detected IDs for that frequency, and the total count of detections for each ID during the 10 minute store period.

Pressing *"ENTER"* while on the Store Rate setting will advance to the next screen.

Screen 2

```
Stationary Defaults:
Tables(1-12):  1,
  ,  ,  ,  ,  ,  ,
  ,  ,
```

Tables :   The frequency tables you want to scan. There are twelve tables available.

Pressing *"ENTER"* while on the Store Rate setting will advance to the next screen.

Screen 3

```
Stationary Defaults:
Antenna #(1-8):     1
EXT Data XFER:   NO
```

Antenna # :   The number of antennas the receiver will sample. This feature requires an external antenna switchbox connected to the AUX port of the R4520C. If using a 2-way switchbox, this would be set to 2.

EXT Data XFER: This setting is set to **YES** when transferring recorded data every hour to another device. This can be used for retrieving your data remotely. Two example devices are RDP (Remote Data Platform) and GOES (Geostationary Operational Environmental Satellites). The GOES satellite operation and requires an account with NESDIS (National Environmental Satellite, Data and Information Service). Contact ATS for more information regarding GOES and RDPs.

Pressing *"ENTER"* while on the EXT Data XFER setting will advance to the next screen.

Screen 4

```
Stationary Defaults:
Reference Freq:    NO
```

To activate the Reference tag feature, use the [F2 ↑] or the [MERGE ↓] key. These two keys are used to toggle between the two choices.

If you entered **YES** for the reference tag, you will be prompted to enter the reference tag frequency, and the store rate of the reference tag.

Screen 5

```
Stationary Defaults:
Reference Freq:
150000
Store Rate:        0060 min
```

Reference Freq:	This is the frequency of a radio tag set up within range of your station used as a check on the system. Since you will not need the same quantity of data you can set up a longer store period to use up less memory. Instead of the strongest signal strength being stored within the storage period, it will be the time of the first valid ID detection.

Note: There is a limit on the number of reference transmitter points that can be collected during each storage period. The maximum number is 16 (I.E. The number of collocated codes on the reference frequency times one plus the number of antennas should not be greater than 16).

An example dataset is shown below:

Date,	Ant,	Fr,	Sig,	Code,	NumDet,	NumMort
7/17/2009 12:47,	0,	150983,	105,	9,	18,	17
7/17/2009 12:47,	0,	150983,	133,	18,	36,	36
7/17/2009 12:47,	0,	150983,	135,	42,	35,	35
7/17/2009 12:47,	0,	150983,	119,	15,	15,	15
7/17/2009 12:47,	0,	150983,	122,	86,	40,	40
7/17/2009 12:47,	0,	150983,	121,	6,	42,	42
7/17/2009 12:47,	0,	150983,	121,	78,	46,	46
7/17/2009 12:47,	0,	150983,	135,	71,	34,	34
7/17/2009 12:47,	0,	150983,	141,	79,	48,	48
7/17/2009 12:47,	0,	150983,	135,	12,	12,	12
7/17/2009 12:47,	1,	150983,	106,	9,	25,	25
7/17/2009 12:47,	1,	150983,	126,	86,	31,	31
7/17/2009 12:47,	1,	150983,	119,	15,	29,	29
7/17/2009 12:47,	1,	150983,	120,	6,	38,	38
7/17/2009 12:47,	1,	150983,	132,	18,	33,	33
7/17/2009 12:47,	1,	150983,	136,	42,	30,	30

For this example there were 2 antennas selected and 10 reference transmitters. The reference transmitter codes were 6, 9, 15, 18, 42, 71, 78, 79, 86. There should have been 30 data points if all the transmitters had been picked up for each antenna during this store period. Instead the data shows detections for all the reference transmitters shown for antenna 0, only 6 shown for antenna 1 and none shown for antenna 2. The maximum number of reference transmitters that can be used when switching between two antennas is five

Store Rate:	This defines how frequently the data from the reference transmitter will be stored. A count of the number of detected tag IDs will be stored for the entire store rate.

Note: The data are not stored until the storage period has expired. For example with storage period set up for once an hour the time the first data are collected might be at 6:00 am. Although the data recorded will reflect 6:00 they will not be committed to memory until 7:00 am. This means when the data are offloaded you may have the data for the actual transmitters appearing before the reference tag. This is true even if the animal data were collected at 6:30 am and the reference data were collected at 6:00 am.

2.1.3 Backlight

Move the cursor to the **Backlight** item and press *"ENTER"*. This will turn the backlight on or off depending on its current state.

2.1.4 Memory

Move the cursor to the **Memory** item and press *"ENTER"*. The "Memory Menu" is used to view the amount of data storage you have left, look at your stored data and reset your data pointer.

This is the view of the "Memory Menu"

```
Memory Menu:
Memory Remaining
View Memory
Delete Memory
```

2.1.4.1 Memory Remaining

Move the cursor to the **Memory Remaining** item and press *"ENTER"*. This screen displays the number of data blocks the R4520C can still write before the memory is full. It list two numbers, one for Aerial data and one for Stationary data. The number of Aerial data blocks will always be half as much as the number of Stationary data blocks. The maximum number of data blocks available for storage is shown below.
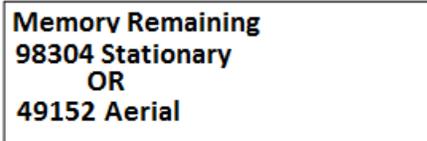
```
Memory Remaining
98304 Stationary
       OR
49152 Aerial
```

2.1.4.2 View Memory

Move the cursor to the **View Memory** item and press *"ENTER"*. This series of screens allows you to view all your previously stored data block by block. The format of the data to be viewed will depend on the selected "Tx Type" and whether it was Aerial or Stationary Logging.

Screen 1

```
View Data at
   Block: 000000
Valid Data Block
Range: 0 to 000010
```

Block: The number of the first data block you want to view. The first data block is zero.
Range: This is the number of data blocks you want to scroll through.

To scroll through the screens displaying the blocks of data, use the [→] or the [←] keys. Two screens are used to display one stationary data block, and three screens are used to show Manual or Aerial data. GPS locations are available with Manual or Aerial data blocks and require an extra screen to view the GPS information.

Screen 2

```
Block Num: 000000
Scan Parameter Block
```

This represents a block of saved parameter data that was used during the following data block saves. It is not viewable here but can be viewed when offloaded from the PC.

To scroll through the screens displaying the blocks of data, use the [→] or the [←] keys

Screen 3

```
Block Num: 000001
04 030 15:57 Ant: 00
150255 SS:091
Tag:120 #M:011
```

After the Block Number, the next row has the Year, Julian Day, Time, and Antenna used.
Next row: Frequency, and Signal Strength.
Next row: Tag ID, # of detected matches for the ID listed.

The Tag ID is displayed as a 3 digit number. The first two digits represent the tag ID, a number from 00 to 99. The third digit represents the number of mortality pulses detected. A 0 represents no mortality pulses detected during the scan time. A 3 represents at least 1 mortality pulse detected during the scan time. A 6 represents a mortality pulse detected during the entire scan time.

For Aerial Data only:

(A block number is not shown for the 2nd screen of Aerial Data)

Lat: 45 29.7200 N
Lon: 093 14.8300 W
GPS Age (sec):001

GPS Age: The amount of time in seconds that have passed since this GPS data had been
                recorded.

This sequence of screens will repeat until you have viewed all the data blocks listed in your range or you
press the *"ESC"* key.

2.1.4.3 Delete Memory

Move the cursor to the **Delete Memory** item and press *"ENTER"*. This instructs the R4520C to reset the data
pointer back to the beginning of memory effectively deleting all the stored data blocks.

Screen 1

Are you sure you
Want to delete?
Press ENTER
To confirm

Screen 2

Press ENTER to clear
Memory or ESC to
return without
clearing memory.

Screen 3

Deleting Memory

This message flashes momentarily then returns you back to the "Memory Menu".

2.1.5 Stat Hold (Stationary Hold)

Move the cursor to the **Stat Hold** item and press *"ENTER"*. This is used to set the number of seconds stationary

scan can remain paused on a single frequency in a scan. The "SHIFT" key followed the *"HOLD"* [RECORD HOLD] key can be pressed to monitor a tag for a period longer than the Scan Time. If the user does not exit the **Hold** mode by pressing "ESC", the R4520C will automatically resume scanning after the number of seconds has been reached. This is a safety feature. The valid range to enter for this setting is 5 to 65535 seconds.

Pressing *"ENTER"* or *"ESC"* from the "Stat Hold" menu will bring you back to the "Setup Menu".

Press *"ESC"* to get to the "Main Menu".

2.2 MANUAL Mode

With the cursor in the **MANUAL** position, press *"ENTER"*.

FR 1(00) 151234

LOW (Flashing LOW/BAT)
GPS (Flashing GPS/OFF)

The GPS is normally OFF for the Manual Mode. If the GPS has been turned on previously from the GPS Screen, or an Aerial Scan, the GPS will remain on when entering the Manual Mode.

To change the frequency

The cursor defaults to the 1 MHz position. From here you can enter whatever frequency you are looking for.

You may use the [→] or the [←] keys to change the cursor position. More likely you will enter tag frequencies using the keypad. Each time you enter a digit the cursor will move one place to the right. If the cursor is in the 1 kHz position (least significant digit), then it will just remain in that location. Receiver frequency is also updated after each key is entered.

Pressing *"ENTER"* will move the cursor to the default location of the 1 MHz position. It does not change the last entered frequency. You may also use the left and right arrow keys to move the cursor around and change the frequency by entering a new digit.
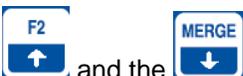
The [F2 ↑] and the [MERGE ↓] keys can be used to increment or decrement a numeric value while keeping the cursor in the same location.

If the enter frequency that is not within the receiver's range,

"**Out of range**" error will be displayed.

The Manual mode does not automatically store the data. To store data in the manual mode, pressing *"SHIFT"* and

then *"RECORD"* will store all data that has been detected and is displayed in the screen.

The Manual mode will display ID tags on the display as it decodes them. Other than storing data, all the features described for the Aerial's **Hold** mode also work here.

The time stamp of all detected tag ID's will be stored when pressing "*RECORD*" . If no ID's are available, only the frequency is saved along with the latest time stamp. Note: GPS data will only be stored if an optional antenna is connected to the receiver, the GPS functionality is turned on and a valid GPS fix has been acquired.

Saving targets will flash on the display

To exit the Manual mode, press the *"ESC"* key.

2.3 AERIAL Mode

Move the cursor to the **AERIAL** item and press *"ENTER"*.

Screen 1

```
Aerial Scan Mode:
Table #        1
Scan Rate   002.5
Time Out    002.5
```

Table #:   Selects the frequency table used for scanning. Twelve tables are available. Multiple tables are used to optimize Aerial surveys in multiple locations.

Scan Rate: Sets the amount of time the R4520C will stop on each frequency while attempting to detect tags. The number after the decimal point may be a 0 or a 5 to allow half second increments. For setting Scan Rate time, see section **13.0**.

Time Out: The amount of time the receiver will stay on a Frequency while attempting to detect a tag. If no tag is detected in the Time Out period, the receiver will advance to the next frequency in its frequency table. This feature allows faster scanning by truncating the scan time if no tag is detected in the Time Out period. The user defines the parameter (e.g. 003 . 300 seconds). Refer to section **14.0** for information on setting the Time Out value.

If the defaults were set up correctly, just press enter for each item listed, and the cursor will move through each setting in the Aerial Setup windows. When all settings have been entered, the Aerial scan will start.

The default settings are used to pre - enter the values for each item listed for the Aerial Setup. Pressing *"ENTER"* on these values stores them into memory. If there needs to be any changes made to any of the items, pressing *"ENTER"* will store the changed value into memory, and that changed value will be used in the Aerial scan.

When an Aerial Scan has started, the R4520C will start scanning the frequencies in the table at the entered scan rate time. When a tag is heard on a frequency, pressing *"HOLD"* [RECORD HOLD] will stop the scan rate and remain on that frequency until *"HOLD"* [RECORD HOLD] is pressed again. When Hold is pressed the second time, the R4520C will resume scanning through the frequencies in the table at the scan rate time.

You may use the *"CHAN↑"* [ADDFR CHAN↑] and *"CHAN↓"* [DELFR CHAN↓] keys at any time to scroll through the channels. When the is scanning through the frequencies, pressing the chan up or chan down keys will override the scan rate time, and advance forward or backwards through the frequency table. While in **Hold**, pressing the chan up or chan down keys will advance forward or backwards through the frequency table and remain in the **Hold** state, recording any available information when detected.

While in **Hold**, the tune up [F2 ↑] and the tune down [MERGE ↓] keys can be used to increment or decrement the frequency.

```
FR 1(00) 151234          Hold
                         LOW  (Flashing LOW/BAT)
                         GPS  (Flashing GPS/OFF)
```

Example 1:

```
FR 1(00) 151234          Hold
662-113 694-110 712M100 LOW  (Flashing LOW/BAT)
595-119 082-121 154M120 GPS  (Flashing GPS/OFF)
728-123 742-118 754-114  +
```

Example 2:

```
FR 1(00) 151234          Hold
126-122 546-122 792-113+ LOW  (Flashing LOW/BAT)
707-122 283-120 052-114+ GPS  (Flashing GPS/OFF)
                      +
```

Hold: Pressing the *"HOLD"* [RECORD HOLD] key will cause the aerial scanning to stop on the current frequency and store data continually. When this has occurred the *"Hold"* text will appear on the screen. Use this key when you want to store data (i.e. time, frequency, signal strength, tag ID, and GPS location) for the displayed frequency. Pressing the *"HOLD"* [RECORD HOLD] key again will cause the R4520C to resume scanning.

To access functions available to this mode press a "SHIFT" key and a "ONE" [ONE 5], "ALL" [ALL 6], "NONE" [NONE 7], "VIEW↑", [VIEW↑ 8] "VIEW↓" [VIEW↓ 9], "MERGE" [MERGE ↓], "ADDFR" [ADDFR CHAN↑], "DELFR" [DELFR CHAN↓], or "RECORD" [RECORD HOLD] key.

GPS: This flashing message will indicate the status of the GPS functionality. GPS data will only be stored if an optional antenna is connected to the receiver, the GPS functionality is turned on and a valid GPS fix has been acquired.

ID's: When a transmitter is identified, the ID will appear in the display. The screen has only enough room to display 9 ID's. If more than 9 ID's are detected, there will be a "↓" indicator in the bottom right hand corner of the display. To view the other ID's use the VIEW↑ [VIEW↑ 8] and the VIEW↓ [VIEW↓ 9] as scroll keys. Shown in Example 1 is the first page of the detected tag ID list. The most recently detected ID will appear in the upper left hand corner of the display. Note that the first two lines of IDs have no "↓" indicator on the right hand side. Example 2 shows all three lines with a "↓" indicator. This shows that the list can scroll both up and down. The absence of any IDs in the bottom row indicates that scrolling down will not show any more detected IDs. A "............." on the display indicates you've reached the end of the list's storage area. All detected IDs will be stored to memory for downloading to the PC. The ID will be shown on the screen as a three digit number followed by its mortality indicator and its signal strength reading. The first two digits are the tag ID. The third digit is a counter that will increment every time the tag ID is identified. This counter will loop from 0-9. (For example: 127 = ID number 12, and has been detected 7 times.) If a tag is in mortality mode the ID information will show an "M" where a "·" would normally appear.

To stop the Aerial Scan, press "ESC". This will return the screen to the "Main Menu".

If you desire to start the aerial scan after stopping the scan, a new window will appear when entering the "Aerial Menu".

Screen 1:

Aerial Scan Mode:
Resume Last Scan
Scan Using Defaults
New Scan

Pressing "ENTER" while the cursor is on **Resume Last Scan**, the following screen will come up:

Screen 2:

Aerial Scan Mode:
Table #   1

Pressing *"ENTER"* while the cursor is on the table number will start an aerial scan using all the frequencies that may have been added or deleted including any merged tables. Specifying a table number then pressing *"ENTER"* will perform the same task but first it will clear out the merged tables while maintaining the added and deleted frequencies from the table specified.

Pressing *"ENTER"* while the cursor is on **Scan Using Defaults**, the Aerial Scan will start scanning using the values entered for the Aerial default settings.

If a new scan is started by starting an Aerial Scan from the "Main Menu", the changed values will be returned to the default values if **Scan Using Defaults** is selected. If any of the scan protocol values need to be changed, you will need to move the cursor to **New Scan** and press *"ENTER"*. The values in the list will show the default values. If you want the values to be remembered for future scans go back to the "Defaults Menu" and make the changes there. With the "R4520 ATSWinRec" software, there is the option to offload the data showing the scan parameters. When this option is selected, the values used for the scan will be able to be viewed along with the data.

2.4 STATIONARY Mode

Move the cursor to the **STATIONARY** item and press *"ENTER"*. See section **2.4.1** for viewing the stationary flowchart. The stationary mode has a low battery indicator. The LOW / BAT indicator will flash in the display when the internal battery voltage is below 11.5V. If external power is connected to the receiver, the internal batteries are not used, and the low battery indicator will be for the external power supply.

There will be multiple windows to go through. Moving the cursor with the ➡ or the ⬅ will allow movement between screens.

Screen 1

```
Stationary Setup:
Time Out        003 sec
Scan Time       012 sec
Store Rate      10   min
```

Time Out: The amount of time the receiver will stay on a Frequency while attempting to detect a tag. If no tag is detected in the Time Out period, the receiver will advance to the next frequency in its frequency table. This feature allows faster scanning by truncating the scan time if no tag is detected in the Time Out period. The user defines the parameter (e.g. 003 . 300 seconds). Refer to section **14.0** for information on setting the Time Out value.

Scan Time: The amount of time to hold on a frequency and attempt to detect tags. The Scan time will override the Time Out time, if a pulse has been detected during the Time Out period. The Scan Time is set to whatever you need this set at (e.g. 003 . 300) seconds. Refer to section **15.0** for information on setting the Scan Time value.

Store Rate: This defines how often a tag's detection will be stored for each antenna. For example if the Store Rate is set to 10 minutes and a scan time of 15 seconds, its presence will only be recorded once during that 10 minute period. The data stored will include the time stamp of the strongest signal strength measured in one 15 second scan time during the 10 minute scan period. Stored with it will be all detected ID's for that frequency, and the total count of detections for each ID during the 10 minute store period.

Pressing *"ENTER"* while on the Store Rate setting will advance to the next screen.

Screen 2

```
Stationary Setup:
Tables(1-12):   1,
  ,   ,   ,   ,   ,   ,
  ,   ,
```

Tables : The frequency tables you want to scan. There are twelve tables available. All the tables listed will be scanned.

Screen 3

```
Stationary Setup:
Antenna # (1-8):        1
EXT Data XFER:     NO
```

Antenna # : The number of antennas the receiver will sample. This feature requires an external antenna switchbox connected to the AUX port of the R4520C. If using a 2-way switchbox, this would be set to 2.

EXT Data XFER: This setting is set to **YES** when transferring recorded data every hour to another device. This can be used for retrieving your data remotely. Two example devices are RDP (Remote Data Platform) and GOES (Geostationary Operational Environmental Satellites). The GOES satellite operation and requires an account with NESDIS (National Environmental Satellite, Data and Information Service). Contact ATS for more information regarding GOES and RDPs.

Pressing *"ENTER"* while on the EXT Data XFER setting will advance to the next screen.

Screen 4

```
Stationary Setup:
Reference Freq: NO
```

To activate the Reference tag feature, use the [F2 ↑] or the [MERGE ↓] key. These two keys are used to toggle between the two choices.

If you entered **YES** for the reference tag, you will be prompted to enter the reference tag frequency, and the store rate of the reference tag.

Screen 5

```
Stationary Setup:
Reference Freq:
150000
Store Rate: 0060 min
```

Reference Freq: This is the frequency of a radio tag set up within range of your station used as a check on the system. Since you will not need the same quantity of data you can set up a longer store period to use up less memory. Instead of the strongest signal strength being stored within the storage period, it will be the time of the first valid ID detection. There is a limit on the number of reference transmitter points that can be collected during each storage period. The maximum number is 16 (I.E. The number of collocated codes on the reference frequency * the number of antennas should not be greater than 16).

Store Rate: This defines how frequently the data from the reference transmitter will be stored. A count of the number of detected tag ID's will be stored for the entire store rate.

Note: The data are not stored until the storage period has expired. For example with storage period set up for once an hour the time the first data are collected might be at 6:00 am. Although the data recorded will reflect 6:00 they will not be committed to memory until 7:00 am. This means when the data are offloaded you may have the data for the actual transmitters appearing before the reference tag. This is true even if the animal data were collected at 6:30 am and the reference data were collected at 6:00 am.

If you desire to start the stationary scan after stopping the scan, a new window will appear when entering the Stationary Mode.

```
Stationary Mode:

Scan Using Defaults
New Scan
```
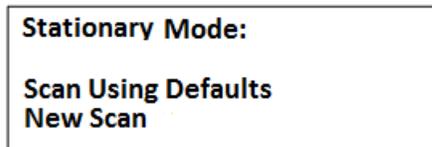
Pressing *"ENTER"* while the cursor is on **Scan Using Defaults**, the Stationary Scan will start scanning using the values entered for the Stationary default settings.

If a new scan is started by starting an Stationary Scan from the "Main Menu", the changed values will be returned to the default values if **Scan Using Defaults** is selected.   If any of the scan protocol values need to be changed, you will need to move the cursor to **New Scan** and press *"ENTER"*. The values in the list will show the default values. If you want the values to be remembered for future scans go back to the "Defaults Menu" and make the changes there. With the "R4520 ATSWinRec" software, there is the option to offload the data showing the scan parameters. When this option is selected, the values used for the scan will be able to be viewed along with the data.

2.4.1 The Stationary Logging Flowchart

Start

The receiver tunes in the next frequency from the frequency table

Timer = 0

Are there multiple antennas?

Yes → Monitor all the station's antennas and display 'Ant 0'

No → Monitor the station's antenna(s) and display 'Ant 1'

Timer = Time Out? No

Yes

Any Signal Present? No

Yes

Timer = Scan Time? No

Yes

Store any data found

Switch to the first individual antenna not yet scanned and display it on the screen.

Timer = 0

No

Timer = Time Out? Yes → Any Signal Present? Yes → Timer = Scan Time? No

No

Yes

Store any data found

Have we scanned all the individual antennas? No

Timer = Time Out? No

Yes

Any Signal Present? No

Yes

Timer = Scan Time? No

Yes

Store any data found

2.5 PC Mode

Move the cursor to the **PC** item and press *"ENTER"*. This Mode is used when communicating with a personal computer (PC). The R4520C needs to be connected to a PC using the supplied cable. The PC must currently be running the ATS supplied ATSWinRec communication software. For more information see the sections of this manual covering "Downloading Data" and "ATSWinRec".

2.6 CLONE Mode

The Clone feature is used to transfer frequency tables and default settings from one receiver to another. The optional blue clone cable with male DB15 connectors on both ends is required to use this function. Use the following procedure:

1. Connect the Clone cable between the two receivers.
2. Turn both receivers on.
3. Select **CLONE** on the receiver you want to be the recipient of the data, press *"ENTER"*.

The receiver should respond with:
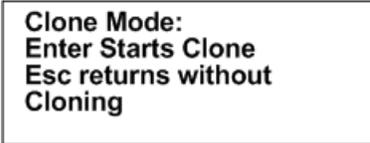
```
Clone Mode:
Enter Starts Clone
Esc returns without
Cloning
```

If a connection cannot be made the receiver will respond with:
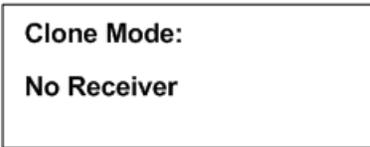
```
Clone Mode:

No Receiver
```

If it does not make a connection turn both receivers off and repeat the steps outlined above.

Remember to select **CLONE**, and then press "*ENTER*" on the receiver you want to clone the information to.

2.7 Ext Data

This optional feature is used when you want to dump data out hourly through a serial port to another device. This screen is used to select the type of device you want to dump to. For this feature to be activated it will need to have been selected for in screen 6 of the Stationary Setup.

Screen1

```
Ext Data XFER:
1: RDP
2: Goes
Format:   1
```

Enter a 1 or 2 for the type of device and press **"ENTER".**

2.7.1 RDP – Remote Data Platform

With this setting selected all the data collected during the hour will be dumped out the **AUX** serial port as binary compressed data.

Screen 2

```
RDP Tx baud:
1:9600
2:57600
Tx Rate:   1
```

9600 :	Sets the serial communication settings for the R4520C's data output to "baud: 9600, no parity, 8 data bits, 1 stop bit".
57600:	Sets the serial communication settings for the R4520C's data output to "baud: 57600, no parity, 8 data bits, 1 stop bit".

Enter a 1 or 2 for the desired serial port settings and press "ENTER". The screen will return to the "Setup Menu"

2.7.2 Goes – Geostationary Operational Environmental Satellites

With this setting selected, limited amounts of data collected during the hour will be dumped out the **AUX** serial ports as binary compressed data.

The GOES functionality enables the receiver to send data to a geostationary satellite so that the user can retrieve it later from another location. This system has the advantage of working in remote locations not typically covered by standard cell phone service providers.

To use GOES you first need an account with NESDIS (National Environmental Satellite, Data and Information Service). You also need a GOES Transmitter. Both the SAT HDR GOES and TX312 models sold by Campbell Scientific, Inc are compatible with the data protocol being sent out the **AUX** serial port. The data coming out the **AUX** port is standard RS232 with settings: "baud: 9600, no parity, 8 data bits, 1 stop bit".

Screen 2

```
GOES Tx baud:
1: 1200     2: 300
3: N/A
Tx Rate:    1
```

1200:   Informs the R4520C that the GOES satellite will be transmitting data back to Earth at 1200 baud. This value is assigned by NESDIS (National Environmental Satellite, Data and Information Service).

300:   Informs the R4520C that the GOES satellite will be transmitting data back to Earth at 300 baud. This value is assigned by NESDIS (National Environmental Satellite, Data and Information Service).

N/A: Informs the R4520C that it doesn't need to worry about the GOES transmission rate. You would select this if you wanted to take advantage of the GOES data format without actually using the GOES transmitter and setup.

Enter a 3 to finish or a 1 or 2 to continue to the next screen and press "*ENTER*".

Screen 3

```
Size in Seconds
of the GOES
transmission
window:  020
```

Enter the value of the transmit window size assigned by NESDIS and press "*ENTER*".

Screens 2 and 3 are used to limit the amount of data dumped out the serial port. The data size will be a size that can be handled by hourly satellite transmissions. Data that doesn't get sent to the GOES transmitter this hour will be saved for the next hours dump. If you anticipate having intervals where you collect more data than can be sent by a satellite transmission, you will need to make sure you have intervals where you collect limited data so the system can catch up.

3.0 TEST - View of the "Battery" Voltage

```
TEST
 4
```

Pressing the *"SHIFT"* key followed by pressing the *"TEST"* key will display the receiver's power source voltage. If the power source is the internal battery it will be the internal battery voltage. If it is an external power source it will be the voltage of the external power source.

```
Battery Test
12.1 Volts
```

4.0 GPS – Viewing / Activating GPS Data ![GPS 2]

Pressing the *"SHIFT"* key followed by pressing the *"GPS"* key allows you to view the GPS data as the data are collected and it allows you to turn the GPS functionality on or off.

Note: The GPS functionality uses a lot of power. Make sure to turn off the GPS when you are not using it in order to extend your battery life.

The ![F2], and the ![MERGE] keys are used to turn GPS on or off. The coordinates are displayed as Degrees . Decimal Minutes. **DD MM.MMMM.** The GPS locations saved in memory are stored as Decimal Degrees, or converted to UTM (NAD83) when using the ATSWinRec software.

```
Lat:   45 29.7200 N
Lon: 093 14.8300 W
                    GPS

GPS ON
```

GPS (non flashing) . The GPS is on, and there is a valid GPS fix.
GPS / **OFF** . The GPS is turned OFF.
NO / **FIX** . The GPS is attempting to acquire a valid GPS fix.
GPS / **ERR** . The GPS has not been able to get a valid GPS fix within 5 minutes.
NO / **GPS** . The GPS has not been able to get a valid GPS fix after 15 minutes, or there is no signal out of the GPS, or the GPS is turned OFF.

5.0 ONE - Selecting a single ID for Audio ![ONE 5]

Note: Used only in Manual and Aerial Hold modes.

Pressing the *"SHIFT"* key followed by pressing the *"ONE"* key allows you to hear only the coded tag you are interested in. This will cause the receiver to filter from the audio all detected coded IDs except the one you've just selected.

```
Select Single Code
for Audio: 12
with Background:    NO
```

for Audio :   The id number of the coded tag you are interested in. All other coded tags will be silenced as they are decoded. All decoded tags will appear on the display and be recorded as they are decoded even if they have been silenced.

With Background: When this is "NO" the receiver will silence all output except the tag with code that has been selected. The selected tag's audio will be slightly delayed because of the amount of processing required to remove all the other audio. If there is another tag in the vicinity that has a pulse that collides in time with the selected tag you could hear occasional pulses that are louder.

To activate/deactivate the Background signal, use the [F4 ↑] or the [MERGE ↓] key. These two keys are used to toggle between the two choices.

Type the coded ID you are interested in and press "Enter". All the Tag IDs will still be printed to the display as they are deciphered and in the **Aerial Hold** mode they will still be saved to memory. It's just the audio that will have the remaining decoded IDs removed. This feature is used to allow positional tracking of the selected tag.

On the Display the selected ID will appear in the left hand corner with an "±" appearing next to it as shown in the example below.

```
FR 1(00) 151234              Hold
126-122*792-113 707-122  LOW  (Flashing LOW/BAT)
052-114                      GPS  (Flashing GPS/OFF)
```
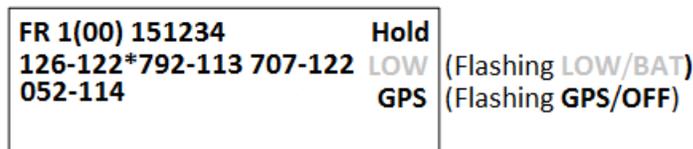
6.0 ALL -Selecting all IDs for Audio [ALL 6]

Note: Used only in Manual and Aerial Hold modes.

Pressing the "**SHIFT**" key followed by pressing the "**ALL**" key allows you to hear all the data be picked up by the receiver. A message will be displayed to the screen indicating the audio filtering has been turned off.

7.0 NONE - Silencing all IDs from the Audio [NONE 7]

Note: Used only in Manual and Aerial Hold modes.

Pressing the "**SHIFT**" key followed by pressing the "**NONE**" key allows you to hear only the background signal. Enabling this will cause the receiver to filter from the audio all the coded IDs as they are deciphered. All the Tag IDs will still be printed to the display as they are detected and in the **Aerial Hold** mode they will still be saved to memory. A message will be displayed to the screen indicating the coded tag IDs have been silenced.

8.0 ADDFR - Adding a Frequency to the Scan Table

Note: Used only in Aerial mode.

Pressing the *"SHIFT"* key followed by pressing the *"ADDFR"* key allows you to append frequencies to your current scan table.

```
Add Frequency
Freq: 150000
```

9.0 DELFR - Deleting Frequencies

Note: Used only in Aerial mode.

Pressing the *"SHIFT"* key followed by pressing the *"DELFR"* key allows you to delete frequencies from your current scan table.

```
Delete Frequency
Freq: 150000
```

10.0 MERGE - Merging Frequency Tables

Note: Used in Stationary and Aerial modes.

Pressing the *"SHIFT"* key followed by pressing the *"MERGE"* key allows you to merge an additional frequency table into to your current scan table. Changes will be lost once you exit the Stationary scan.

```
Merge Table 2
```

11.0 RECORD - Recording Data

RECORD
HOLD

Note: Used only in Aerial and Manual modes.

Pressing the *"SHIFT"* key followed by pressing the "*Record*" key forces a save to be preformed when a save would not ordinarily be done. The R4520C will save the data it has currently available. For example: You would use it if you were in the **Aerial Hold** mode and a signal was not being decoded but you still wanted to save GPS data, frequency, and time.

12.0 PC - Downloading Data

First install the provided software, ATSWinRec, onto your computer. This program needs to be operating on the computer first, for the R4520C to recognize a PC connection.

The setup should start automatically, if it does not, select START, RUN, BROWSE to find the SETUP file on the CD, then OPEN and OK. Run the setup to install the ATSWinRec program. It will install a short cut icon on your desktop.

12.1 Com Port (Settings Menu)

This is the communications port (Com Port) that you have selected to communicate from your personnel computer to the R4520C. You will need to use a standard USB A Male to USB Mini communication offload cable which is provided to you by ATS. The first time you start ATSWinRec after installation you'll be asked to select a Com port from a provided list. This is a list of communication ports currently residing on your computer. After the selection is made it will be the default Com port selected during subsequent sessions using ATSWinRec. The Com Port can be changed by selecting "Com Port" from the "Settings" menu and selecting a new Com Port from the list provided. This selection will then be the new default selection.

Connect the provided USB Serial Cable to a USB port on the computer, and to the PC connector on the R4520C.

With the ATSWinRec program running on the computer, move the R4520C cursor to the PC position while in the R4520C "Main Menu". Presses "*ENTER*" on the R4520C.

The R4520C display will change to:

```
Looking For PC
```
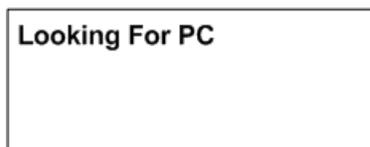
And then to:

```
PC Mode:

Active
```

If communication is not successful:

1. Check that both ends of the offload cable are plugged in. The female end of your cable plugs into a Com Port of your computer and the male end plugs into the R4520C's 9 pin connector labeled "PC/CLONE".

2. Verify that the selected Com Port matches the PC Com Port that you are currently plugged into.

3. Make sure that the R4520C is powered up.

4. Make sure that you are in the R4520C's "PC Mode" and that the screen reads "Active". Choose "PC Mode" by selecting "PC" from the "Main Menu" of the R4520C. This needs to be done while you are connected to your PC and after you have booted up the ATSWinRec program.

 If your computer does not have a Com Port, you can adapt your computer by using a PCMCIA card designed for serial I/O or an USB/Serial I/O adapter.

12.2 ATSWinRec

The main screen of the ATSWinRec program looks like the following:
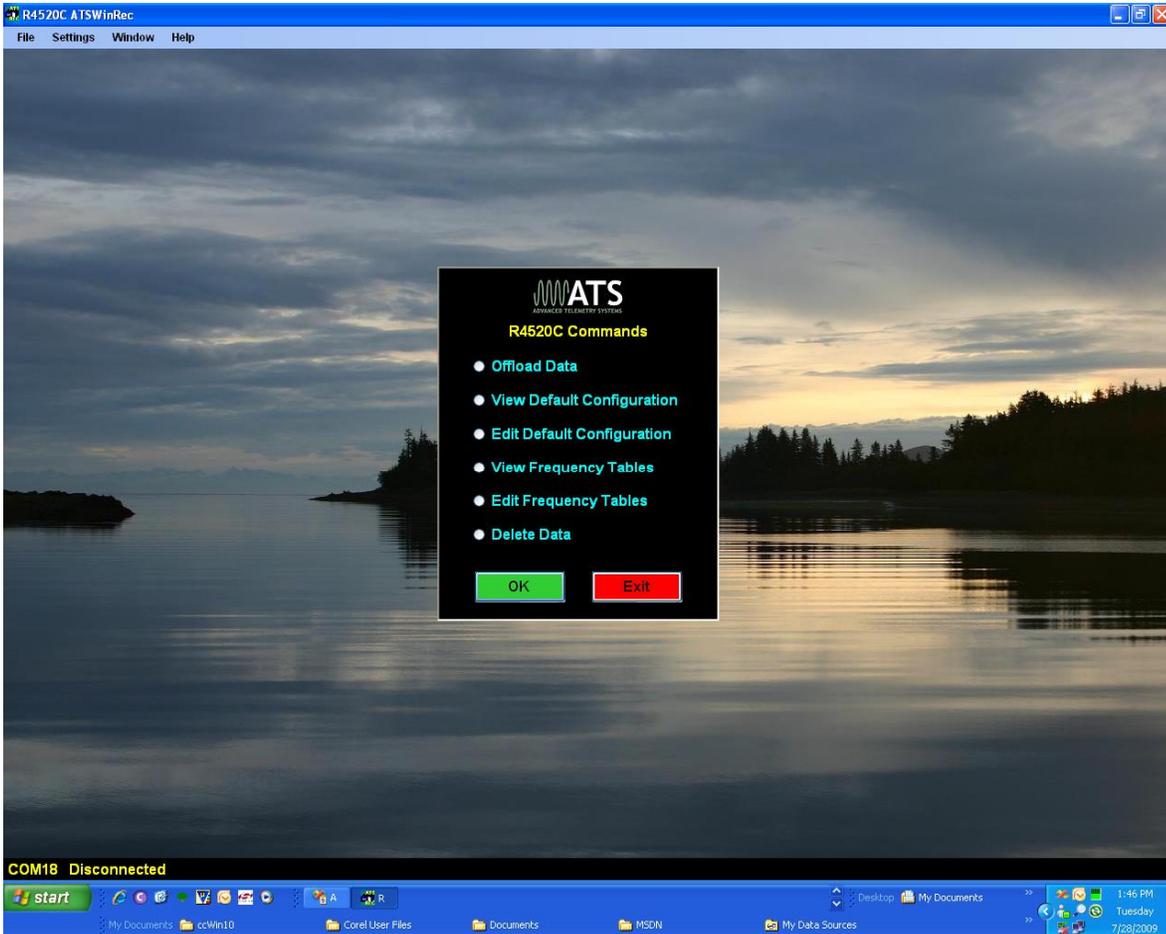
12.2.1 First Time Start Up

When starting the ATSWinRec program for the first time you will be prompted for a com port with the following dialog box:
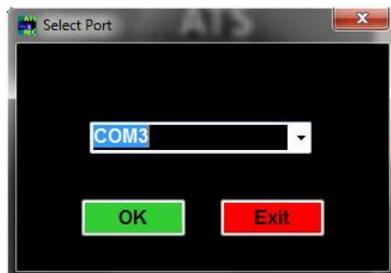
It is also possible that you may also get the following dialog box:
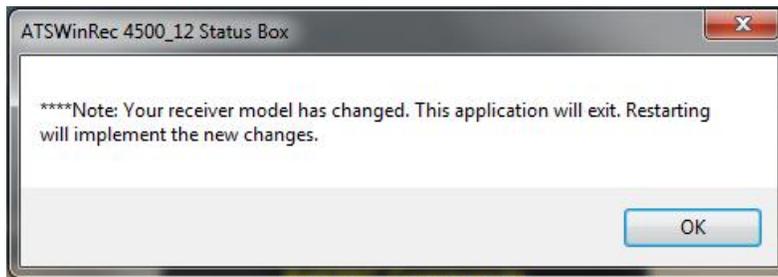
This is a notification that the software has readjusted to the R4520C receiver model.

12.2.2 Offloading Data

If you select Offload Stored Data followed by OK, the following screen then appears:

You can select some of the offload parameters. Most are self explanatory.

Recover Deleted Data allows you to recover deleted data. When deleting data, a data pointer that is used to store memory in the R4520C is reset, and when recovering deleted data, the data pointer can be returned to the previous location. Thus data can be recovered if the data has not been overwritten by resetting the pointer. When the R4520C memory is maxed out, the newest data will start writing over the oldest data blocks. Recovering deleted data will only work for the last data set deleted.

You may also set the starting data block to be greater than zero. For example you may only want to check the most recent data.
You can select the coordinate for the GPS data.

You can select the frequency data displayed with all six digits or with the two most significant digits suppressed.

Showing parameters in the offloaded data. This feature allows the data to include the scan parameters for each scan started when offloading the data. When this feature is not selected, the offloaded data will not have any scan parameters showing in the offloaded data.

The figure below shows downloaded data with first an Aerial Scan, then a Manual Scan, then a Stationary Scan. The last column is an index into the parameter table displayed at the end of the data. The parameter number 0 appears here in lines 8 . 16. The parameter settings for those data points are displayed on line 33. To have this extra information appear in your offloaded data you need to select yes in the "Show Parameters in Offloaded Data" box of the offload screen.

Row 1: Advanced Telemetry Systems' R4520C Series Receiver-Data Logger
Row 2: Csv Data File: C:\Program Files\Advanced Telemetry Systems Inc\ATSWinRec_R4520C\Data\fd7_29_2009_13_58_42.csv
Row 3: Generated: 7/29/2009
Row 4: Program: ATSWinRec_R4520C   Version: R4520C_1.0.3495.22408   Source:PC

Yr	Day	Hr	Mn	Sec	Ant	Fr	Sig	Code	NumDet	NumMort	Latitude	Longitude	GpsAge	PrmNum
9	210	8	14	21	NA	3995	108	12	1	0	45.44088	-93.3021	1	0
9	210	8	14	21	NA	3995	108	12	1	0	45.44088	-93.3021	1	0
9	210	8	14	22	NA	3995	108	12	1	0	45.44088	-93.3022	0	0
9	210	8	14	23	NA	3995	108	12	1	0	45.44088	-93.3022	0	0
9	210	8	14	25	NA	3995	108	12	1	0	45.44088	-93.3022	0	0
9	210	8	14	26	NA	3995	108	12	1	0	45.44088	-93.3022	0	0
9	210	8	14	27	NA	3995	108	12	1	0	45.44088	-93.3022	1	0
9	210	8	14	28	NA	3995	107	12	1	0	45.44088	-93.3022	1	0
9	210	8	14	29	NA	3995	108	12	1	0	45.44088	-93.3022	0	0
9	210	8	14	43	NA	3995	108	12	1	0	45.44089	-93.3022	0	1
9	210	8	14	43	NA	3995	108	12	1	0	45.44089	-93.3022	0	1
9	210	8	14	44	NA	3995	108	12	1	0	45.44089	-93.3022	0	1
9	210	8	14	44	NA	3995	108	12	1	0	45.44089	-93.3022	0	1
9	210	8	14	45	NA	3995	108	12	1	0	45.4409	-93.3022	1	1
9	210	8	14	46	NA	3995	108	12	1	0	45.4409	-93.3022	0	1
9	210	8	15	NA	1	3995	108	12	9	0	NA	NA	NA	2
9	210	8	15	NA	1	3995	108	12	10	0	NA	NA	NA	2
9	210	8	16	NA	1	3995	108	12	9	0	NA	NA	NA	2
9	210	8	16	NA	1	3995	108	12	9	0	NA	NA	NA	2
9	210	8	16	NA	1	3995	108	12	10	0	NA	NA	NA	2
9	210	8	16	NA	1	3995	108	12	9	0	NA	NA	NA	2

Row 30: ***PrmNum Key***

PrmNum	Block_Type	Scan_Type	TimeOut	Scan	Tables	GPS	StoreRate	Antennas	ExtData	Reference_Frequency
0	Aerial	NA	NA	3	1	Yes	NA	NA	NA	NA
1	Manual	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	Stationary	NA	3	12	1	NA	0	1	No	NA

Steps for Offloading:

1. To offload the data, make sure the **Offload Stored Data** button is checked (default position on start up). Select any other format options and select "OK".

2. Selecting the "OK" button will start the data download. Another window will pop up showing the progress of the download.

3. When the Data Download is complete, a window will appear asking if you would like the data deleted from the receiver. If you do delete the data, and later realize that you did not want to delete the data, the "**Recover Deleted Data**" tab can be used to recover the last data set deleted. The deleted data is only retrievable as a downloaded file using ATSWinRec.

4. Next will be a window that prompts the user for a file name. The default file name is a date stamped file name. The file is stored in a Data folder. The location will be where the ATSWinRec was installed to. The default location is:

   C:\Program Files\Advanced Telemetry Systems, Inc\ATSWinRec_R4520\Data

5. After saving the file, a new window will appear displaying the downloaded data. The spreadsheet program Microsoft® Excel® is the default used for file viewing but another program can be used instead. To change the program used for viewing your data go to the "**Settings**" option in the menu bar and pick "**Select Spreadsheet Editor**". A dialog box will appear that will allow you to change the viewing program selection.

12.2.3 View / Edit Default Configuration
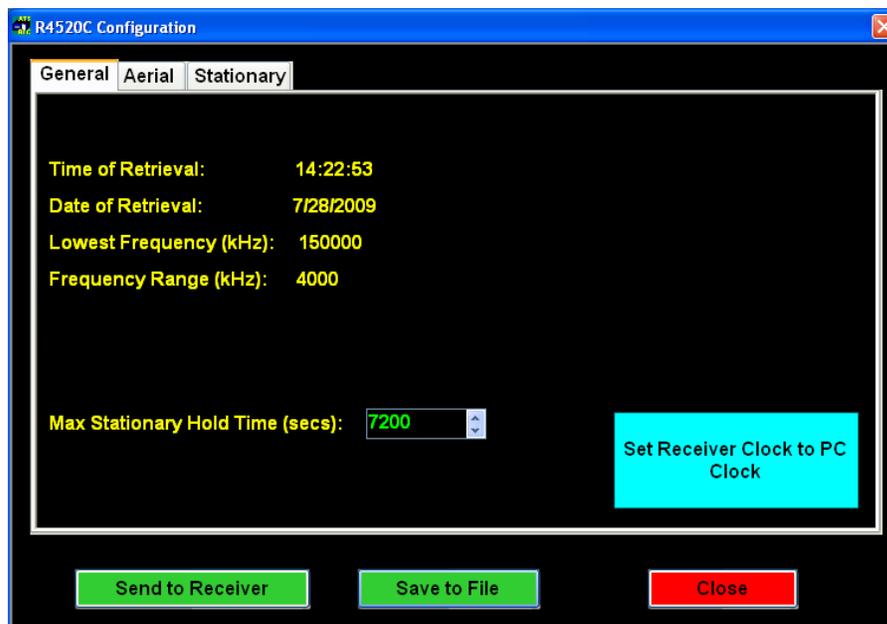
The screens will be the same for viewing or editing the default configuration. In the *View Default Configuration* mode, no parameters can be modified.

Only the selections in blue and the numeric entries in green can be modified. No information will be saved, unless the green buttons are selected; *Save to File* or *Send to Receiver*. See section **2.1.2 Defaults** for information on each configuration parameter.

All default configurations can be retrieved from the receiver or from a file, and sent to the receiver or saved to a file.

If no configuration was sent to the receiver or saved to a file, selecting *Close* will not save any changed values.

When selecting the *Set Receiver Clock to PC Clock* button, the PC time is sent to the R4520C and is converted to: Year, Julian Day, and 24 hour time format.

12.2.4 View / Edit Frequency Tables

The screens will be the same for viewing a frequency table or editing a frequency table. In the *View Frequency Tables* mode, no parameters can be modified.

When editing a frequency table the source can be; from a file, from a receiver connected the PC, or a new frequency table can be created using ATSWinRec. A group of 12 tables can be entered for editing, or a single table can be entered for editing.

The frequency files are saved as a group (12 tables) . FileName_grp.xml or as a single table . Filename_tbl.xml.

Group Frequency Tables

When opening a file of 12 frequency tables, ATSWinRec will be looking for a file with the extension *_grp.xml. A single frequency table file (file name with extension *_tbl.xml) will not be allowed to be opened.

When sending a group (12 tables) of frequency tables to the receiver only tables with frequencies will be sent. Also, the option to only send selected tables to the R4520C is available by deselecting any frequency table tabs not wanting to be sent.

Single Table Frequencies

When opening a file for a single frequency table, ATSWinRec will be looking for a file with the extension *_tbl.csv. A group table file (file name with extension *_grp.csv) will not be allowed to be opened.

If a file is saved as a single table, the file can be loaded to any selected frequency table and sent to the receiver by selecting the corresponding frequency table tab. Selecting the tab for the frequency table location is available for opening a file, saving a file, or sending the table to the receiver. When loading a single table from a file or saving a single frequency table to a file, each table selected to be loaded or saved, will have a Windows+open file dialog box for each file. The upper left corner of the open file dialog box will show the frequency table number which the file will be saved to, or loaded to.

The figure below is opening a single frequency table file for table 3.
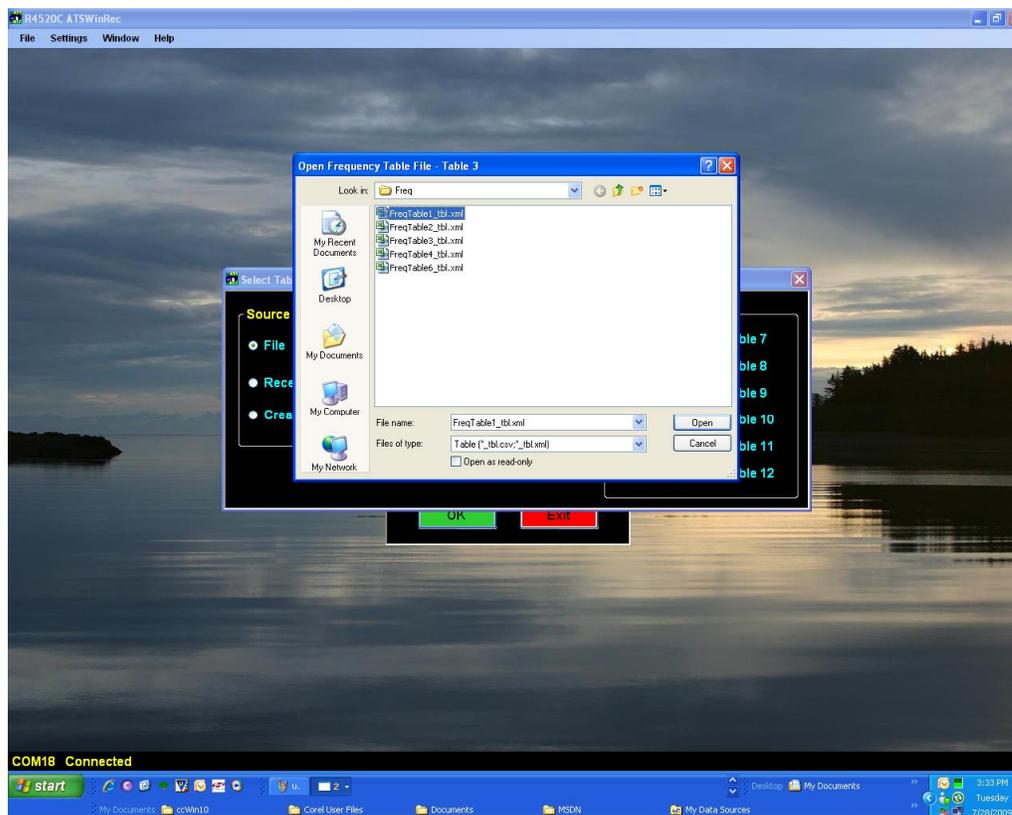
If a receiver is not connected to the PC when a new frequency table is created, the lowest frequency of the receiver will need to be entered. If the wrong lowest frequency is entered when creating a new frequency table, the table will not be sent to the receiver and an error message will appear indicating that the lowest frequencies do not match.

12.2.5 Delete Data

 Selecting *Delete Data* will delete the data in the receiver. Warning messages will appear in case if the tab was accidentally selected.

12.2.6 EXIT

To exit from the ATSWinRec program select: *Exit*, then *OK*

13.0 Setting Aerial Scan Rate

The minimum Aerial Scan Rate should be set to allow for a single pulse from the transmitter with the longest pulse repetition period to be heard.

The period length is available with the data sheet provided with the transmitters. To get the period length in seconds, divide the period (ms) by 1000.

For an ID code 24 transmitter, the period length is 1310 (ms) / 1000 = 1.310 seconds. The minimum scan rate should be set for 1.5 seconds so at least one pulse will be heard.

14.0 Setting Stationary Time Out

The minimum stationary Time Out time should be set the same way as setting the Aerial Scan Rate. At least one coded pulse burst (three beeps) is needed to be detected during the Time Out time, to trigger the Scan Time. If a full pulse burst is not detected during the Time Out, the R4520C will not determine a tag is present, and move on to the next frequency during a stationary scan.

The Time Out can be set for longer than the recommended minimum setting. Setting the right Time Out will depend on the size of the frequency table, and how quickly the table should be cycled through.

15.0 Setting Stationary Scan Time

The minimum stationary Scan Time needs to be set for a valid tag ID to be detected, and to take into consideration how many tags are expected to be co located. The more tags located in the same area, the longer the scan time is needed to identify all of the tags.

For a single tag to be identified, three pulse bursts are required. For an ID code 24 transmitter, the period length is 1310 (ms) / 1000 = 1.310 seconds. For three pulse bursts, the time would be 3*1.310 = 3.93 seconds. The minimum scan rate should be set for 4 seconds to allow decoding of the ID for a single transmitter. If more tags are located in the same area on the same frequency, the scan time would need to be set longer than 4 seconds. To identify 6 tags, 12 seconds should be used. To identify more than 6 tags, a longer scan time will be needed. The more tags located at the same time, the more time is needed to process all of the incoming pulses to identify transmitter ID's.

16.0 Offloaded Data Format

Heading . The offloaded file heading identifies the file

Model:	The model of the receiver that was offloaded.
Filename:	The name of the file with the personal computer drive and folders included.
Version:	The version of ATSWinRec used to create this file.
Date:	The date the file was originally created.
Source:	Indicates whether the data was offloaded via a PC or a PDA.

Column Headers . Lists the name of each column field.

Date . The date each point was recorder.

YY,JJJ,HH,mm,	The offload used the Julian Date Format.
or	
MM/DD/YYYY HH:mm,	The offload used the Standard Date Format.

YY:	A number from 0-99 representing the last two digits of the year.
YYYY:	A number from 0-9999 representing the year.
JJJ:	A number from 1-366 representing the Julian day (1-366 for a leap year, otherwise 1-365).
MM:	A number from 1-12 representing the month.
DD:	A number from 1-31 representing the day of the month.
HH:	A number from 0-23 representing the hour.
mm:	A number from 0-59 representing the minute.

Stationary Data . The data stored while the R4520C was logging data in Stationary Mode.

A:	A number from 0-8 representing the antenna being used. A '0' indicates all antennas were turned on.
(FF)FFFF:	A number representing the transmitter's frequency. Either it will be 6 digits representing the entire frequency or it will be a number from 0-9999 representing the last four digits of the frequency.
nn:	A 2 digit number from 0-99 representing the tag ID.
mmm:	A 3 digit number from 0-255 representing the number of detections with a mortality indicator.
TTT:	A number from 40-154 representing the signal strength.
ddd:	A number from 1-255 representing the duplicate count for the ID during the store period.

Aerial Data . The data stored while the R4520C was logging in either Aerial or Manual Mode.

SS:	A number from 0-59 representing the second.
(FF)FFFF:	A number representing the transmitter's frequency. Either it will be 6 digits representing the entire frequency or it will be a number from 0-9999 representing the last four digits of the frequency.
nn:	A 2 digit number from 0-99 representing the tag ID.
mmm:	A 3 digit number from 0-255 representing the number of detections with a mortality indicator.
TTT:	A number from 40-154 representing the signal strength.
(-)LL.LLLLLLLL: or *XXXXXXX.X:*	A number representing either Latitude or the X coordinate for UTMs (Universal Transverse Mercator).
(-)lll.llllll: or *YYYYYYYY.Y:*	A number representing either Longitude or the Y coordinate for UTMs (Universal Transverse Mercator).
ZZZ:	This will appear only if UTMs were selected and represents the UTM zone.
AA:	A number in seconds from 0-119 representing how long ago the GPS coordinates were recorded.

_____

When offloading data and showing parameters in the offloaded data, there will be a parameter number appearing in the last column. Find that number under the ***PrmNum Key *** appearing at the bottom of the offload. Cross referencing this will let you know what parameters was used for each data point that was recorded. Each column has a short descriptive header. Expand the columns to read what each parameter field is.

 Below are the column headers followed by some examples:

   Column Headers:

   PrmNum, Block_Type, Scan_Type, TimeOut, Aerial_TimeOut, Scan, Tables, GPS, StoreRate, Antennas, ExtData, Reference_Frequency

   Parameter Examples:

   0, Aerial, Coded Tx, NA, 2, 3.5,1, Yes, NA, NA, NA, NA

   1, Stationary, CodedTx, 2 , NA, 12, 1, NA, 0, 1, No, No

   2, Stationary, CodedTx, 3, NA, 12, 2 3, NA, 10, 1, Yes, No

17.0 Charging the Batteries

The R4520C is using NiMH (Nickel Metal Hydride) batteries. The capacity of the battery pack is 4.0 Amp hours. The R4520C will operate from internal batteries for approximately 18 hours for stationary mode, and approximately 11 hours for manual and aerial modes while using the GPS.

The batteries can self drain to 80% capacity during a 6 month shelf life.

It is recommended to maintain a charge cycle when storing the receiver for long periods of time. If the charge capacity of the batteries does not seem to be at full capacity, a couple charge cycles can bring the battery pack back to full capacity (discharge . charge . discharge . charge)

The charger supplied with the R4520C is a "smart charger". There is a thermal sensor to detect a full charge, and to shutdown the charge process if the battery pack overheats.
Turn OFF the power to the R4520C when charging the batteries.

When the charger is connected to the R4520C, the charging sequence will start.

A fully depleted battery pack should be charged to full capacity within 5 hours.

18.0 EXT – External Data Output

If the EXT option has been selected the R4520C will send data once an hour out the **AUX** and the **PC/CLONE** ports while stationary logging. If using GOES (Geostationary Operational Environmental Satellites) option, the data will be sent to the GOES transmitter's buffer thru a cable attached via the **AUX** port. While the R4520C is sending data out its serial ports one or two status screens will be displayed.

Screen 1

```
Preforming EXT
Data Transfer
Total blocks
to process: 8
```

This screen indicates the R4520C is starting to send data out. The example above has 8 data blocks in memory to process. Only valid data blocks will be sent. The number of blocks the R4520C sends may actually be less than 8. For example there could be informational blocks that contain programming information for your R4520C that would not be sent.

Screen 2 (GOES option only)

```
Total Verified
 106
Total Possible
 106
```

This screen indicates the number of bytes that were sent over versus the number of bytes that the GOES transmitter sent acknowledges for. If these numbers do not match a "CHECK" will flash on the screen indicating a probable system problem. If this happens check your connections. Also make sure your GOES transmitter is turned on and operating correctly. The GOES transmitter should display the same number of bytes in its buffer.

If the R4520C determines there were more bytes of data to be sent over to the GOES buffer than the GOES transmitter can transmit, it will save this data for the next hour's transmission cycle. You should try to set up your system so that it does not log more data than it can transmit in a 24 hour period. For fixed period logging each data point will use 11 bytes. For variable period logging each data point will use 11-12 bytes depending on the type of data being transmitted. Assume an extra 29 bytes overhead for the header and footer of the transmission block. Check with NESDIS to determine how many bytes your transmission assignment will allow.

Note: When using the GOES option and as long as the R4520C has not filled up it will not lose the data. It will always try to catch up. In order to save transmission space, the day the data is collected is attached to the transmission and not to the individual data point. If the back log becomes too large the date information will not match the day the data was collected.

When using the RDP (Remote Data Platform) option the R4520C will always dump all the data recorded during the previous hour's logging.

Even after the R4520C has filled up it will continuing logging. The newest data will be written over the oldest data.

In order for data to actually be lost the data back log would have to be the entire capacity of the data logger which is over 90,000 data blocks.

You can connect to the **PC/CLONE** from your PC using your offload cable. By using a communication software such as Microsoft ® HyperTerminal or Symantec's Procomm Plus and the serial settings "baud: 9600, no parity, 8 data bits, 1 stop bit" or "baud: 57600, no parity, 8 data bits, 1 stop bit" you can monitor the data that is sent out. This data comes out in a compressed format that if using GOES is the same as that you will see when downloading your data from NESDIS or if using the RDP is a compressed format that when uncompressed is the same as your normal offloaded data.

18.1 Data Format and Translation

18.1.1 BINARY DATA

To maximize the amount of data you can send in a transmission, your data has been compressed into binary data. The binary data is sent as ASCII text that is viewable in a text editor. The downloaded data will appear in the same form that it was sent.

Some example GOES data:
350/11:00 122
@@PA@@J@@
A@@@@HB@@
@ATLKhGKy
@ATLKpHKy
@ATLKpHKy
@ATLKpHKy
@ATLKpGKz
@ATLKpHKz
@ATLKhGK{
@ATLKhHK{
@ATLKhHK{
END

Some example RDP data:
350/10:00 122 RDP_C Dump
`@DA@@G@P@@C@@J
@P@@@PA@`@@@@@B
@@TLWaU^Bcd@@DH
@@TLWaU^Bcd@@DG
@@TLWaU^Bcd@@DG
@@TLWQU^Bcd@@DG
@@TLWaU^Bch@@DG
@@TLWaU^Bch@@DG
@@TLWaU^Bch@@DG
@@TLWaU^Bch@@DG
@@TLWaU^Bch@@DG
@@TLWaU^Bcl@@DH
@@TLWaU^Bcl@@DH
@@TLWaU^Bcl@@DG
END

To view this as more meaningful data you need to run translator program that is provided by ATS on request. The translated data for the RDP style dump is the same as a normal offloaded data file.

18.1.2 GOES Translated Output Format

1533C4CE08261161223G43+1NN180WFF00424`

Day/Hr:Min	Volts	Freq	Code	Ant#	Signal	Hr:Min	#Matches
261/07:00	12.6	150684	16	0	119	7:01	15
261/07:00	12.6	150684	16	1	126	7:08	15
261/07:00	12.6	150684	16	2	95	7:02	5
261/07:00	12.6	150684	16	0	121	7:19	10
261/07:00	12.6	150684	16	1	114	7:19	14
261/07:00	12.6	150684	16	2	106	7:19	12
261/07:00	12.6	150684	16	0	125	7:25	7
261/07:00	12.6	150684	16	1	137	7:25	8
261/07:00	12.6	150684	16	2	120	7:25	7
261/07:00	12.6	150684	16	0	129	7:38	13
261/07:00	12.6	150684	16	1	137	7:38	16
261/07:00	12.6	150684	16	2	122	7:31	15
261/07:00	12.6	150684	16	0	140	7:49	15
261/07:00	12.6	150684	16	1	142	7:49	15
261/07:00	12.6	150684	16	2	121	7:45	8
261/07:00	12.6	150684	16	2	136	7:59	22
261/07:00	12.6	150684	16	0	138	7:59	14
261/07:00	12.6	150684	16	1	137	7:54	15

END

Day: A number from 1-366 representing the Julian day (1-366 for a leap year, otherwise 1-365). This appears in the transmission header of R4520C and it indicates the day the data was processed for transmission.

Hr: A number from 0-23 representing the hour. This appears in the transmission header of the R4520C and it indicates the hour the data was processed for transmission. The data is sent from the R4520C at the top of the hour over to the GOES transmitter. This hour represents the hour previous to the hour the data is sent. If the transmissions are keeping up with the data collection this will be the same hour as the hour the data was collected.

Volts: Voltage to the tenths of volts representing the system voltage at the time the data was sent over to the GOES transmitter. This appears in the transmission header of R4520C.

Freq: A number representing the transmitter's frequency. It will be a number from 0-9999 representing the last four digits of the frequency.

Code: The number representing the code of the detected transmitter.

Ant#:   A number from 0-8 representing the antenna being used. A "0" indicates all antennas were turned on.

Hr: Min: A number representing the hour and minute this data point was saved to memory.

#Matches: A number from 1-255 representing the number of codes detected during the scan.

END: The END appears at the end of the data sent to the GOES. If it does not appear you know the data transmission was incomplete and some data was lost.

JULIAN DATE CALENDAR

(PERPETUAL)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	001	032	060	091	121	152	182	213	244	274	305	335	1
2	002	033	061	092	122	153	183	214	245	275	306	336	2
3	003	034	062	093	123	154	184	215	246	276	307	337	3
4	004	035	063	094	124	155	185	216	247	277	308	338	4
5	005	036	064	095	125	156	186	217	248	278	309	339	5
6	006	037	065	096	126	157	187	218	249	279	310	340	6
7	007	038	066	097	127	158	188	219	250	280	311	341	7
8	008	039	067	098	128	159	189	220	251	281	312	342	8
9	009	040	068	099	129	160	190	221	252	282	313	343	9
10	010	041	069	100	130	161	191	222	253	283	314	344	10
11	011	042	070	101	131	162	192	223	254	284	315	345	11
12	012	043	071	102	132	163	193	224	255	285	316	346	12
13	013	044	072	103	133	164	194	225	256	286	317	347	13
14	014	045	073	104	134	165	195	226	257	287	318	348	14
15	015	046	074	105	135	166	196	227	258	288	319	349	15
16	016	047	075	106	136	167	197	228	259	289	320	350	16
17	017	048	076	107	137	168	198	229	260	290	321	351	17
18	018	049	077	108	138	169	199	230	261	291	322	352	18
19	019	050	078	109	139	170	200	231	262	292	323	353	19
20	020	051	079	110	140	171	201	232	263	293	324	354	20
21	021	052	080	111	141	172	202	233	264	294	325	355	21
22	022	053	081	112	142	173	203	234	265	295	326	356	22
23	023	054	082	113	143	174	204	235	266	296	327	357	23
24	024	055	083	114	144	175	205	236	267	297	328	358	24
25	025	056	084	115	145	176	206	237	268	298	329	359	25
26	026	057	085	116	146	177	207	238	269	299	330	360	26
27	027	058	086	117	147	178	208	239	270	300	331	361	27
28	028	059	087	118	148	179	209	240	271	301	332	362	28
29	029		088	119	149	180	210	241	272	302	333	363	29
30	030		089	120	150	181	211	242	273	303	334	364	30
31	031		090		151		212	243		304		365	31

FOR LEAP YEAR USE OTHER CHART

JULIAN DATE CALENDAR

(FOR LEAP YEARS ONLY)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Day
1	001	032	061	092	122	153	183	214	245	275	306	336	1
2	002	033	062	093	123	154	184	215	246	276	307	337	2
3	003	034	063	094	124	155	185	216	247	277	308	338	3
4	004	035	064	095	125	156	186	217	248	278	309	339	4
5	005	036	065	096	126	157	187	218	249	279	310	340	5
6	006	037	066	097	127	158	188	219	250	280	311	341	6
7	007	038	067	098	128	159	189	220	251	281	312	342	7
8	008	039	068	099	129	160	190	221	252	282	313	343	8
9	009	040	069	100	130	161	191	222	253	283	314	344	9
10	010	041	070	101	131	162	192	223	254	284	315	345	10
11	011	042	071	102	132	163	193	224	255	285	316	346	11
12	012	043	072	103	133	164	194	225	256	286	317	347	12
13	013	044	073	104	134	165	195	226	257	287	318	348	13
14	014	045	074	105	135	166	196	227	258	288	319	349	14
15	015	046	075	106	136	167	197	228	259	289	320	350	15
16	016	047	076	107	137	168	198	229	260	290	321	351	16
17	017	048	077	108	138	169	199	230	261	291	322	352	17
18	018	049	078	109	139	170	200	231	262	292	323	353	18
19	019	050	079	110	140	171	201	232	263	293	324	354	19
20	020	051	080	111	141	172	202	233	264	294	325	355	20
21	021	052	081	112	142	173	203	234	265	295	326	356	21
22	022	053	082	113	143	174	204	235	266	296	327	357	22
23	023	054	083	114	144	175	205	236	267	297	328	358	23
24	024	055	084	115	145	176	206	237	268	298	329	359	24
25	025	056	085	116	146	177	207	238	269	299	330	360	25
26	026	057	086	117	147	178	208	239	270	300	331	361	26
27	027	058	087	118	148	179	209	240	271	301	332	362	27
28	028	059	088	119	149	180	210	241	272	302	333	363	28
29	029	060	089	120	150	181	211	242	273	303	334	364	29
30	030		090	121	151	182	212	243	274	304	335	365	30
31	031		091		152		213	244		305		366	31

(USE IN 2008, 2012, 2016, 2020, ETC.)