VLA/VLBA User Interface Style

Revision 2

The following describes the user interface for the VLBA and new VLA on-line computer systems. The interface is to be used in each VLBA Motorola VME station computer, the VLBA DEC VAX array control computer, and the new VLA MODCOMP Classic array control computer. The idea is to produce interfaces which behave the same even though their functions maybe different. The interface is currently under development and this is to serve as a design document.

The interface is designed to execute with terminals that have only character capability. Provisions will be made to allow the interface to work on a variety of terminal types with the least powerful denominator being a Visual 100. The thought is when more modern terminals arrive they will at least emulate the V-100 subset of ANSI standard X3.64, 1977 for terminals. Spreading the interface across computer and terminal types should help lower the overall development costs.

In general the interface will not exceed the 24 lines of 80 characters of the V-100. However some VLA terminals will have more than 24 lines to ease handling of 27 antennas. It is also expected that some situations will require displays to exceed either one or both of the V-100 dimensions. Any display which exceeds the 24 by 80 dimensions will normally have a scrolling capability to allow it to be useful on a V-100 size terminal. Just how the scrolling will be caused has not been decided.

The need for graphics capabilities is recognized but not for functions germane to this interface. The plan is to provide graphics on special terminals running different software, perhaps vendor provided. These terminals and software will need capabilities quite superior to those under discussion, although the terminals could also run the current interface. The fact that many more of the less expensive, character-only terminals will be needed justifies the development of custom interface software.

Menu Line

The interface uses a hierarchical menu structure. The current menu is always shown on the top-most terminal line and usually contains several commands grouped by function. The hierarchical structure allows the user to access all available commands without having to display them all at the same time.

The first menu command from the left is always displayed in reverse video. This is the currently selected command. When the cursor is in the menu another command can be selected by rolling the menu. This is done using the right-arrow, tab, left-arrow, or backspace keys. The right-arrow and tab keys roll the menu one command to the left, selecting the next command to the right of first command. The left-arrow and backspace keys roll the menu one command to the right, moving the command at the extreme right to the first position. Another way of selecting a command is to press the command's first letter. This left rolls the menu until the next command beginning with the letter is in the first position.

To execute the selected command press RETURN or down-arrow. Some menu commands when executed replace the menu line with a lower-level menu. The user is then able to select and execute commands from this new menu. When the cursor is in the menu striking up-arrow always replaces the menu with the previous, higher-level menu. Striking up-arrow enough times will produce the top-most menu.

Descriptor Line and Additional Help Messages

The second terminal line down from the top always contains a description of the command or screen field where the cursor currently resides. The descriptor line is in reverse video and acts as a separator between the command menu and the screens below.

The text provided by the descriptor line allows menu commands and screen field labels to be quite short. Short commands and labels are fine for the experienced user providing a concise screen packed with information. But by positioning the cursor on a command or screen field a novice user can obtain a fuller description through the descriptor line. Because this description can be a full line in length it can be much more detailed than even an ordinary label. For displayed and entered fields the descriptor line will also include the proper range for the value.

In addition to the descriptor line the user can obtain still more information about a command or screen field by positioning the cursor on the item and pressing '?'. This will produce typically a paragraph or two of help message overlaying a portion of the terminal outside the command or field. This message will at least include the descriptor line. In addition to its normal function the next key entered by the user automatically removes the help overlay.

The top-most command menu (the menu presented when interface execution begins) will contain a HELP command. When this command is executed a summary of how to use the interface is

presented. These instructions will run several full terminal displays in length. It is hoped though the use of these "on line" facilities that all interface documentation can be kept immediately available to the user.

Screens

As previously stated executing some menu commands produces the next lower-level menu. The other type of menu command produces a screen or group of screens when executed. A screen is defined as a collection labels and fields that have as their purpose a single concise function. Each screen is based on a parsimony of terminal space and fulfills a limited objective.

A single screen can occupy from one to six regions. A user can select up to six screens depending on the size of the selected screens, all executing simultaneously. Unless a screen occupies all six regions it is surrounded by a border to separate it from other screens.

There are three types of screen fields: parameter entry, display, and command. Parameter entry and display fields have a label and an associated character string or numeric value. The value is always displayed right-justified in its field. Command fields have only a label.

Within a screen the cursor can only be positioned within a field. The cursor can be moved between and within fields using the tab, up-arrow, down-arrow, left-arrow, right-arrow, or backspace keys. When the cursor enters a parameter entry field the area changeable by the user is shown in reverse video. Only the first label character of unchangeable fields is reversed when the cursor enters them. The user cannot change anything in these fields but can get the descriptor line and ? information for the field.

The tab key always moves the cursor to the beginning of the next field to the right. When the cursor is at the right-most field of a screen line, pressing tab will move the cursor to the left-most field on the next screen line. Since the first screen line is assumed to follow the last repeatedly pressing tab will take the cursor to every field of the screen.

The up-arrow and down-arrow keys quicken access to distant screen fields. They move the cursor to the left-most field on the previous and next screen lines, respectively. The first screen line is assumed to follow the last line, and the last line is assumed previous to the first.

The left-arrow, right-arrow, and backspace keys are primarily for moving the cursor within a changeable screen field. The right-arrow key moves the cursor one character to the right. When the cursor reaches the right-most field character any more

entries of right-arrow will be ignored indicated by ringing the terminal bell.

The left-arrow and backspace keys are identical in action. They move the cursor one character to the left. When the cursor is at the left-most field position striking left-arrow or backspace will move the cursor to the next screen field to the left. Because the cursor is positioned to the left-most field character when the field is first entered, pressing left-arrow or backspace repeatedly produces results similar to repeatedly pressing tab, only in the opposite direction.

The ^ (shift 6) and > (shift .) keys are used to move the cursor between screens, and between screens and the command menu. The ^ key moves the cursor to the left, next higher screen or to the command menu, whichever is immediately above the current cursor screen. When the cursor is in the command menu pressing ^ will move the cursor to the bottom-left screen. Pressing > moves the cursor to the next screen to the right. Pressing > twice results in returning the cursor to its original position. When the cursor moves to another screen it resumes the same position it previously held in that screen.

The first line of each screen always contains the same two things. The first character of the line constitutes the "kill" field as indicated with a reverse video "K". Placing the cursor on this field and striking RETURN removes the screen from the terminal. The cursor then returns to the menu line, presumably to select a new screen. The remainder of a screen first line is used for the screen title. Some screens will have a parameter entry field following the screen title. This is used to specify the unit to which the screen currently applies. Some examples are the antenna and synthesizer number.

Most screens will have one line reserved for error messages. Messages will need to be brief since a line is only 40 characters on most screens, but this is thought to be enough.

The small, modular screens of the interface have several advantages. The VLBA plans to have several jacks in each station where a "technician" terminal can be attached. These terminals will have limited screen area and be small enough to be carried on a technician's belt. Small screens have obvious advantages here.

Simultaneous, multiple screens allow the user (rather than the programmer) to select the needed information and place it together on the terminal. The alternative is through guess or experience to place collateral data in a comprehensive single screen. This produces a screen with unnecessary or peripheral data for most common situations, and no way to handle exceptional cases. Multiple screens should also reduce programming effort

because most information will appear only in one place.

Screen Parameter Entry Fields

These are fields where the user may change the supplied default value. The default value is always the last value entered. That is, when a screen is first shown all of its parameter entry fields will contain their most recent value.

Parameter entry fields may be changed using one of several techniques. The user may change one or more characters of the original field by first using the cursor control keys to position the cursor and then overstriking the original character(s).

Or the user may prefer to use the control-U key to first clear the field, and then enter an entirely new value. A value entered this way may be left-justified, but after the value is entered it will be re-displayed in the normal right-justified manner.

If the cursor reaches the right-most field character as the user is inputing cursor movement will stop. Further input will continue to change the last field character but will not move the cursor.

When editing input the delete key may be used. When it is struck the cursor first moves one character to the left. If the cursor was already at the left-most field character the input is ignored indicated by ringing the terminal bell. If the cursor moved the character at the new cursor position is overwritten by the character to its right. That character's previous position is in turn filled by the character to its right, and so forth, finally filling the right-most field character with a blank.

Still another way to change the field value is using the control-P ("Previous") and control-N ("Next") keys. These keys scroll through all possible values for the field. There are some character string parameter entry fields where this option is not relevant, and control-P and control-N have no effect here.

Numeric fields which are integers (have no fractional part) may be displayed and entered in one of several bases. The base is indicated by a prefix (or lack of) in the displayed value. The prefix is part of the changeable field, and is either ' for octal or # for hexidecimal. Decimal values have no prefix. When the user changes the prefix the value is accepted and displayed in the new base until the prefix is changed again.

The number of changeable characters in a numeric parameter entry field depends on the minimum and maximum acceptable values for the field. This can be a problem for integers where the base

may be changed. The number of characters will be set by the programmer for the number required to enter the value in octal (includes the ' prefix).

As field characters are entered some checking is done according to the field type. For character string types all alphabetic, numeric, blanks, and . (decimal point) characters are accepted. On input character string types generally preserve each character's case, but the display case is left to the programmer. For real numbers only 0-9, - (minus sign), . (decimal point), and E will be accepted. For integers the base prefix will determine the set of acceptable characters for the remainder of the field. Inappropriate characters are not displayed and the terminal bell is rung to indicate an error.

Striking RETURN will have the effect of entering the parameter. All input is ignored if the field is exited without striking a RETURN. In this case the field's previous value is restored. When a RETURN is entered the field's contents are fully checked for validity. If the contents are invalid a line of "--inappropriate--", etc. is displayed in the descriptor line and the field help message is displayed.

Screen Display Fields

These are screen fields where current values are shown. Most display fields are updated at a rate appropriate for the value. Values are displayed in normal video. Out of range values will be indicated by displaying them in reverse video.

Some screens which consist only of display fields may be built by the user by employing a "skeleton file". This is an text file (changeable using standard editors) which specifies all labels and data of the screen.

In some situations a screen field may have the attributes of both a parameter entry field and a display field. Normally the field value is constantly being updated like a display field. But when the user places the cursor on the field the updating stops, and it becomes a parameter entry field. When a new value is entered in the field it is used to set the hardware or memory value which the field is normally displaying. When the user leaves the field the updating resumes as before. In this way the user is provided feedback that the entered value reached its destination properly.

Screen Commands

They are fields that when the cursor is placed on them and RETURN is struck some action occurs. They have been called "execute buttons". As with the display field label, the first letter of the command field is shown in reverse video when the

cursor is moved to the field. The execution of the command requires no parameters except those in the parameter entry fields of the screen.

Global Control Keys

At all times the following keys will be active.

? - Give additional help for current cursor position.

Control-C - Exit the program and return to the computer operating system command interpreter. When control-C is struck the question "Do you really want to abort(Y or N)?" is asked before any action is taken.

Control-R - "Refresh", Erase and re-write the terminal display.

The following keys are defined to be equivalent to the arrow keys in case the terminal keyboard has no arrow keys.

Control-T - Up-arrow
Control-V - Down-arrow
Control-F - Left-arrow
Control-G - Right-arrow

Example

The following attempts to show how the terminal display might typically appear. The reader must supply some imagination since reverse video characters and the cursor cannot be shown.

Two VLBA screens are shown. The RF/LO/IF Switch Module screen shows the present switch setting. It also allows the user to set new switch configurations. The "COMMAND" screen allows the user to send primitive commands on the monitor and control bus. Assume the cursor is residing at the "S4" field of the RF/LO/IF SWITCHES screen.

```
COMMAND MONREQ SETADDR INTERNAL CHECK READBLK
Input to Cable D (S6=N) or C (S6=X), Select Position 0-6 (0=open)
+------------------------------+------------------------------+
|K     RF/LO/IF SWITCHES       |K          MCB COMMAND        |
| ACBAND 1.3CM   BDBAND  20CM  |    SINGLE     CONTINUOUS     |
|  S1 6   S2 6   S3 2   S4 2   |      ADDRESS #1234           |
|  S5 N   S6 N   S7 2   S8 4   |         DATA 1234            |
|  S9 X  S10 1  S11 1  S12 1   |        DELAY    0            |
| S13 0  S14 0                 |                              |
| NO RESPONSE FROM INTERFACE   |                              |
+------------------------------+------------------------------+
```

All values on the RF/LO/IF SWITCHES screen are constantly being read and displayed. The "ACBAND" and "BDBAND" fields of this screen categorize the settings of two switch groups. If a switch group is in the configuration necessary for a particular frequency band then that band is shown in the appropriate band field, otherwise the band field is blanked.

The fields of the RF/LO/IF SWITCHES screen are an example of fields that act as both parameter entry and display fields. For this reason each field value is shown in reverse video. When the cursor is moved to a field this indicates to the user that the field is changeable. Changing the field value set the switch (or switches in the case of the band fields) to a new value.

The fields "SINGLE" and "CONTINUOUS" in the MCB COMMAND screen are screen commands. When "pressed" they use the parameter values from the lower three screen fields to send a single or continuous command(s) on the monitor and control bus.

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