HOLT INC.
INTEGRATED CIRCUITS

MIL-STD-1553 Remote Terminal GUI User Guide

Devices Supported
HI-2130
HI-6120, HI-6121
HI-6130, HI-6131
HI-6135, HI-6136
HI-6137, HI-6138

September 2015

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1. INTRODUCTION

The Holt *RT Configuration Wizard* is a Windows compatible program for setting up MIL-STD-1553B remote terminals based on Holt's 1553 protocol ICs. Without a lengthy datasheet familiarization process, the user can quickly generate RT configuration tables and device settings for use with these Holt devices: HI-2130, HI-6120, HI-6121, HI-6130, HI-6131, HI-6135, HI-6136, HI-6137 and HI-6138. The HI-2130, HI-6130 and HI-6131 devices can operate two concurrent remote terminals; *RT Configuration Wizard* can independently configure both RTs by running two successive passes through the program.

The program saves time by asking important questions first. Then, only the necessary configuration screens are shown to complete the project design.

Once configured, it is a simple matter to make changes:

- add or remove transmit (Tx) or receive (Rx) subaddresses
- enable or disable "illegal command detection" (ICD)
- if using ICD, quickly add or remove legal word counts for any Tx or Rx subaddress
- if using ICD, automatically configure shared "bit bucket" buffers for illegal subaddresses and mode codes
- if not using ICD, automatically configure shared "bit bucket" buffers for unimplemented sub-addresses
- enable or disable broadcast commands
- with broadcast enabled, add or remove "Notice 2" segregation for Rx subaddress data for broadcast messages
- convert HI-612x projects for use with HI-613x (or vice versa)
- for HI-613x projects, reserve RAM space for BC or bus monitor when assigning RT RAM
- enable or disable "simple mode command processing" vs. conventional RAM buffers
- change RAM buffer style (Indexed, Index-Zero, Ping-Pong or Circular types 1 or 2)
- quickly change buffer size for Indexed, Circular-1 or Circular-2 subaddresses
- add or remove message interrupts
- add or remove mode code commands, or change mode command options
- for any change(s), instantly generate new configuration tables and update RAM addressing
- generated tables and files are C- language compatible, plain text files
- evaluate reconfiguration impact in minutes, not hours or days

When projects are saved, all program settings are stored. Reloaded projects can be modified and resaved using the same (or a new) project name. Incomplete projects can be saved then reloaded later for completion.

2. STARTING THE PROGRAM

There are two options: start a new project or load a previously-saved project. To select a previously saved project for review and/or edit, select the desired project name from the pull-down “combo box” before clicking the **LOAD SELECTED PROJECT** button. Saved project names use a ***.HPF** file extension (in order to appear in the “combo box” file selector).

A project can only be saved on the first and last screens in the program. An unfinished new project can be saved in an incomplete state by repeatedly clicking the BACK button until reaching the opening screen (Sheet 1). Once there, type a project name without file extension in the “combo box” then click SAVE PROJECT button. Two files are saved in the directory where the program resides. The program adds the .RT1.HPF and .RT1.DAT file extensions (or .RT2.HPF and .RT2.DAT extensions for RT2 in a dual-RT HI-6130 or HI-6131 project):

- *projectName.RT1.HPF*
- *projectName.RT1.DAT*

Both files are needed when loading a saved project. One file contains the “form” data, including all checkmarks, selections and value entries; the other file contains non-graphical data about your project.

IMPORTANT: These files do not include output text file data that is generated by the program at the last screen (sheet 15). But, as long as you have both files listed above, the output text files can be recreated for completed projects by loading the project, then using the NEXT button to advance to the final screen (sheet 15) in the program. At Sheet 15, the MAKE OUTPUT FILES button generates output text files and saves them in the program directory.

3. SHEET 2. TOP-LEVEL CHOICES

Selections on Sheet 2 greatly impact the following data input process and the manner in which the data is compiled. Figure 1 shows a screen shot of the Sheet 2 top level choices.

When a completed project is reloaded, revisiting Sheet 2 lets you change project settings such as device type, broadcast command handling and other criteria. Example: If you reload a pre-existing project at Sheet 1 having broadcast commands disabled, you can enable broadcast commands here (or vice versa). If broadcast commands are disabled, several data input screens are skipped, later. If converting from broadcast-disabled to broadcast-enabled, using the NEXT button to advance through data input screens now opens previously skipped screens for characterizing the newly added broadcast commands.

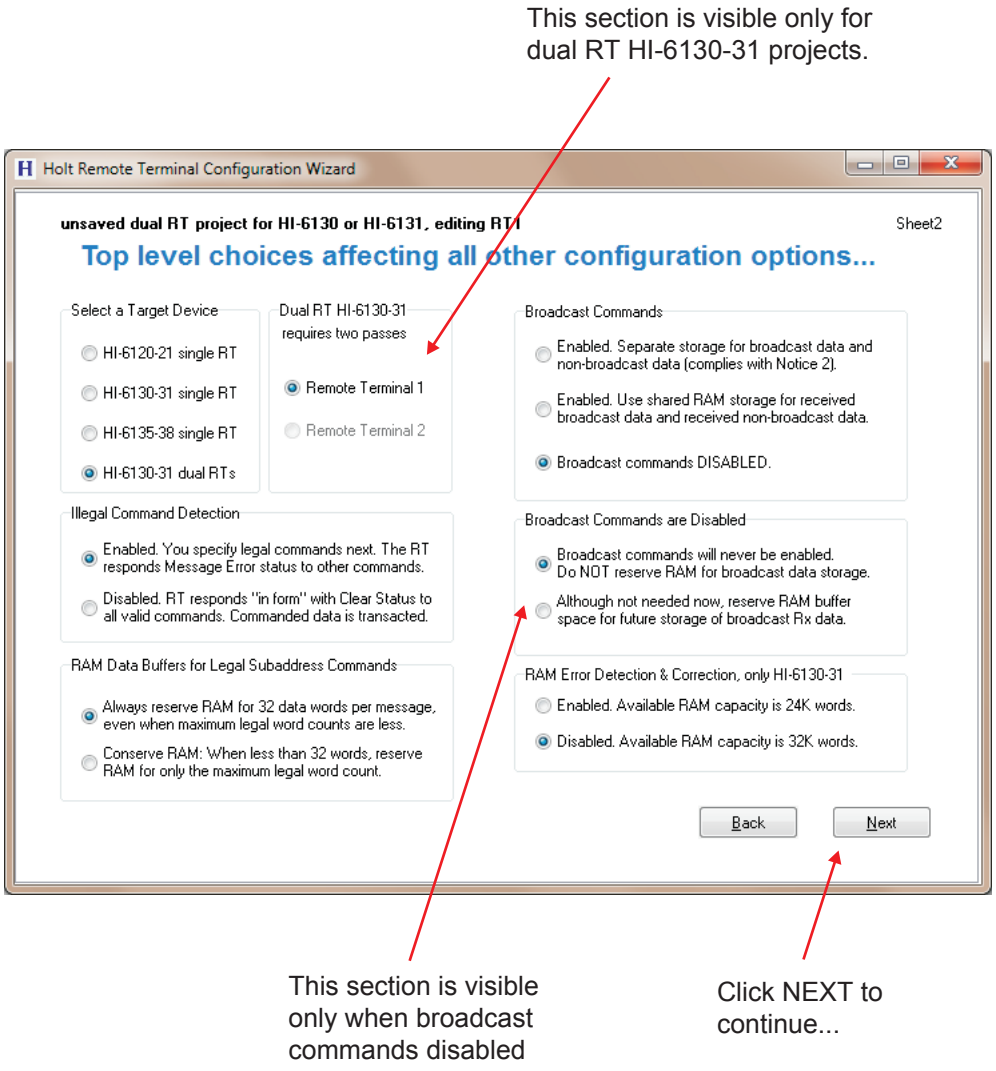


Figure 1. Sheet 2 Notes.

Formative changes occur when enabling or disabling “Illegal Command Detection” on Sheet 2. In MIL-STD-1553, illegal command detection is considered an option. The *RT Validation Test Plan* describes different behavior for “response to commands” based on this setting. These differences are fully handled by the Holt 1553 protocol device, and this program asks you for just the necessary information based on your Sheet 2 selections:

- When illegal command detection (ICD) is disabled, the RT responds “in form” to all valid commands, whether or not the information conveyed is meaningful. The RT responds “Clear Status” to all non-broadcast messages (unless data word error occurs) and transacts the number of message data words commanded in the received command word. All transmit and receive subaddresses 0-30 must be prepared to transact the full range of data word counts, from 1 to 32 data words. With ICD OFF, the RT Wizard program presents an option to conserve buffer RAM space by letting you identify “implemented” transmit and receive subaddresses. From the full range of subaddresses 0 through 30, “implemented subaddresses” comprise the meaningful subset where transacted data is actually used. To save RAM, user is given

the option (on Sheet 2) to assign a 34-word junk data “bit bucket” RAM buffer shared by all unimplemented transmit and receive subaddresses. From the standpoint of device function, data for unimplemented subaddresses must be stored somewhere in RAM. A single shared buffer is more efficient than assigning a dedicated RAM buffer for each unimplemented subaddress (although the program can do so, if you choose).

- Most “real world” applications probably use illegal command detection (ICD ON). When ICD is enabled, the remote terminal differentiates between “legal” and “illegal” commands. When an illegal command is received, the RT responds Message Error status and no data words are transacted. Legal vs. illegal can be sorted by transmit/receive status, broadcast vs. non-broadcast for receive commands, as well as individual data word counts within a transmit (Tx) or receive (Rx) subaddress. For example: a 15-word transmit command for subaddress 10 can be illegal, while all receive commands (having any data word count 1 to 32) for the same subaddress are legal. Broadcast Rx commands to the same subaddress may be treated differently from non-broadcast receive commands. The RT Wizard program guides the user through a series of screens defining legal/illegal status, then generates a “command illegalization table” stored in device RAM.

The majority of following data input screens differentiate legal commands from illegal commands when ICD is enabled. When ICD is disabled, just three screens are needed to identify implemented subaddresses, but not word counts.

Figure 2 and Figure 3 show program flow charts for single-RT and dual-RT (HI-613x only) implementations respectively.

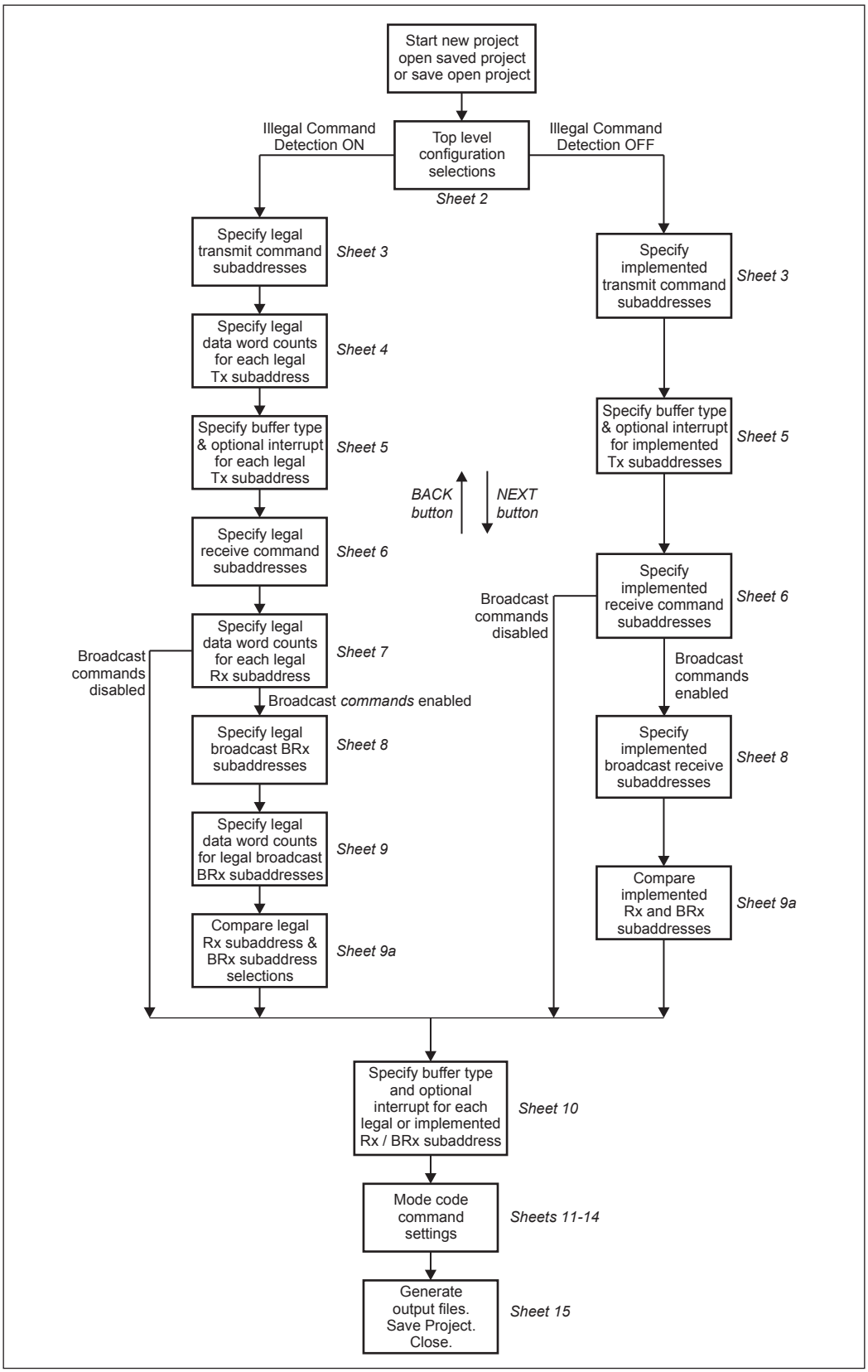


Figure 2. Program Flow Chart.

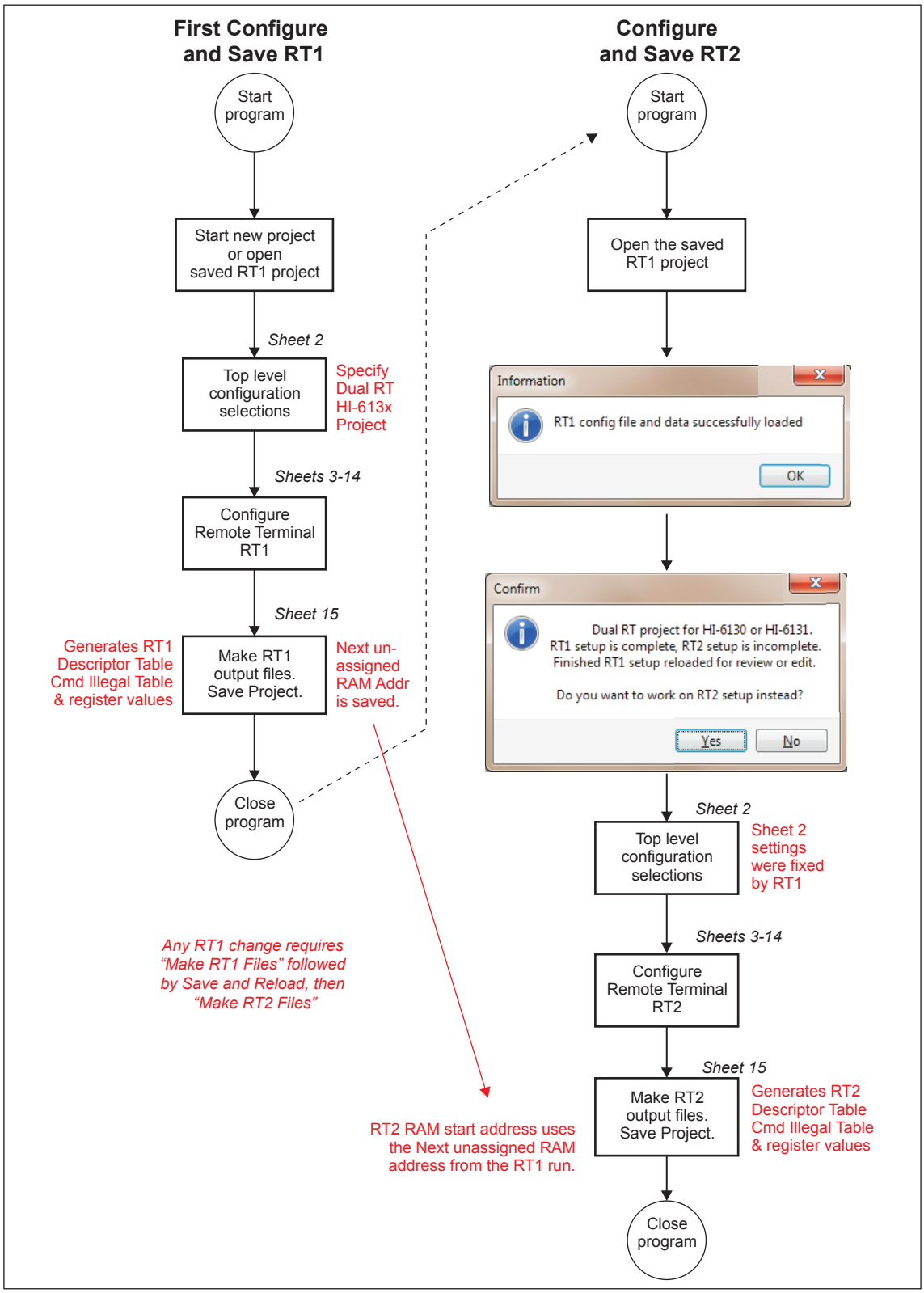


Figure 3. Two Pass Sequence for Dual-RT HI-613x Project.

4. TRANSMIT AND RECEIVE SUBADDRESS COMMAND DATA INPUT SHEETS 3 - 10

Notes for these data input sheets are presented in the following pages as a series of screen captures with added comments.

For the word-count selection screens (Sheets 4, 7 and 9) and buffer/interrupt selection screens (Sheets 5 and 10), there are two significantly different operating modes. The left side of each screen is used for subaddress selection; the right side is used for assigning either word counts or buffer/interrupt choices.

- When the screens are initially entered for a new project, the left-side panel is yellow. Multiple subaddresses can be selected on the left half of the screen for simultaneous and identical option assignment. In the three word count select screens, as few as three mouse clicks can select all legal subaddresses 0-30, and then assign the same range of legal word counts, for example all word counts 1-32.
- Once option selection is fully complete for all eligible subaddresses, the sheet switches to single subaddress “Review and Edit” mode. At this transition, the left side subaddress selection panel changes to green color and only one subaddress can be selected. When this transition occurs, the NEXT button on the screen is enabled. See Figure 6 on page 12 for an example showing the “green button” transition. The user has the option of clicking an individual subaddress on the left-side green panel, to reveal the setting for the individual subaddress. Changes can be made for the selected individual subaddress, entered by clicking the UPDATE button. Failure to click UPDATE means the modification is not entered.
- After loading a saved project (assuming it was completed) each word selection and buffer/interrupt selection screen opens in the green Subaddress “Review and Edit” mode.

  A green screen occurs when all subaddresses requiring configuration are defined on the current page. The user has three options:

  - Select an individual subaddress for review or edit by clicking its radio button on the left panel. Settings for the selected subaddress will appear and can be modified by entering changes, **then clicking the UPDATE button**.
  - Click the BACK button one or more times to review or modify settings on earlier screens. To save an unfinished project, click BACK repeatedly until Sheet 1 appears; the SAVE button is found there. Be sure the desired file name is shown in the text entry box before clicking SAVE.
  - Click the NEXT button to continue the project design process. Most screens do not activate NEXT until the green screen occurs.

Program sheet 3 presents the opportunity to enable or disable the MIL-STD-1553 option known as “data wrap-around”. Transmit subaddress 30 and receive subaddress 30 are usually reserved for this purpose, although sheet 3 lets you select a nonstandard SA number. A bus controller uses data wrap-around to perform two-part loopback tests. In the first part, the BC sends data words to the RT by issuing a receive command to Rx SA30. In the second part, the BC issues one or more transmit commands to Tx SA30. The RT responds by transmitting the same data words stored from the previous Rx SA30 receive command.

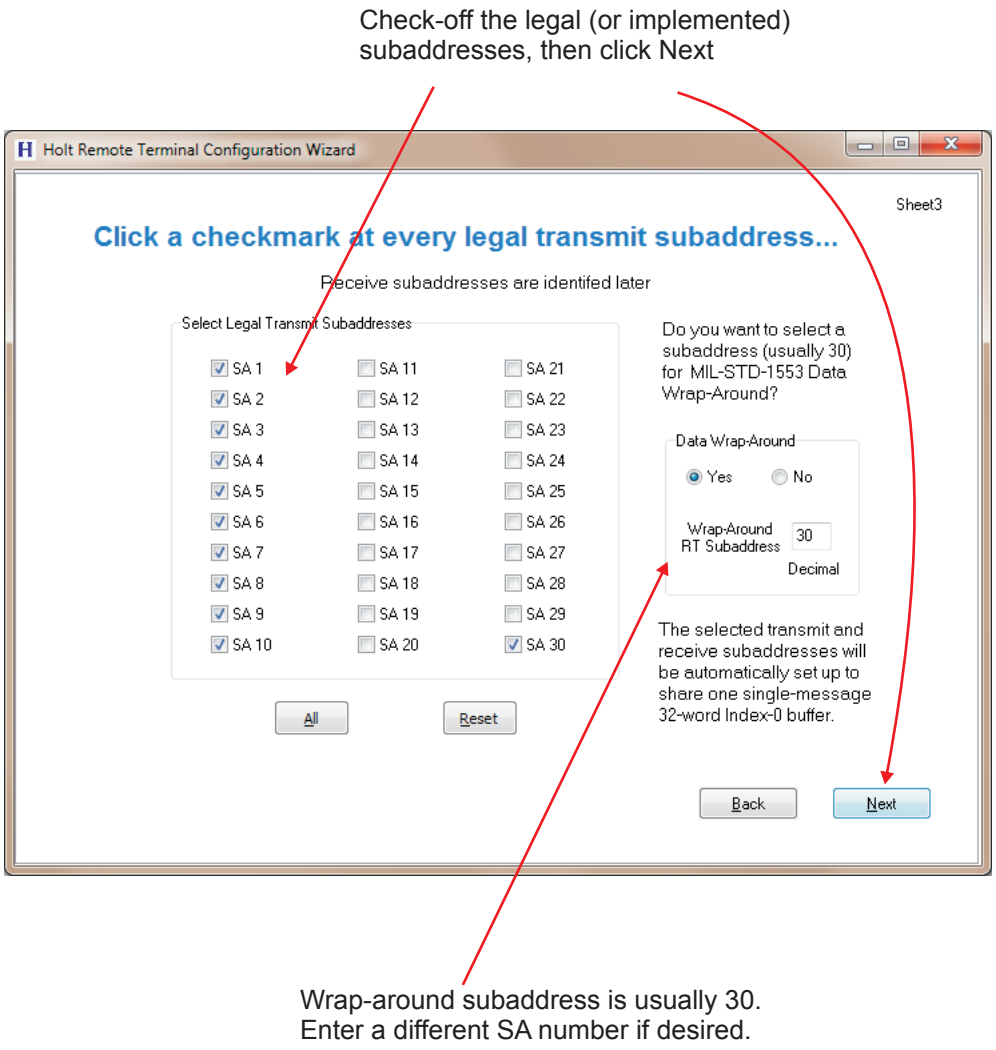


Figure 4. Sheet 3 Notes.

Data wrap-around is implemented by assigning the same Index-0 (single message mode) RAM buffer for both Tx SA30 and Rx SA30. The RT Wizard program automatically configures the chosen data wrap-around subaddress in sheets 2 – 10. In general, the program lets you examine SA30 settings in “green screen” review / edit mode, but SA30 changes (SA enable/disable, legal word count selection and buffer type) are disallowed.

If you notice subaddress SA30 behaving differently, the reason is data wrap-around configuration.

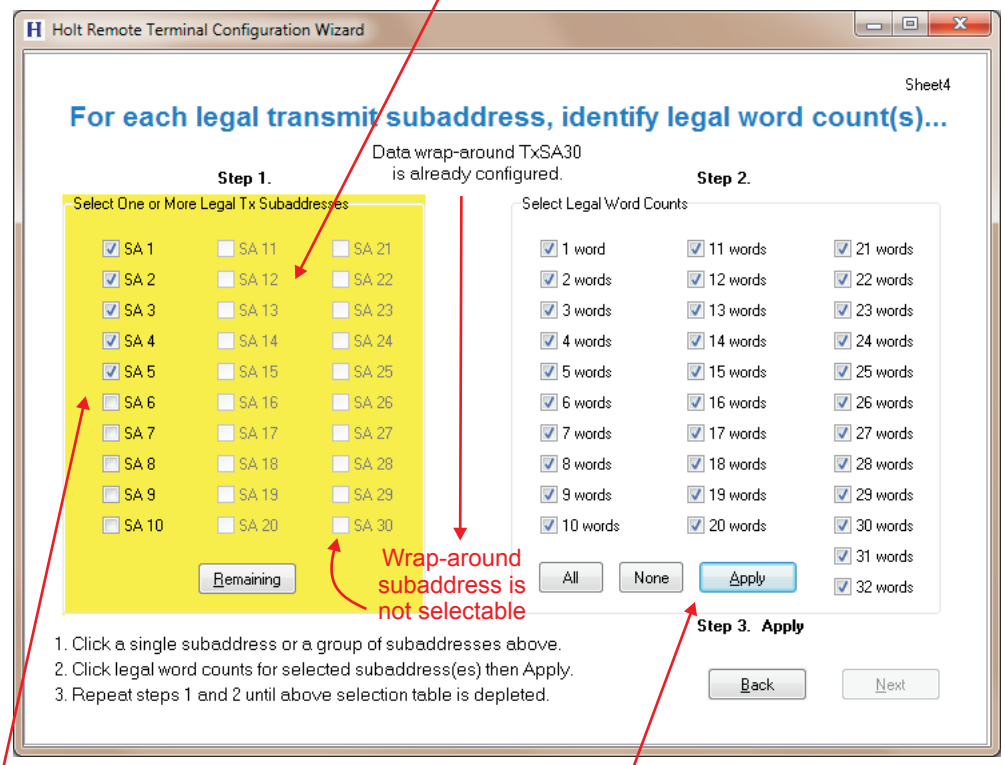
If ICD (illegal command detection) is disabled at Sheet 2, this step selects implemented subaddresses which transact meaningful data. Unselected subaddresses (not implemented) will share a “bit bucket” data buffer.

Pressing NEXT goes to Transmit Subaddress “word count” selection, Sheet 4...

If ICD (illegal command detection) is disabled at Sheet 2, this step is skipped.

This panel is yellow while one or more subaddresses remain unconfigured.

Only subaddresses declared legal on the previous screen can be checked-off



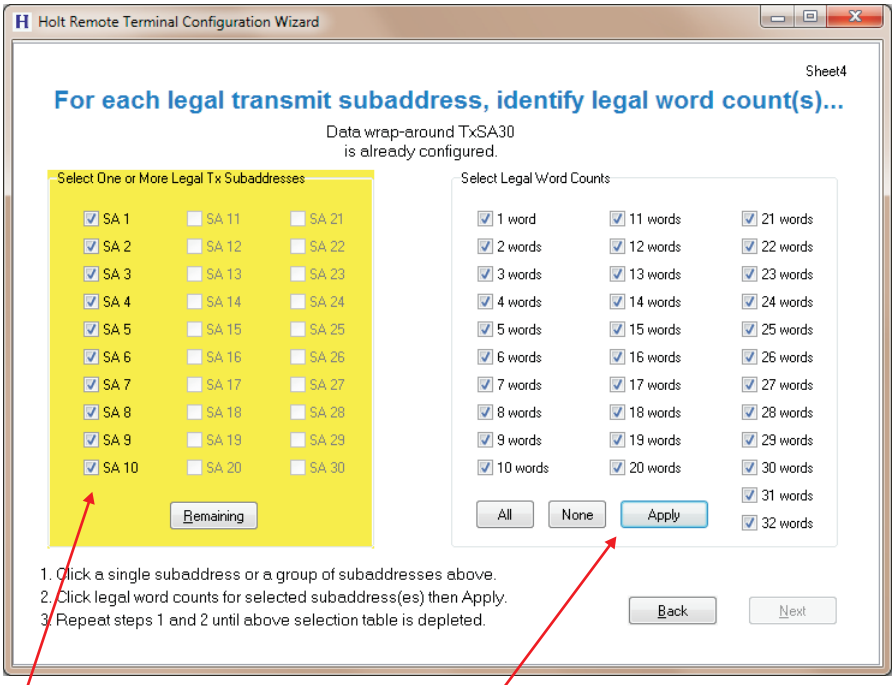
Select multiple subaddresses for identical configuration, or one subaddress at a time for unique configuration.

Click Apply to configure selected subaddresses with the chosen word count(s).

Figure 5. Sheet 4 Notes.

Legal word count selection for transmit subaddresses (only if ICD is ON)

Continuing Transmit Subaddress “word count” selection, Sheet 4...



If all remaining subaddresses are selected for configuration...

and Apply is clicked to configure the remaining subaddresses...

...the yellow panel goes green: This means all subaddresses are configured...

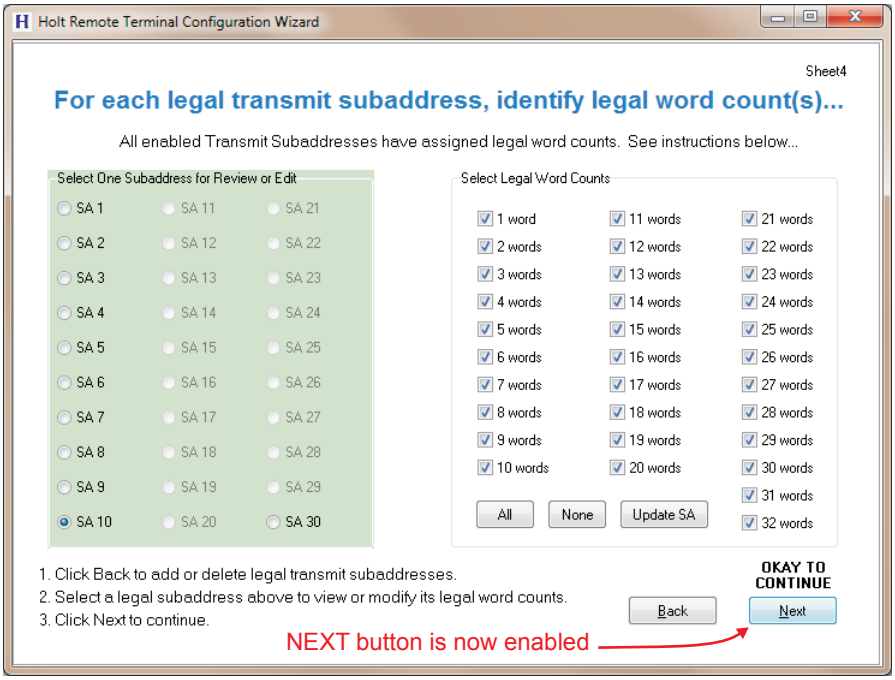


Figure 6. Sheet 4 Notes.

Legal Word Count Selection (only if ICD is ON).

Continuing Transmit Subaddress “word count” selection, Sheet 4...

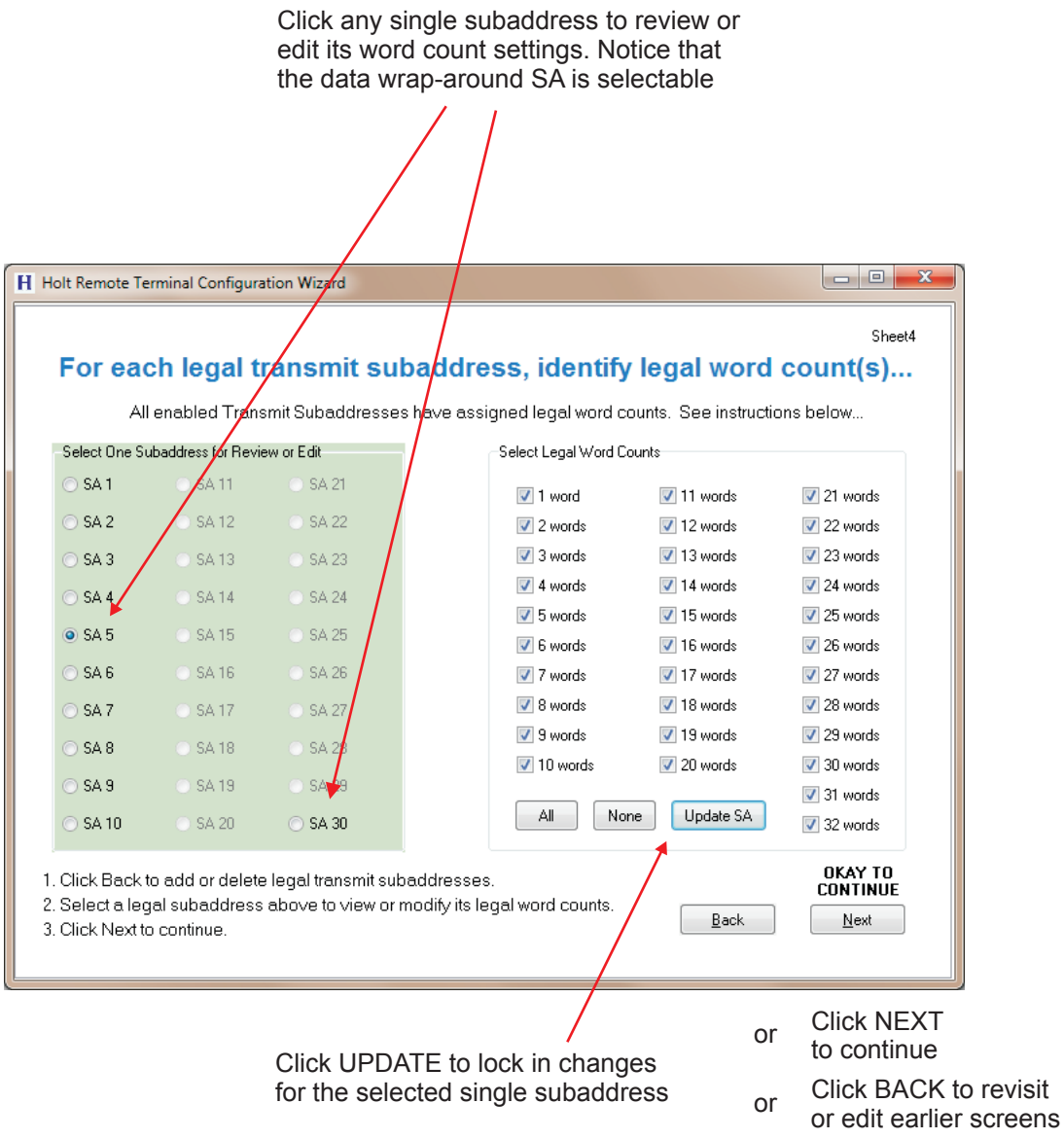


Figure 7. Sheet 4 Notes.

Legal Word Count Selection (only if ICD is ON)

In this example, transmit subaddress 5 is checked. The right side shows all legal word counts for Tx SA5. User can revise Tx SA5 word counts but must click the UPDATE SA button to lock in any transmit subaddress 5 changes.

Pressing Next goes to Sheet 5...

Transmit Subaddress buffer type and message interrupt selection...

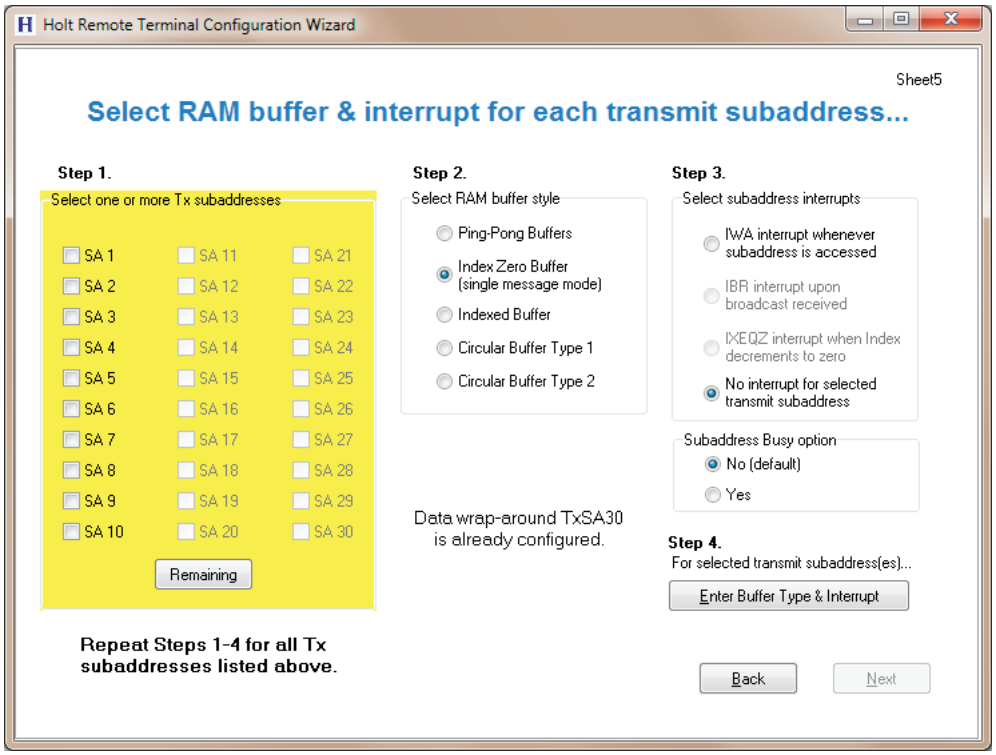


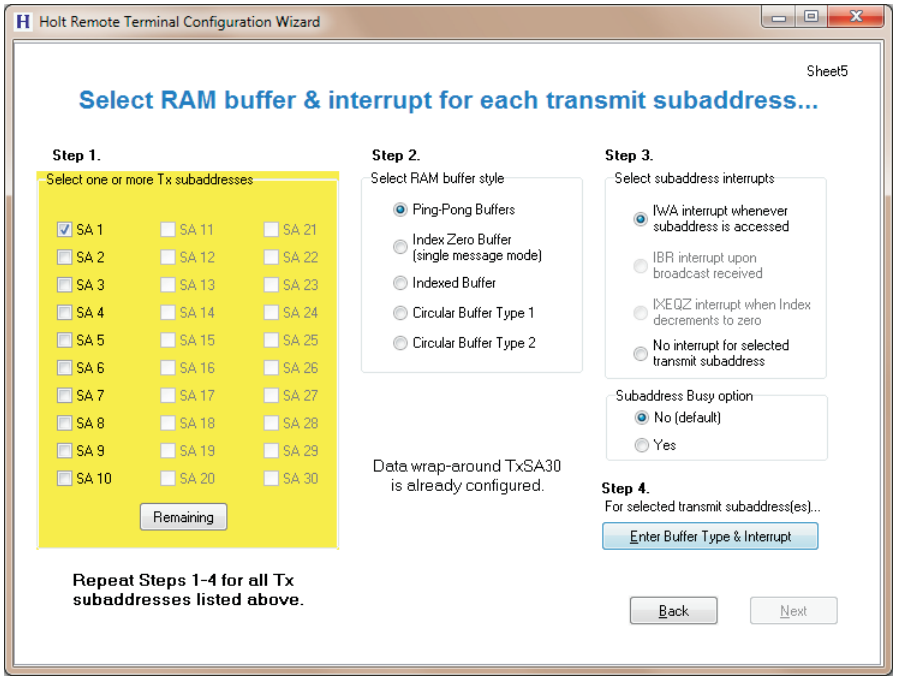
Figure 8. Sheet 5 Notes.

Here we select data buffer style and message interrupts for the legal transmit subaddresses.

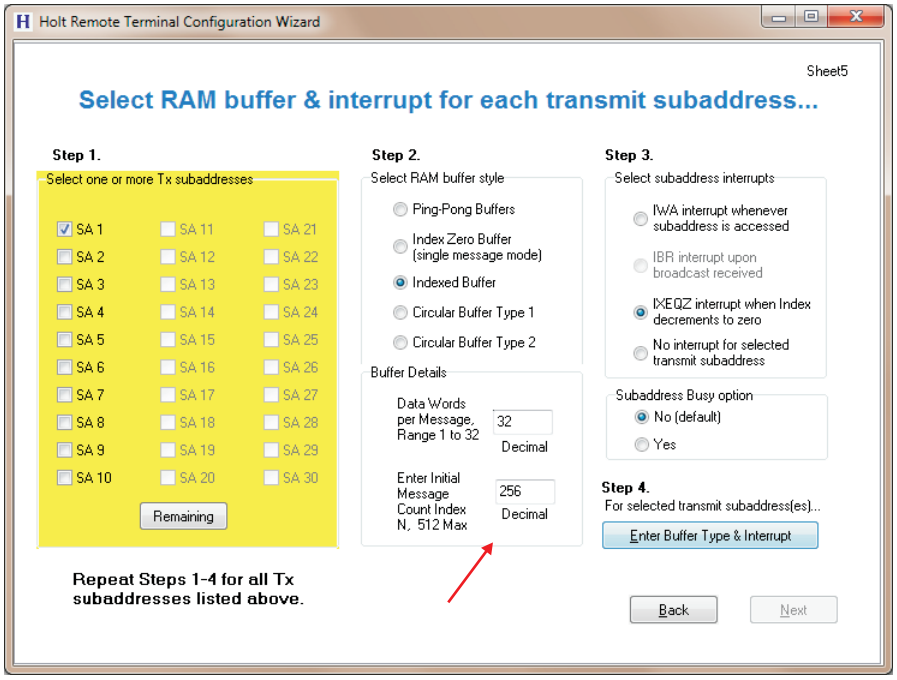
Select multiple subaddresses in the yellow panel for identical configuration, or a select single subaddress for unique configuration.

Like word count assignment we just completed, this screen locks out NEXT until all enabled subaddresses are configured. NEXT button is enabled when the yellow panel turns green.

There are five buffer choices. Message interrupt options differ by buffer type.

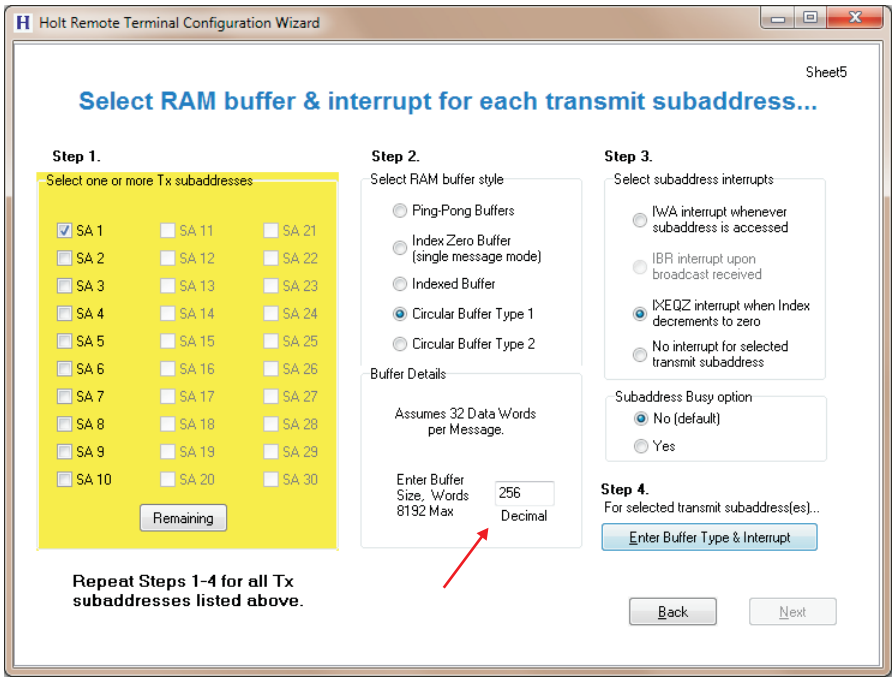


Index-0 (single message mode) or ping-pong buffer selection screen

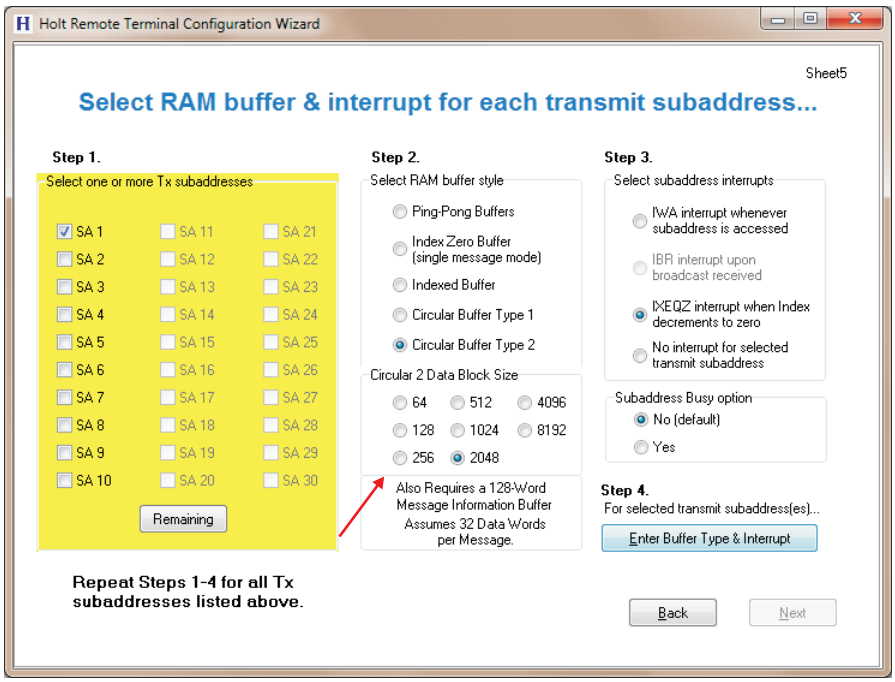


Indexed buffer selection screen
Enter number of messages and message size

Figure 9. Sheet 5, Index Buffering.



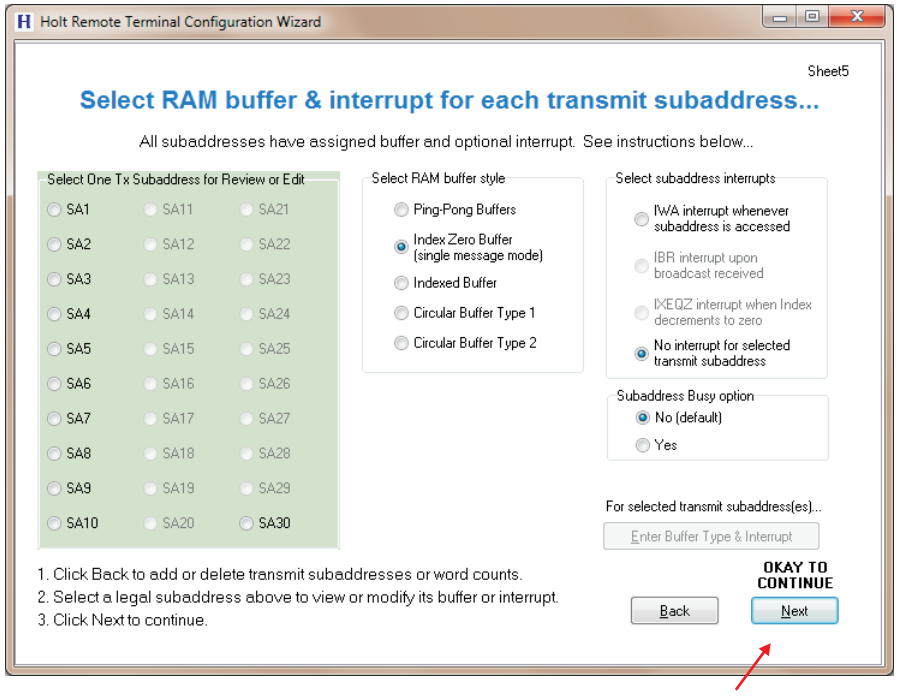
Circular buffer type 1 selection screen
Enter buffer size



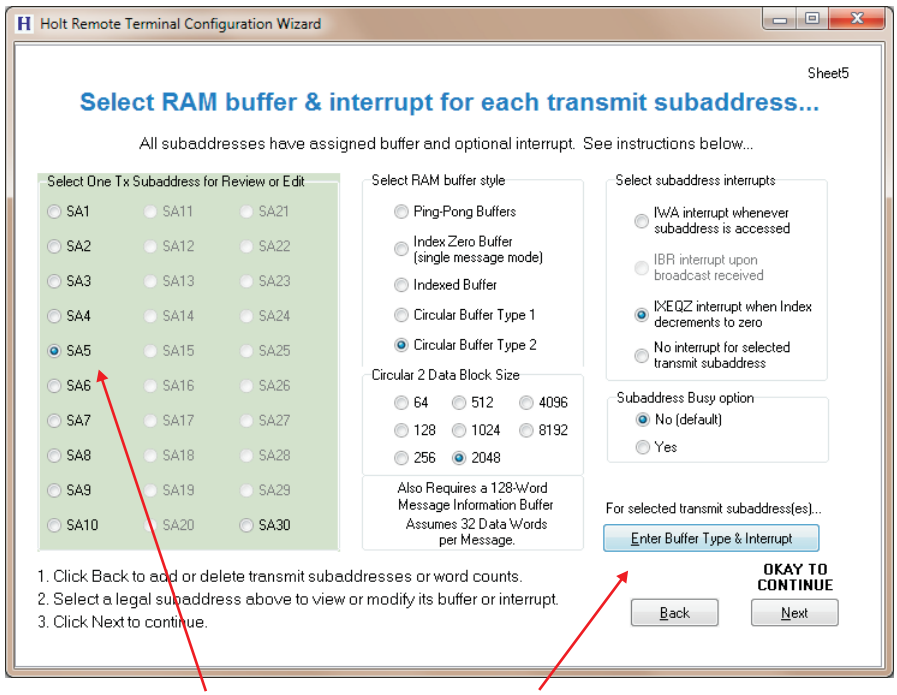
Circular buffer type 2 selection screen
Select buffer size

Figure 10. Sheet 5, Circular Buffering.

When all subaddresses have assigned buffer type, the yellow panel goes green...



With all subaddresses assigned, the NEXT button is enabled

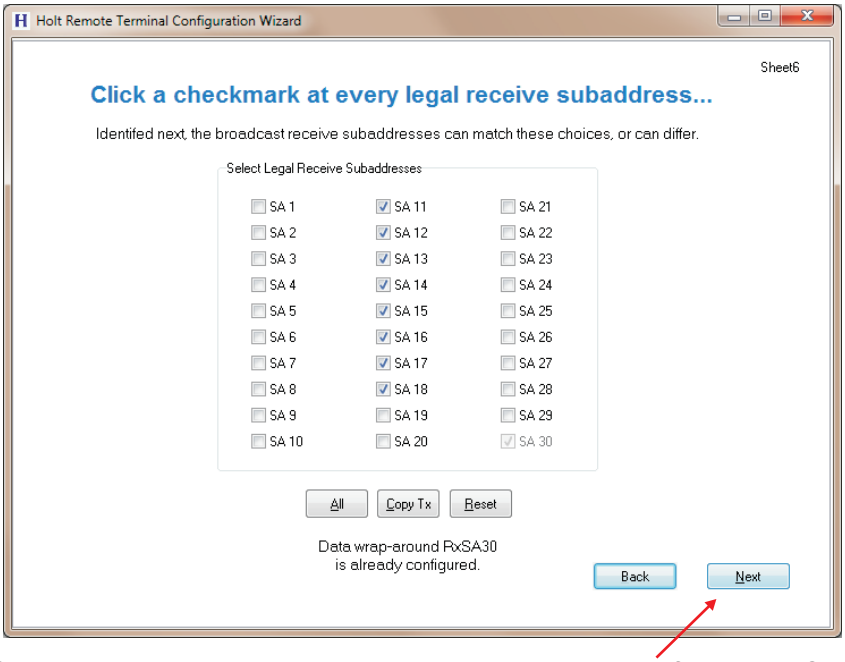


or user can select an individual subadddress to view or edit settings before continuing. Click ENTER BUFFER TYPE to lock-in changes.

Figure 11. Transmit Subaddress Selection Completed. .

Pressing NEXT starts Receive Subaddress selection (non-broadcast)...

This is nearly identical to the transmit subaddress Sheet 3. If broadcast is enabled (Sheet 2) broadcast subaddresses are entered later.



Clicking NEXT starts Rx word count selection, just like we did for transmit SAs.
If ICD is disabled, skip the next sheet (7).
Below, we clicked REMAINING then ALL word counts for a quick configuration...

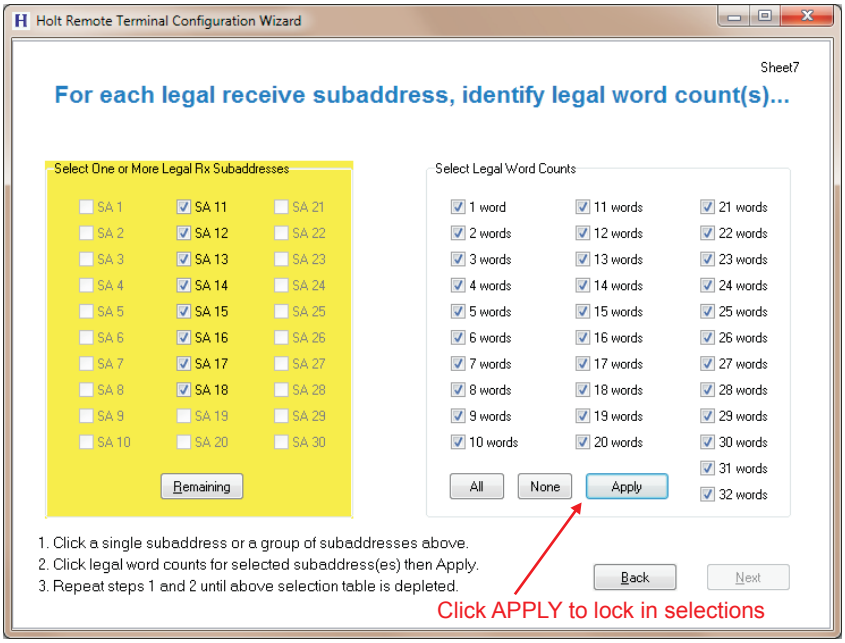
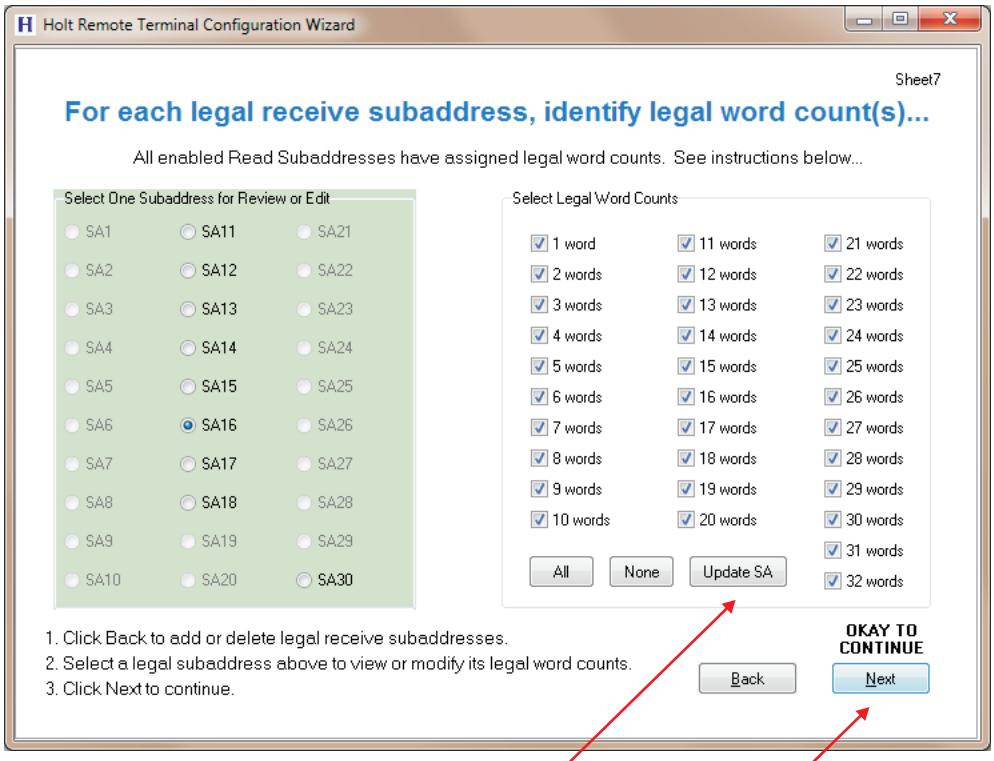


Figure 12. Receive Subaddress Selection.

Clicking APPLY selected word counts for the enabled Receive Subaddresses. Since no remaining subaddresses need word count selection, the yellow panel turned green and the NEXT button was enabled.

Below, SA16 is selected for review and possible edit. We unselected word counts 30 through 32; the user would click UPDATE SA to lock-in that change. Assume user does NOT change SA16 word counts, but instead clicks NEXT below..

When broadcast is enabled (at Sheet 2), we will enter setup for those messages next. The most likely situation is enabling identical receive subaddresses (and word counts) for both broadcast and non-broadcast messages. BUT hardware also allows receive subaddresses that are broadcast-only, or non-broadcast-only. This will be shown in the example...



Click UPDATE to lock in any SA16 changes,

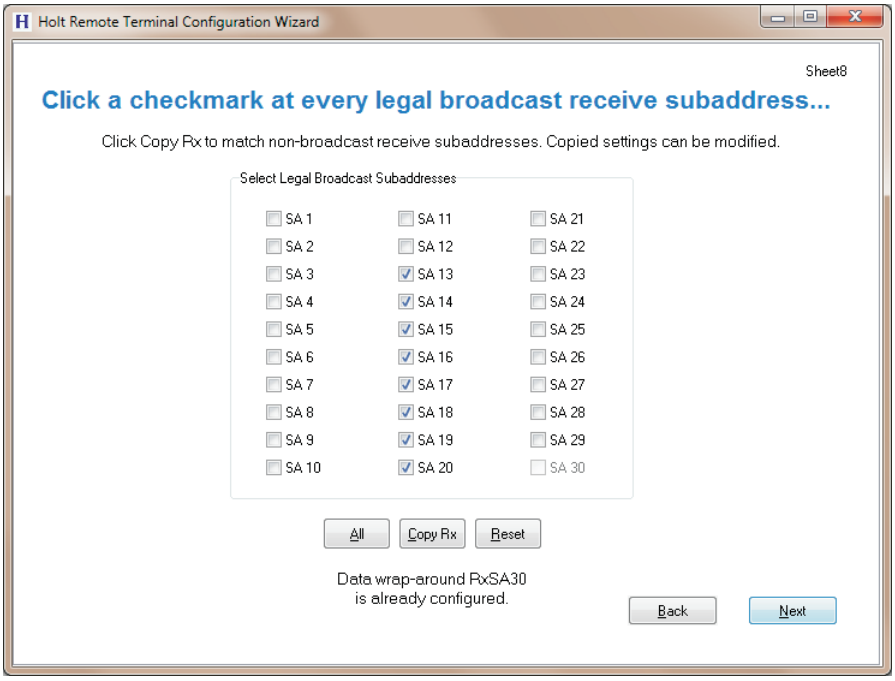
or click NEXT to continue...

Assume user clicks NEXT without changing SA16...

If broadcast is disabled, program jumps to Sheet 10.
If broadcast is enabled, program goes to Sheet 8...

Figure 13. Receive Subaddress Selection Completed.

In many cases, broadcast receive will mirror just-completed Sheets 6 and 7.



We purposely picked a different (but overlapping) set of subaddresses from non-broadcast receive commands.
Clicking NEXT goes to word count selection, just like we did for Tx and Rx SAs.

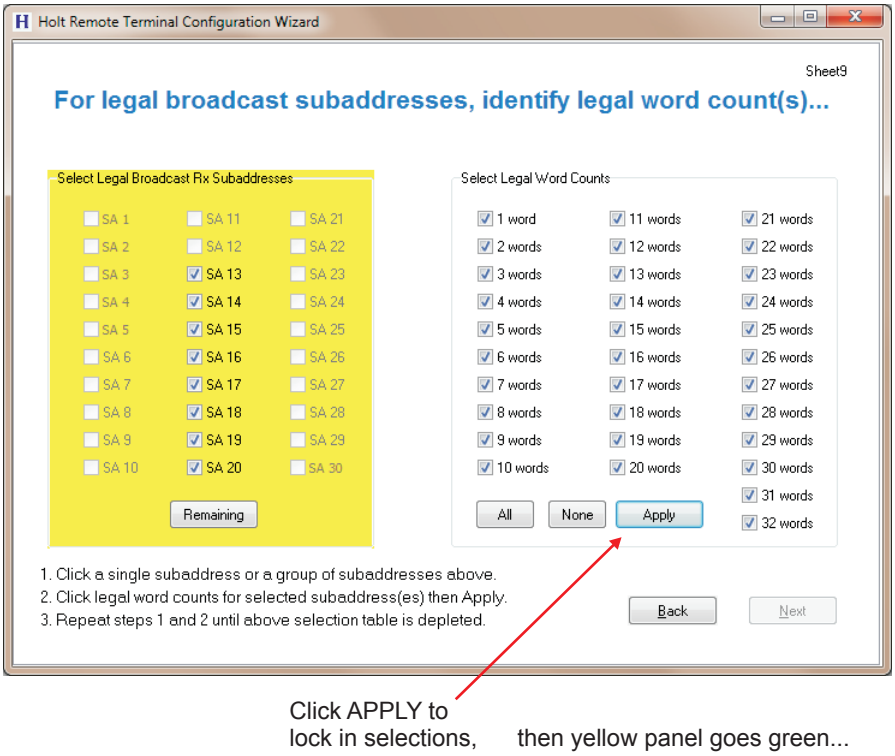


Figure 14. Sheet 8 Broadcast Receive Subaddress selection.

We have a potentially confusing situation with receive and broadcast receive messages.

With broadcast messages enabled, it is possible (but perhaps unlikely) that these messages will have a different selection of enabled subaddresses. in fact, it is possible to have a mix of subaddresses that are receive-only, broadcast-only, or receive and broadcast ready.

If illegal command detection (ICD) was enabled at Sheet 2, a further complication for subaddresses okay for both receive and broadcast is that the broadcast and non-broadcast variants may have different selections for legal word counts for one or more subaddresses. Flexibility may be nice, but might cause confusion!

The confusion is avoidable if (1) identical sets of receive subaddresses apply for both broadcast and non-broadcast messages, and (2) legal word counts match for each enabled receive subaddress, such as all word counts 1-32 are legal.

For demonstration purposes, our example will purposely violate both guidelines (1) and (2) to show how to deal with these complexities.

We will change word counts for one broadcast subaddress, SA16...

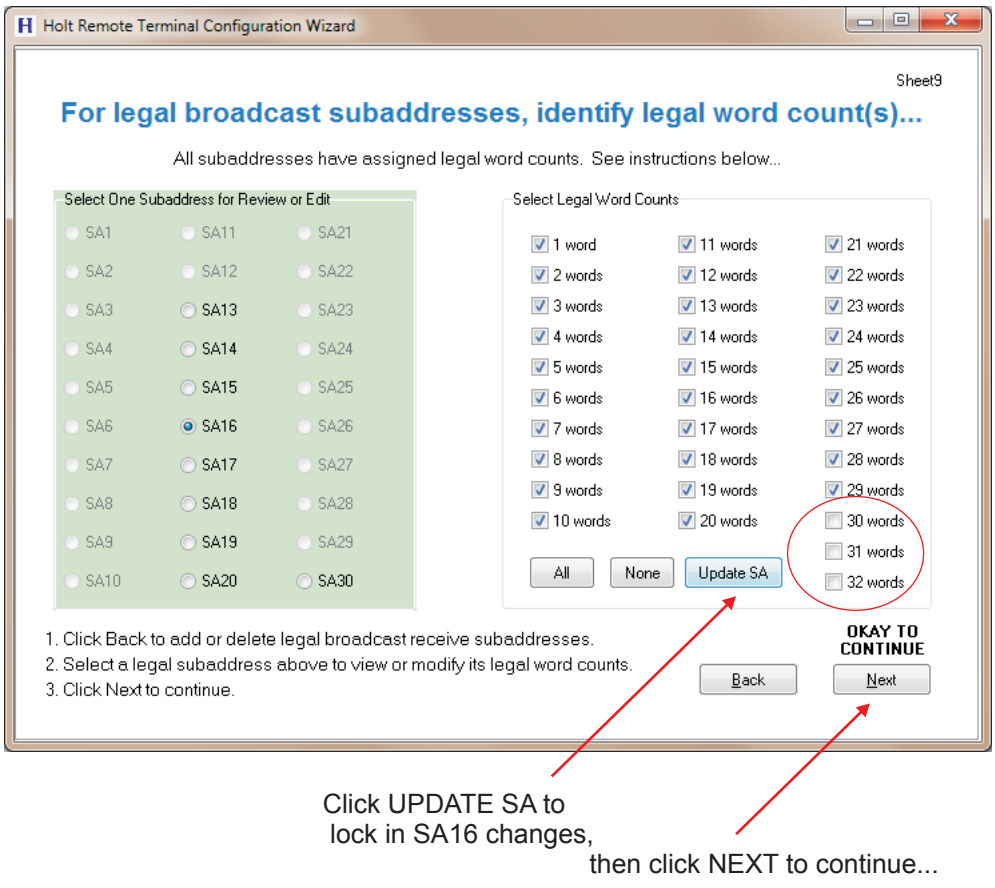
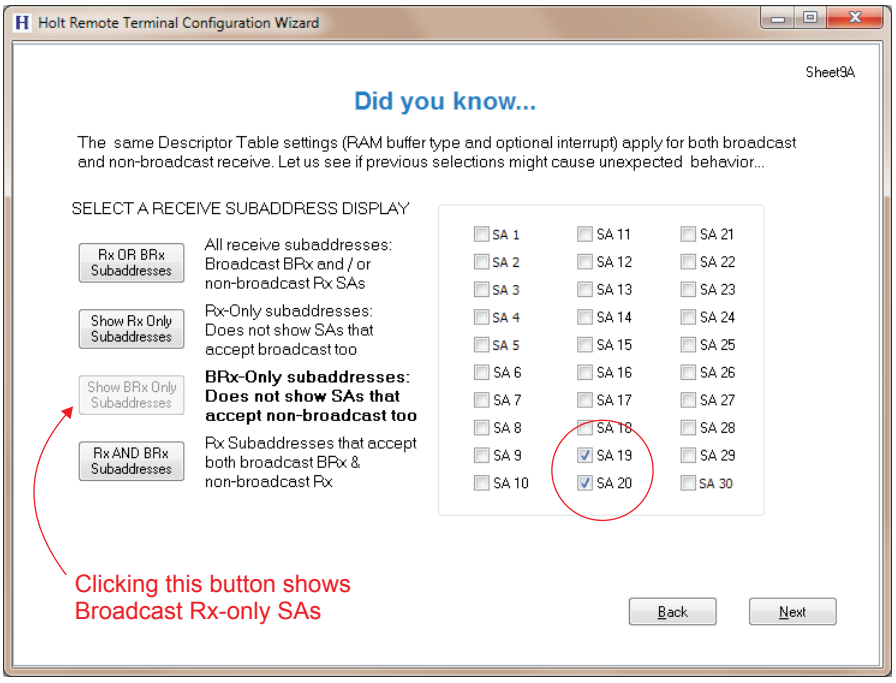


Figure 15. Sheet 8 Broadcast Receive Subaddress selection.

Clicking NEXT opens Sheet 9A...



Clicking NEXT goes to word count selection, just like we did for transmit SAs.

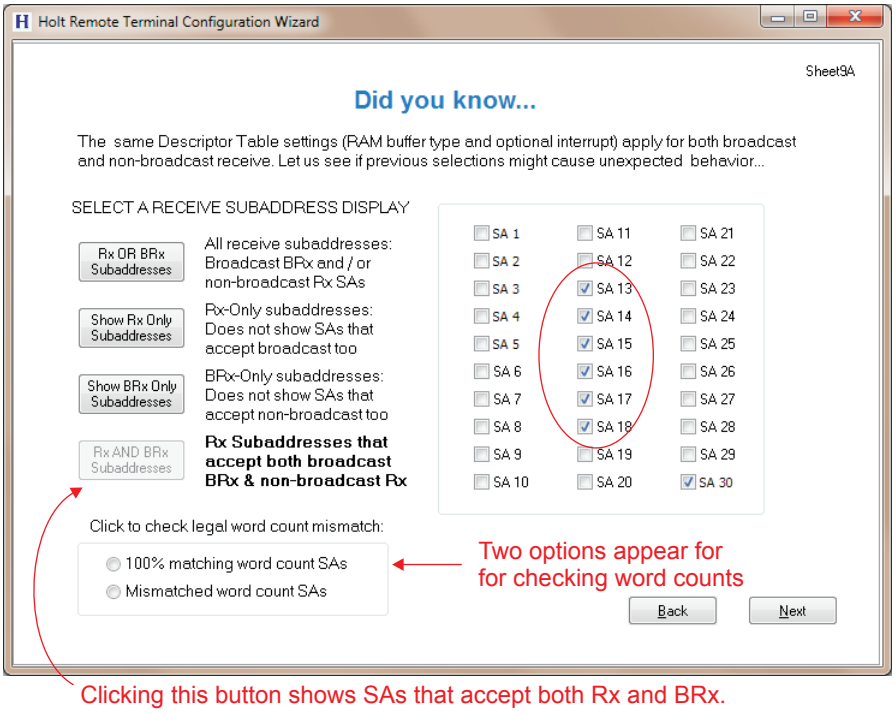
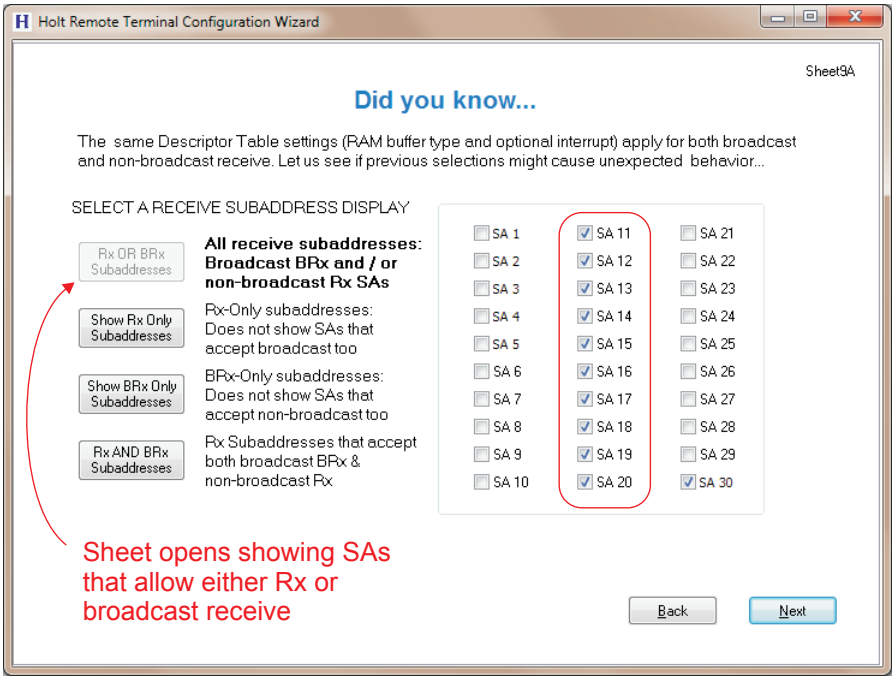


Figure 16. Sheet 9a Notes.

Program Sheet 9A helps identify accidental (or intentional) configuration differences between broadcast and non-broadcast receive sub-addresses. Sheet 9A opens if broadcast AND non-broadcast receive commands are allowed.



Clicking NEXT goes to word count selection, just like we did for transmit SAs.

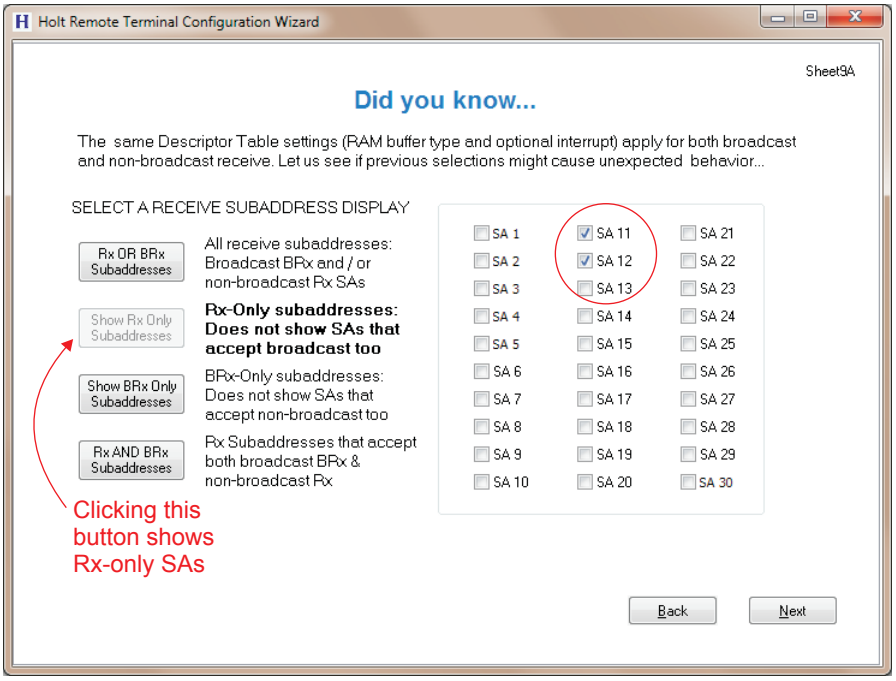
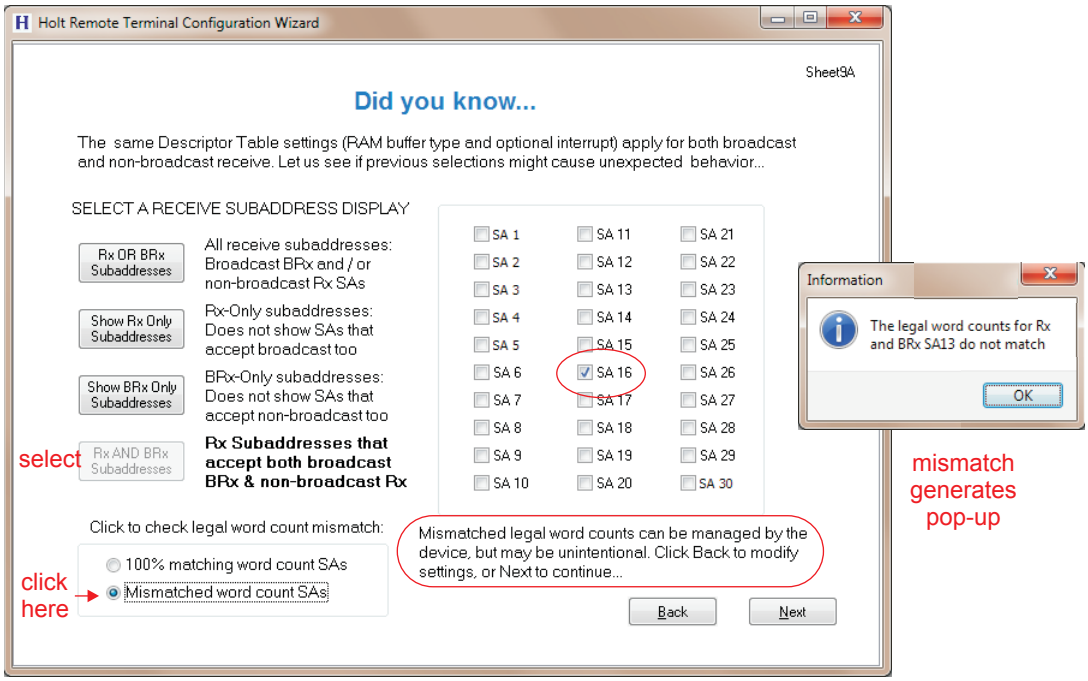


Figure 17. Sheet 9a Notes.



User has the option of going back to match word counts, if unintentional.

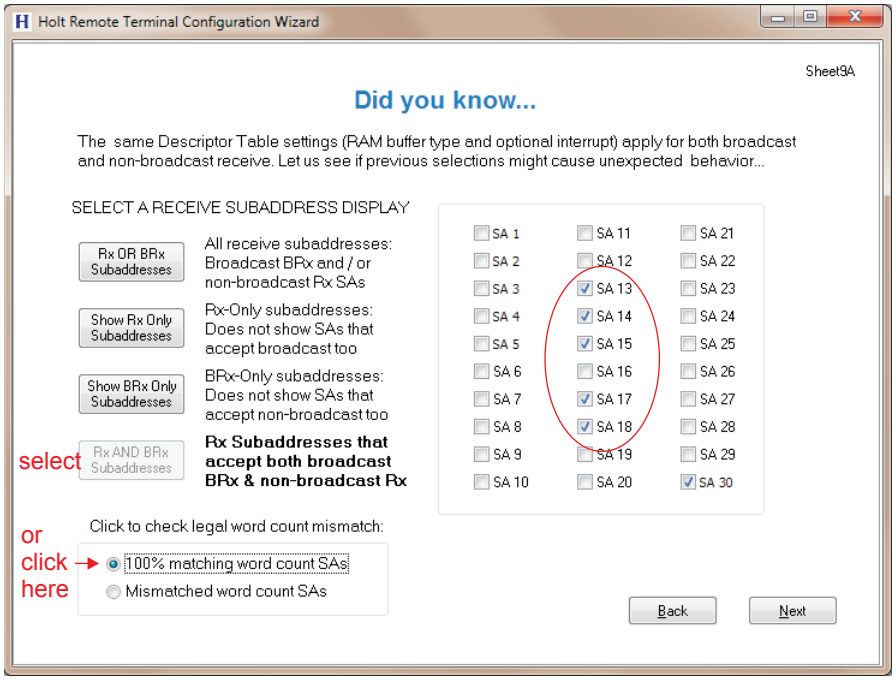
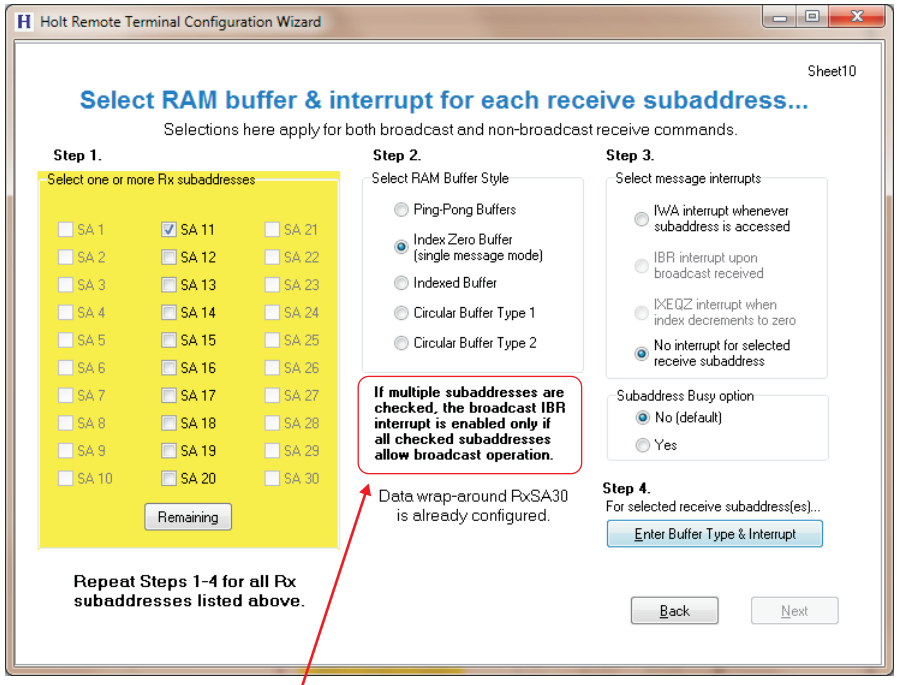


Figure 18. Sheet 9a Notes.

Clicking NEXT opens Sheet 10...

Selections made here affect both broadcast and non-broadcast receive messages.



Note concerning IBR broadcast interrupt assignment. See next 2 panels.

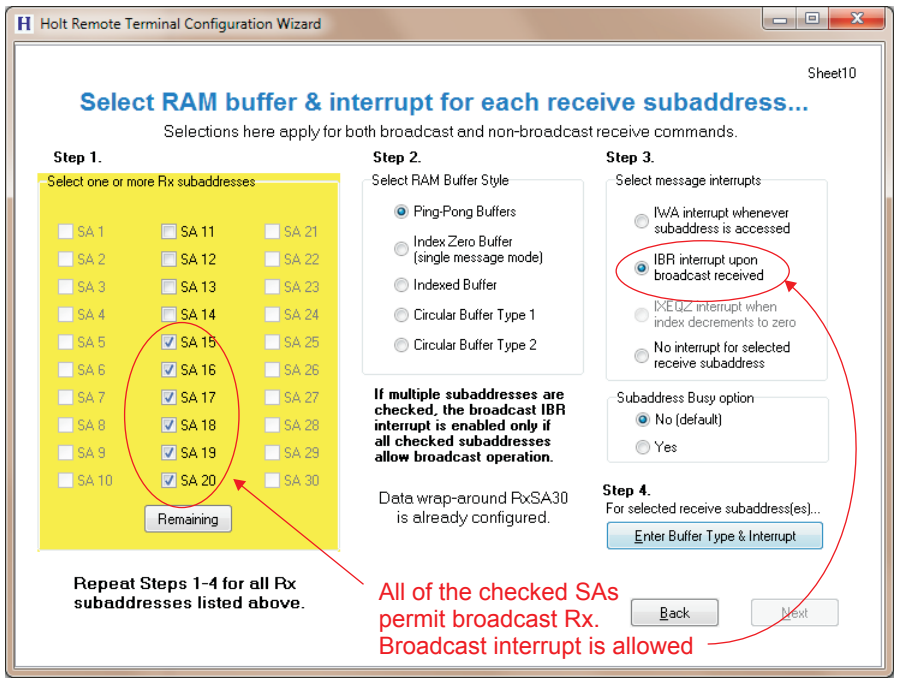
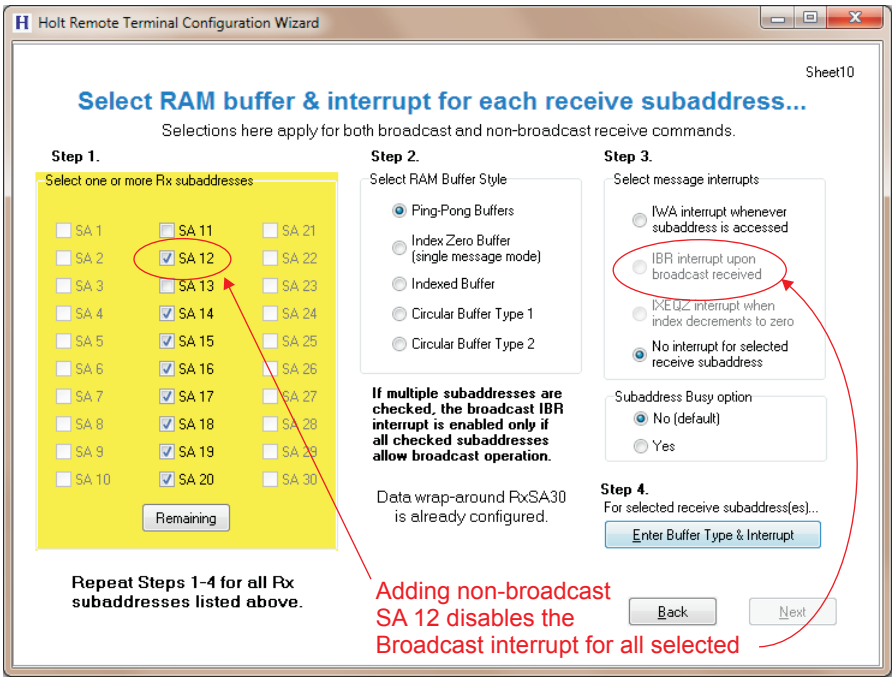


Figure 19. Sheet 10 buffer type and message interrupt selection for Receive Subaddresses (including Broadcast Receive)....



Buffer assign process is the same as performed for transmit subaddresses at sheet 5. Follow sheet 5 instructions to assign buffers for receive subaddresses...

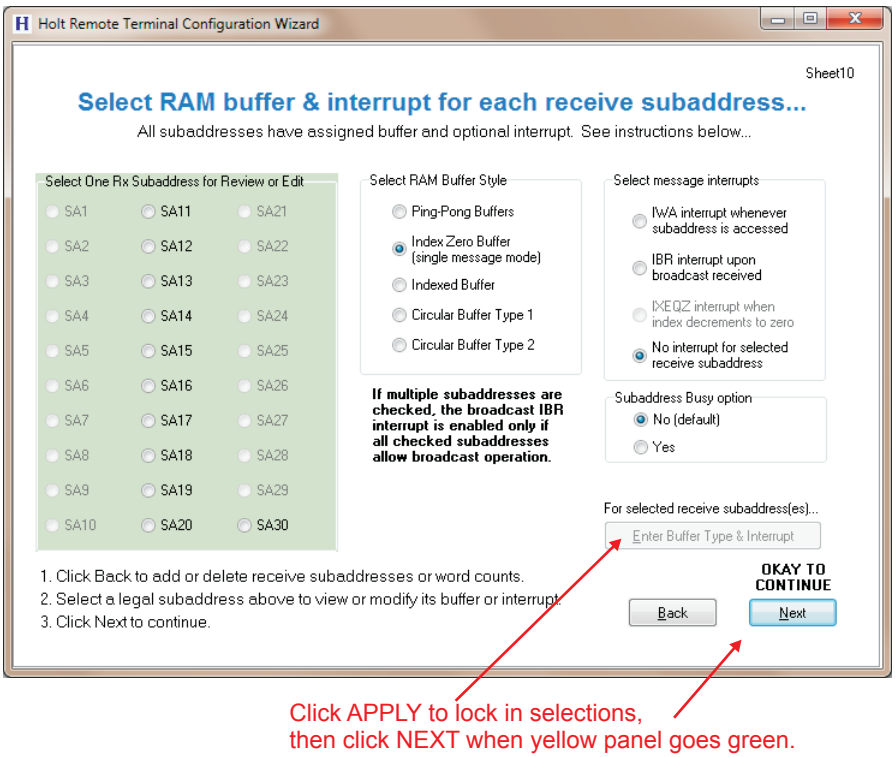
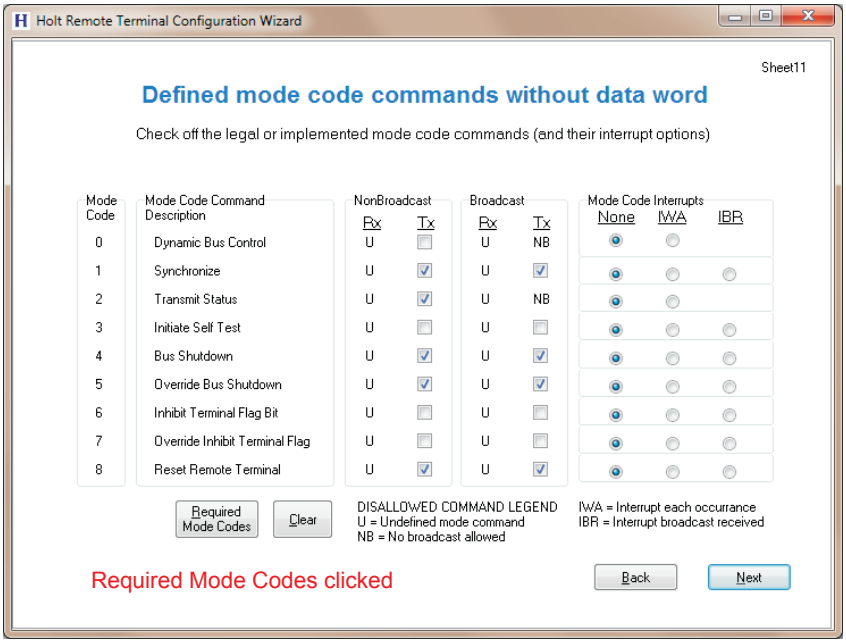


Figure 20. Sheet 10 Completed

5. MODE CODE COMMAND DATA INPUT SHEETS 11 - 14

After Sheet 10, device characterization continues with four additional screens. They should be self-explanatory. Sheet 12 presents an option called Simple Mode Code Processing (SMCP) which applies to all mode code commands. In most cases, SMCP is enabled. When SMCP is disabled, additional RAM space is used for mode command message results.



Make selections for defined mode code commands and axxociated interrupts, if any...

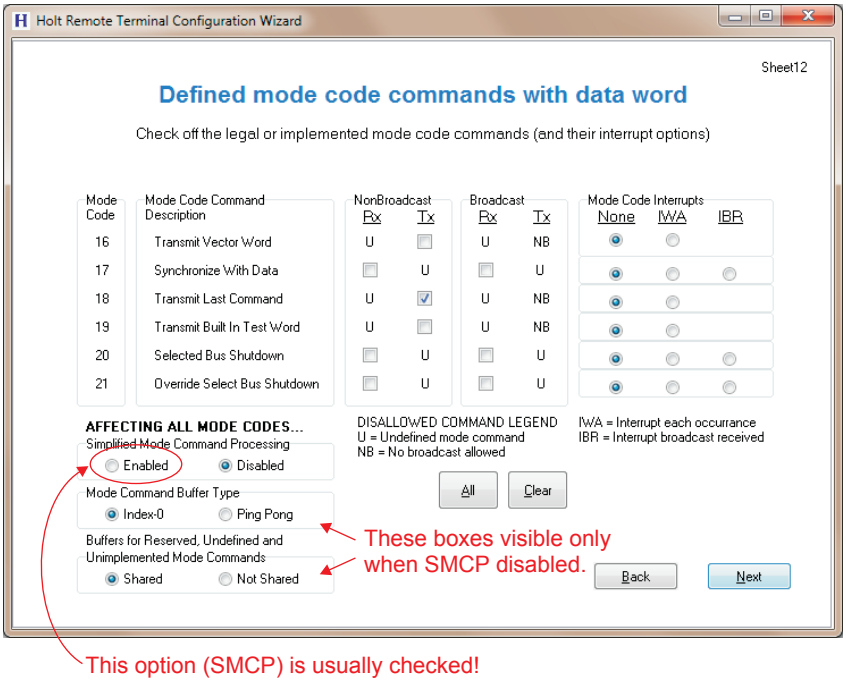
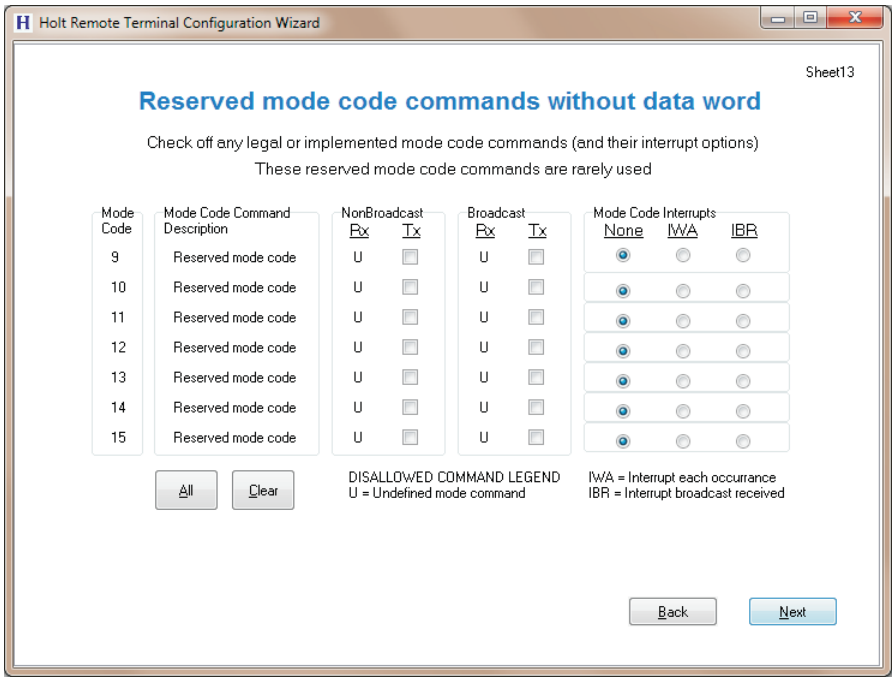


Figure 21. Defined Mode Code Command Entry Sheets 11 and 12.



These reserved mode code commands are rarely used.

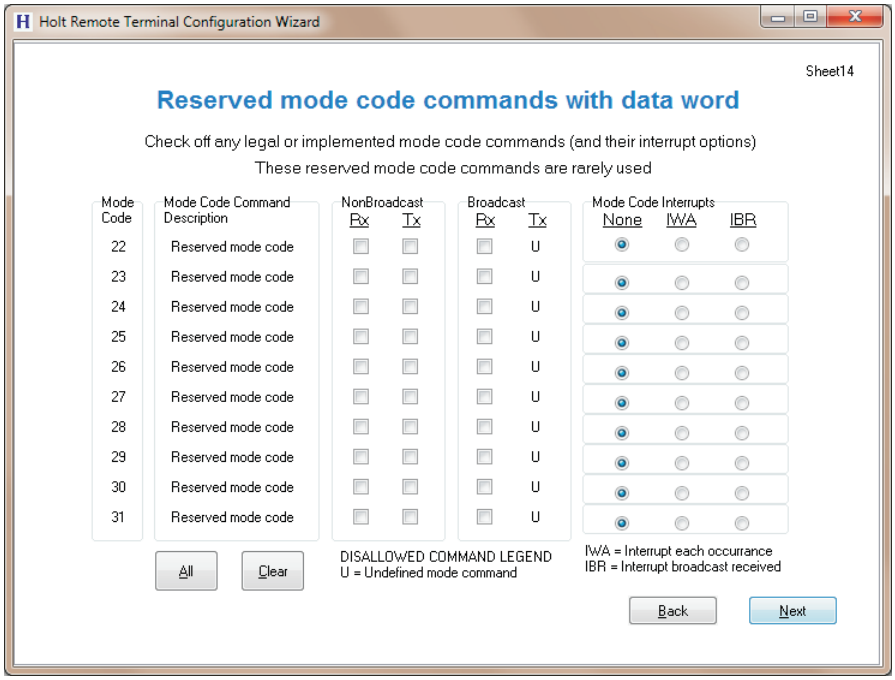


Figure 22. Reserved Mode Code Command Entry Sheets 13 and 14.

Continue to final Sheet 15 where two button clicks will finalize and save a single-RT project. Project can be reloaded later for edits...

6. “RT CHARACTERIZATION COMPLETE” FINAL SHEET 15

The right side of this screen displays text input boxes for starting and ending RAM addresses. The default values can typically be applied as is. For dual RT HI-6130 or HI-6131 projects, the RT2 starting RAM address is automatically adjusted to begin after the last assigned RT1 RAM address. The end address usually indicates end of RAM (0x7FFF, or 0x5FFF if using a HI-6130 or HI-6131 configured for error detection/correction). The end address for HI-6135 - 38 is 0x1FFF. However a lower end address can be entered if trying to reserve upper RAM space for other HI-6130 or HI-6131 terminal devices, BC or monitor.

Clicking MAKE OUTPUT FILES generates four text files. These files convey the necessary RT Descriptor Table, RT Command Legalization Table and initial register settings for selected device configuration registers. The file called `Address Assignment Log.txt` records the chronological RAM assignment sequence for the RT. Automatic checking for end-of-RAM overrun errors is limited, so this file should be examined.

Clicking SAVE PROJECT saves the `projectName.RT1.HPF` and `projectName.RT1.DAT` files using the base project name entered in the text input box.

Once a project is fully defined, changes are easily made by clicking BACK to reach the desired screen where changes are needed. If activating additional subaddresses, clicking NEXT to access following screens enables only the incremental subaddress changes needing data input. It is not necessary to recharacterize previously input subaddress information.

The following pages present information on finalization sheet 15. Two versions of sheet 15 are presented, showing the sequence for a dual-RT HI-6130 or HI-6131 project. Dual RT projects require two passes through the program, first configuring RT1, followed by a second pass for RT2. The procedural flow chart for a dual-RT HI-6130 or HI-6131 project is presented.

Once the HI-6130 or HI-6131 project is complete, any changes to RT1 require “rebuilding” both RT1 and RT2 at the sheet 15 “make files” button. The assigned addresses for RT2 RAM features depend on first knowing the ending RT1 RAM address.

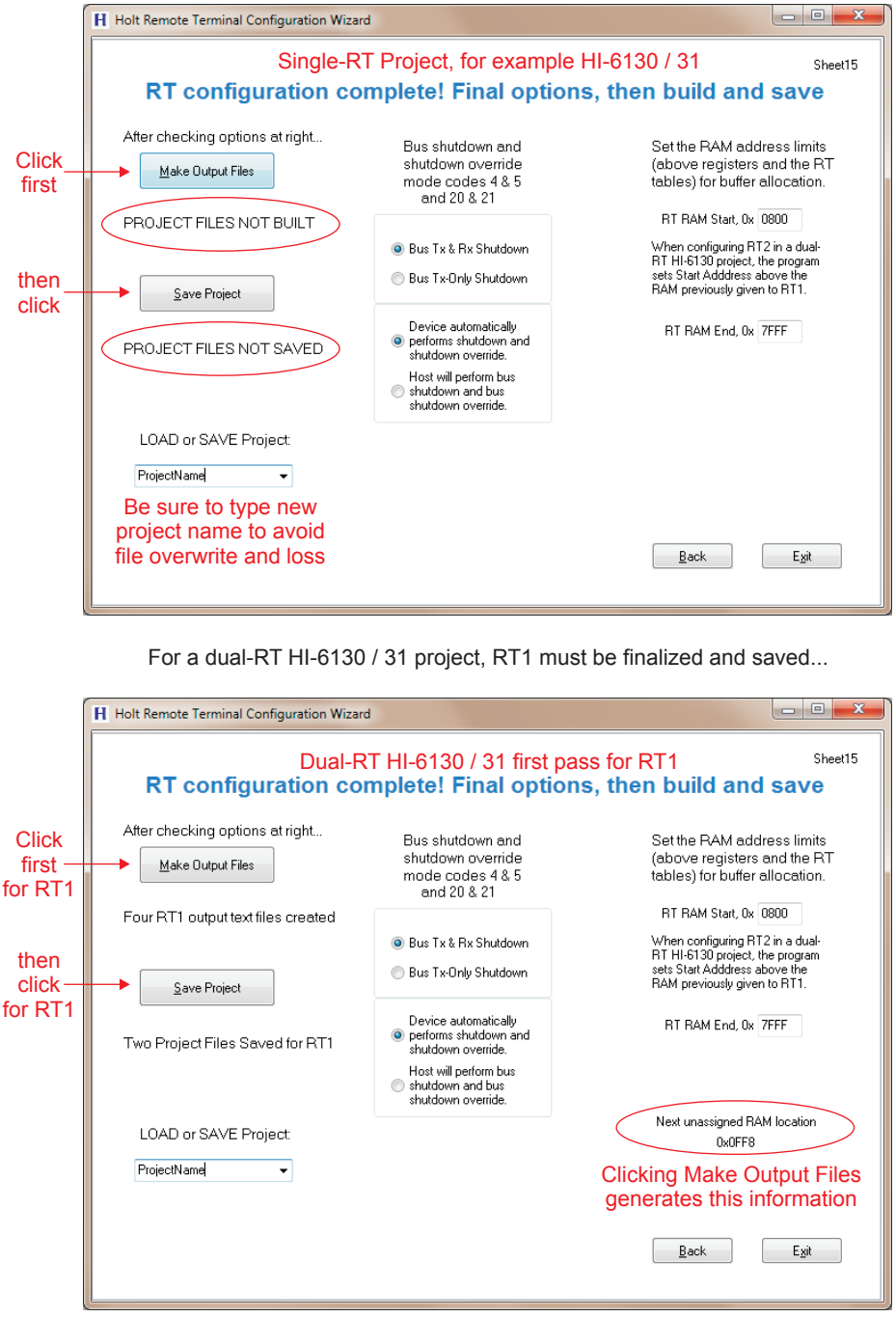
IMPORTANT: Most RT applications will need just one or two subaddresses with large “bulk data transfer” buffers. Many RTs will need none. These are often large RAM buffers using Indexed, Circular-1 or Circular-2 methods. While the program lets you choose subaddress buffers up to 8K words, you have just a limited range of free RAM to assign. Use common sense when assigning buffer types!

Finally, look at the RAM Address Assignment Log text file after clicking MAKE OUTPUT FILES. This shows the chronological assignment sequence that occurred. In particular, watch for RAM assignments approaching or crossing over the end-of-RAM address limit.

For HI-6130 or HI-6131 using RAM error detection and correction option (selected on sheet 2), the upper limit is 0x5FFF (24K words). Otherwise the upper limit for HI-2130, HI-6120, HI-6121, HI-6130 and HI-6131 is 0x7FFF (32K words). For HI-6135 through HI-6138, the limit is 0x1FFF (8K words). At sheet 15, the program automatically fills in this default end address value, which can be edited.

Default start address is automatically filled in too. Note: a single RT project for HI-6130 or HI-6131 overwrites the default range used by unused RT2 descriptor table, unless you edit

start address.



For a dual-RT HI-6130 / 31 project, RT1 must be finalized and saved...

Then re-open the saved project and you get the option of inputting new data for RT2...

Figure 23. Final Sheet 15 Makes Output Files and Saves Project.

After repeating the data entry process for RT2, you will return to Sheet 15 to finalize and save the RT2 project details. Notice that RAM allocations begin where RT1 RAM allocations ended on the last screen capture.

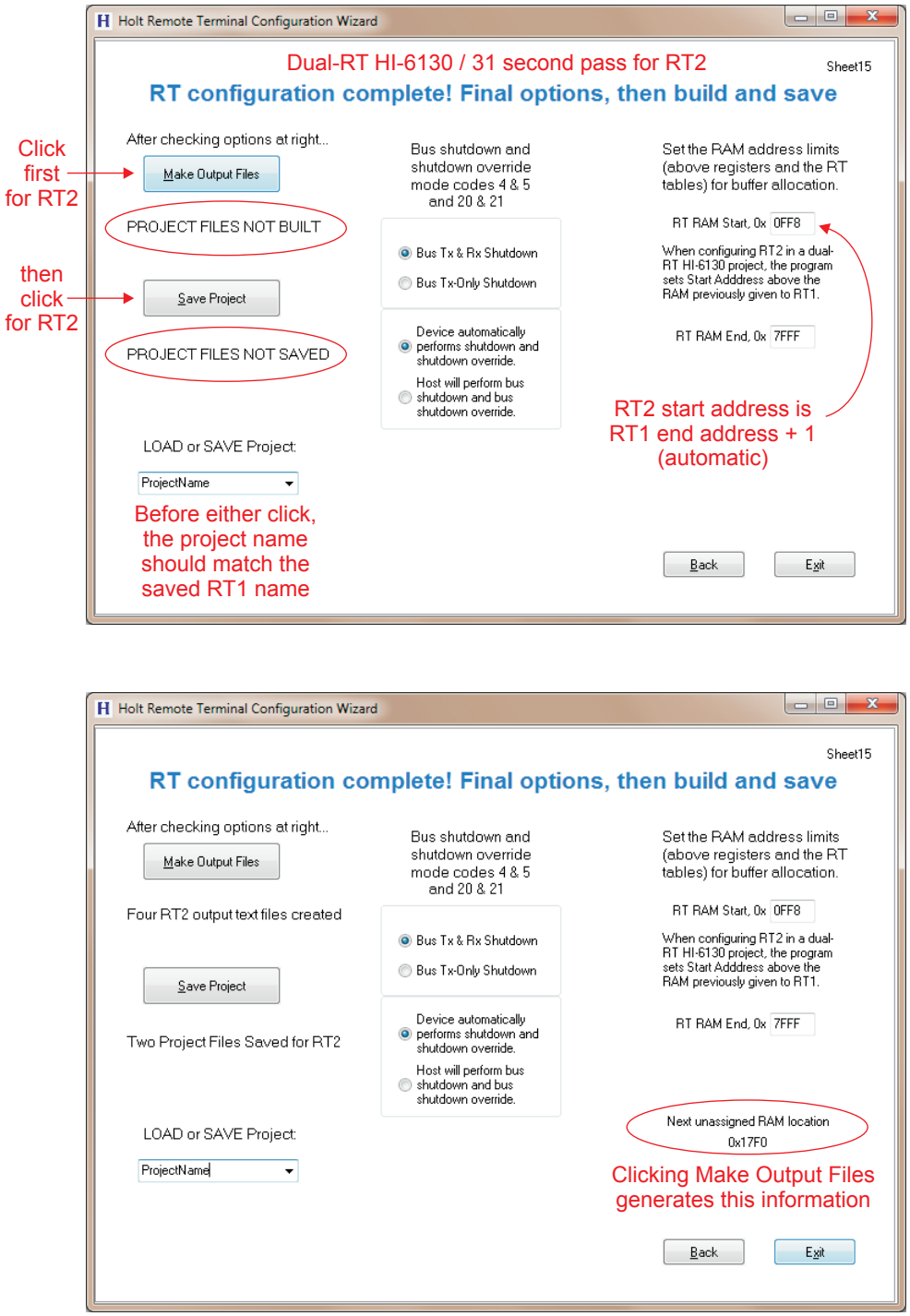


Figure 24. Final Sheet 15 Makes Output Files and Saves Project.

7. FILE DESCRIPTION

`WizardGUI.exe` is a fully contained Windows program. Because many files are generated by the program when capturing and processing a project, the executable file should be copied to an empty directory. The generated files will automatically be stored in the same directory. Of course copies of the program might exist in separate folders for each project.

`bform.RT2.hpf` is a blank RT2 project configuration file generated by `WizardGUI.exe`. This file can be freely deleted as it is generated automatically by the program when needed.

When saving a project, the user types a project name in the text entry box seen in sheet 1 or 15. The user-entered project name is embedded in each of the saved files, shown as `projectName` in the examples below. All files follow the same naming convention for identification:

- 1x designates projects for HI-6135 through HI-6138.
- 2x and 3x designate HI-6120/21 versus HI-6130/31.
- All projects have `RT1` components.
- Only dual RT projects for HI-6130/31 also have `RT2` components.

The file pair below fully describes a saved HI-6120 or HI-6121 RT project:

```
projectName.2x.RT1.hpf            2x indicates HI-6120/21
projectName.2x.RT1.dat
```

The files below fully describe a saved dual-RT HI-6130 or HI-6131 project:

```
projectName.3x.RT1.hpf            3x indicates HI-6130/31
projectName.3x.RT1.dat            RT1 and RT2 indicate 1st/2nd RT
projectName.3x.RT2.hpf
projectName.3x.RT2.dat
```

The HI-6130/31 device supports both single- and dual-RT projects. The saved file pair for a single RT project consists of the two RT1 files.

Two RTs are set up for HI-6130/31 using two full passes through the program. The first pass defines RT1. Upon RT1 completion, the SAVE PROJECT button on sheet 15 generates the two RT1 files. The next time the project is opened, sheet 1 offers the choice to edit either RT1 or RT2. If RT2 is chosen, another pass through the program characterizes the second RT. When the project is then saved, a second file pair designated RT2 is created. These files do not replace the RT1 files. Both file sets are needed. Thus for dual-RT HI-6130/31 projects, RT1 and RT2 are saved as separate entities. At any time, only one remote terminal (either RT1 or RT2) can be loaded into the program for review or edit.

Four plain text files are generated each time the MAKE OUTPUT FILES button is clicked on sheet 15:

projectName.CIT.3x.RT1.txt	Command Illegal Table
projectName.DET.3x.RT1.txt	Descriptor Table
projectName.REG.3x.RT1.txt	Register initialization info
projectName.RAM.3x.RT1.txt	RAM assignment log

These files can be opened with any text editor including Windows Notepad or any C compiler text editing utility.

The command legalization and descriptor tables are formatted as array declarations, directly usable by any C compiler. Fully annotated for convenience, comments use C language conventions:

- // end of line comments
- /* `comment` */ format for multi-line comments

The REG file contains full and partial initialization values for registers in the HI-612x or HI-613x device. In some cases, the registers contain bits (or bit fields) that are not optioned in the program, requiring further modification by the user. This file is primarily a verbose description for the user. However the last part of the file consists of a series of computer-readable word pairs having this format:

```
0xAAAA,0xBBBB // comment.
```

`0xAAAA` represents a register load value, and `0xBBBB` represents a register address

Finally, the RAM file is a chronological record of the program sequence that assigns buffer space in RAM for subaddress and mode command storage. This file should be checked to verify that end-of-RAM address overrun does not occur. The program employs limited checking for this problem.

8. REVISION HISTORY

Revision		Date	Description of Change
AN560,	Rev. New	07/01/13	Initial Release.
	Rev. A	09/11/15	Update to add MAMBA™ family of devices. Update and add additional screen captures to provide additional detail.