GBES SCREENs User's Guide

Glen Langston

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This document describes the use of the VLBA SCREENs package and summarizes the screens functions. The Green Bank Earth Station (GBES) control system uses the VLBA SCREENs package as the human interface for monitoring and manual control of the GBES status. The basic frame work of the VLBA screens package is used unchanged by the GBES (*i.e.* screen layout, help, data entry and task spawning). The SCREENs package is a simple "windowed" package, where there are one or more screens for each hardware module type. In each screen, information concerning the hardware module state is displayed and the user may be allowed to command the hardware module functions.

This document describes differences between the VLBA SCREENs and those used by the GBES. The GBES specific screens are displayed and the functions described. Some design principles applicable to the final set are also given. Many of the original VLBA screens are used unchanged at the GBES. However, some screens were modified and several new ones were created.

The SCREENs interface is used primarily for diagnosing station problems, while the MONCHK task performs automatic monitoring and logging of the state of the tracking station. The SCREENs design allows remote display of the antenna status to any site with internet access to the GBES control computer.

Overview

The SCREENs programs run on the station computer, called `phobos`, which schedules real-time tasks using the VxWorks operating system. The SCREENs programs may be run directly on a VT100-type terminal connected to the station computer. The SCREENs are more often run on a Unix workstation, using the "remote screens" facility.

At the VxWorks prompt, the SCREENs program by entering

`SCREEN` <`cr`> <`cr`>

Where <`cr`> indicates typing a carriage return.

The remote screens facility is initiated by entering

`/s3/ovlbi/bin/rscreen phobos` <`cr`>

at the Unix prompt, in an xterm window, or using a VT100 terminal.

The SCREENs package has on-line documentation of the special characters used control the window functions and move between windows. The HELP text is included in Appendix A.

```
SYN DOWN LOMON GPS DEMOD DECODER TWT SATSIM BBC IFDIST UP
Strike <CR> to Kill This Screen                                      NZ
┌[K]──────15h18m10───────DISPATCH COMMANDS────[A/M] AUTO ─[MORE][TOP ]─Page─  0┐
│  File: 96DEC09.cmd.a                                                          │
│Include: 96DEC09.cmd.a                                                         │
│21h31m59 INCLUDE FILE=astronomyStop.cmd                                        │
│21h36m59 INCLUDE FILE=surfsatStart.cmd                                         │
│21h51m59 DEFINE  PHASEFILE=9612092151.phr                                      │
└───────────────────────────────────────────────────────────────────────────────┘
┌[K]──────────────ANTENNA─────[A/M] AUTO ┐┌[K]──────────STATION CLOCK─────────────┐
│[ TRACK ]    [BRAKE OFF]   [COMPUTER]   ││  UTC 15h18m17s   [INC] [DEC]          │
│[STARTUP]       [STOW]     [STOP]       ││  LST 15h13m34s   UT DATE 1996DEC09    │
│[SHUTDOWN]      [SNOW]     [SERVICE]    │└───────────────────────────────────────┘
│Az,El COMMAND 179d03'12"  84d37'08"     │┌[K]──────STATION MODE──────[A/M] AUTO ┐
│Az,El ENCODER 179d03'04"  84d37'00"     ││MODE IDLE         #0000    SATID     0 │
│Az,El  ERROR    0d00'08"   0d00'07"     ││PROG DOPLER            SRC DAY00       │
│  STATUS      1110 0111 0111 1100       ││RA,DEC   0h00m00.0  90d00'00"    J2000 │
└────────────────────────────────────────┘└───────────────────────────────────────┘
┌[K]────────WEATHER STATION──────────────┐┌[K]─────────────GPS────────────────────┐
│  UNITS [METRIC ]       TEMP  -2.9      ││1996DEC09 15h18m15.00s       ELEV   807│
│   WIND VEL    6     MAX TEMP [  4]     ││GPS-STA         0.000000152  SATS     6│
│       EAST    0     MIN TEMP [ -5]     ││LAT    038d26'00.2" LONG 079d49'20.2"  │
│       WEST    0     PRESSURE  918.4    ││Delay          70 ns MODE TIME         │
│ PEAK GUST [  9]       DEW PT  -7.9     │└───────────────────────────────────────┘
│   WIND DIR 289          RAIN [ 0.00]   │
└────────────────────────────────────────┘
```

Figure 1: VLBA SCREEN package running with GBES screens running. The top line of this SCREEN top level menu. Most of the menu options are from the VLBA screen package, although two, DISPATCH and STATUS, have been added by the GBES. The DISPATCH screen shows the automatic control command file being executed and the next few commands to be executed. The ACU screen has a toggle button, AUTO/MANUAL, that prevents accidental changes of the commanded antenna position. The GPS screen displays the current UTC and LST time at Green Bank and the difference between station and GPS time. The WEATHER STATION screen displays the current wind velocity, and other weather parameters.

SCREENs Functions

The VLBA SCREEN display is divided into three parts, *1)* Top Line MENU consisting of a list of SCREENS and sub-MENUS, *2)* Second Line containing a description of the cursor item (SCREEN, MENU or data item), and *3)* SCREENS display area, the remaining 22 lines of the display.

The GBES has modified the highest level MENU by *a)* deleting the OBS menu and moving the CLOCK screen to the top, *b)* removing the FR sub-menu, and *c)* adding the DISPATCH and STATUS sub-menus. Descriptions of the VLBA and New GBES SCREENs and MENUs are listed below.

HELP: Describes use of the SCREENs package (unchanged from VLBA).

CLOCK: Screen displays the current clock settings, updated at a 1Hz rate. This screen is unchanged from the VLBA version, but has moved to the top-level MENU.

```
SYN DOWN LOMON GPS DEMOD DECODER TWT SATSIM BBC IFDIST UP
Top Level Command File being executed by Dispatch.                         NZ
┌[K]─────15h53m40──────DISPATCH COMMANDS────[A/M]MANUAL─[MORE][TOP ]─Page─  0┐
│   File: twtLongX2ss.cmd                                                     │
│Include: twtLongX2ss.cmd                                                     │
│17h51m58 TWT     STOP                                                        │
│17h51m58 SATSIMOFF                                                           │
│17h51m58 SETMODE 0 0                                                         │
└─────────────────────────────────────────────────────────────────────────────┘
┌[K]─────TWO WAY TIMING────[A/M]MANUAL┐┌[K]──────────TWT PHASE DET──────────┐
│Xmtr  7.0850000 GHz Pwr 100.00% of Nom││0:      -13629.932 1:      -13638.434│
│DDS1 28.3333569 MHz   DDS2 12.0000000││2:      -13646.936 3:      -13655.438│
│(up)  0.0000000 kHz/s (dn)  0.0000000││4:      -13663.939 5:      -13672.441│
│    -0.0000000 Hz/s/s       0.0000000││6:      -13680.944 7:      -13689.446│
│Xmtr[ON ] PhDetInp: VS  2ndLO: 620 MHz││8:      -13697.949 9:      -13706.450│
│Band: X   Lock   2ndLO Lock  1Hz #11C8││Frequency       85.020224 Hz         │
│XmtrTemp     297 K   2ndLoVCO -0.010 V││Doppler           85  Ampl.    1.415 V│
│XmtrVCO   3.301 V  500RefLvl   5.225 V││CZERO   -0.018 V   SZERO   -0.009 V │
│XmtrPwr   1.113 V                     ││GAINERR   1.068     QERR    -0.044   │
└──────────────────────────────────────┘└──────────────────────────────────────┘
┌[K]───SATELLITE SIMULATOR──[A/M] AUTO ┐┌[K]─────TWT INTERNALS─────[A/M] AUTO ┐
│ Power [ON ]     Band [ X ]   locked  ││PhDet [ZERO]  DDS [RESET] DSP [REBOOT]│
└──────────────────────────────────────┘│Re-Syncs [#B5BF]      Re-Boots [#AAB3]│
                                        │1Hz Count #11C8   1Hz Interrupt #11C7 │
                                        │Software : Status #0000 Version #0223 │
                                        │Read Back:  2ndLO #25      bits #E2   │
                                        └──────────────────────────────────────┘
```

Figure 2: The MODULE MENU contains a screen or menu for each hardware module. This figure shows the hardware status when using the satellite simulator at X-band. The orbit file used in this test causes the TWT module to detect a phase residual of 85Hz. The TWT CONTROL screen displays the frequencies and transmitter power used during the test. The TWT PHASE screen is used to determine the test success. If the Frequency and Phase fields of the PHASE screen are both near 85 Hz, the module is working correctly. The TWTINT screen displays internal diagnostics of the TWT module and software.

ACU: The antenna control unit for the GBES is different from the VLBA and a new ACU screen was needed. (New GBES menu and Screens.)

ACU: Displays the commanded and actual antenna positions and antenna status.

ACUSTAT: Status of antenna stow pins and limit switches.

RADEC: Shows the Right Ascension and Declination in J2000 and coordinates of date.

POINTCOR: Display antenna pointing correction coefficients and refraction.

PEAKUP: Display/Control maximum signal location parameters.

MCB: Monitor/control bus diagnostic MENU. This menu and it's SCREENs are un-changed from the VLBA version.

COMMAND: Send MCB command.

MONREC: Send MCB Monitor Request(s) and Display Resulting data.

READBLK: Read a block of MCB addresses.

```
SYN DOWN LOMON GPS DEMOD DECODER TWT SATSIM BBC IFDIST UP
Monitor and Control 500 MHz LO Round-Trip Phase Monitor (L103) Module       OV
┌[K]────────────LO MONITOR──────────────────┐ ┌[K]────────────────GPS─────────────────────┐
│     XMT  LOCKED          RCVR LOCKED      │ │1996DEC05 11h32m18.00s       ELEV   807    │
│ MASER_PWR  -1.079      10M IN    3.413    │ │GPS-STA          0.000000000  SATS     6   │
│ VCXO CONT  2.886      (500IN)    0.000    │ │LAT    038d26'00.2" LONG 079d49'20.2"      │
│  SW-> [SIGNAL    ]  100M VCO   -0.327     │ │Delay            70 ns MODE TIME           │
│ LENGTH(CM)  5.775   500M VCO    2.417     │ └───────────────────────────────────────────┘
│ LENGTH(PS) 192.5      IN   69   QD 159    │ ┌[K]─────2-16 GHz SYNTHESIZER-  2CM─────────┐
└───────────────────────────────────────────┘ │        FREQ 13.6            CODE #0D99    │
┌[K]───────────STATION CLOCK────────────────┐ │         D/A  4.233    Sideband UPPER      │
│    UTC 11h32m20s    [INC] [DEC]           │ │    YIG Main  5.024 100 MHz REF  4.863     │
│    LST 11h11m13s   UT DATE 1996DEC05      │ │      YIG FM  0.112  100 MHz IF  4.111     │
└───────────────────────────────────────────┘ │    Comb Gen  5.322        Output  2.593   │
┌[K]──────────CLOCK INTERNALS───────────────┐ └───────────────────────────────────────────┘
│tickGet()/64 41539  tocCount    32109      │
│ boot: Time 02h37m10s Date 1996DEC05       │
│  resync      0       tocMissed      0     │
│      lst_midnight 23h37m00.06s            │
└───────────────────────────────────────────┘
```

Figure 3: GBES timing reference screens. The GPS screen displays a measure of the difference between station time and GPS time. The station time is based on the maser signal from the interferometer building, which is received by the reference reciever. The LOMON screen displays both parameters from the reference transmitter (left side of the screen), and the reference reciever (right side of the screen). The synthesizer screen displays the 100MHz signal from the reference reciever. The station clock (CLOCK screen) uses the 1 PPS signal from the reference distribution system, based on the maser signals. The CLKINT screen displays internal properties of the station timing software.

- SETALL: Set all interface address blocks.
- SETADDR: Set a single interface address block.
- INTERNAL: Display interface internal values.
- FREADBLK: Reads a block of MCB addresses and writes those data to a file as well as to the screen. (Currently not functioning, because the VLBA has hard coded file names not existent at the GBES.)

MODULE: This MENU has been modified with the sub-menus DECODER and DOWN converter added. The base band converter PWRSR and PCC screens for the VLBA have been removed.

- SYN: The synthesizer SCREEN is unmodified from the VLBA version. (Three synthesizer units are allowed as input, but the GBES has only 4cm, unit 1, and 2cm, unit 2.
- DOWN: New SCREEN to monitor and control the GBES 4cm and 2cm down converter status.

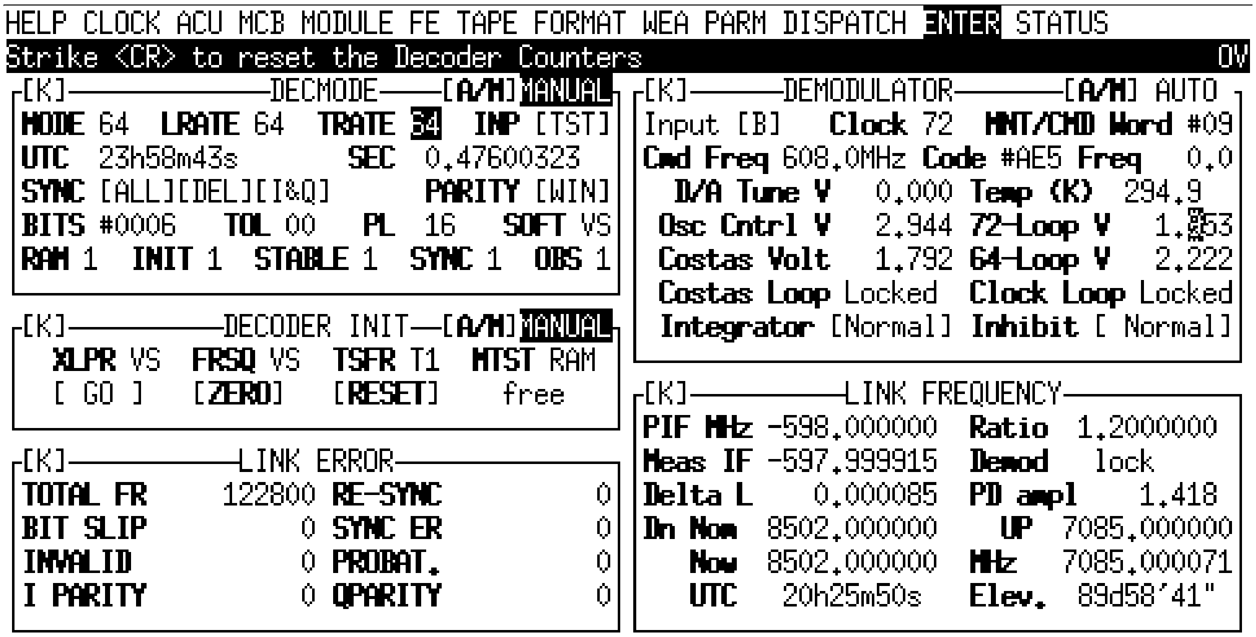

Figure 4: GBES SCREENs for monitor and control of decoder and demodulator. The LINKFREQ screen displays summary information useful when tracking SURFSAT. In this figure, the system was set up in its internal "X band Long-Loop" test mode, in which the phase residuals should be a constant near 85 Hz, as shown in the LINKFREQ screen. In the test configuration, the DEMOD should show both loops locked.

LOMON: Monitor and control Round-Trip Phase Monitor Module.

GPS: Monitor and Control GPS receiver.

DECODER: New MENU of screens to Monitor and Control wideband data decoder.

- VME: VME communication MENU of test screens.
- DECMODE: Set and monitor mode parameters of the decoder.
- DECINIT: Set decoder configuration
- LINKERR: Monitor various link errors detected by decoder.
- RHD: Monitor decoder Radioastron Header.
- RAMSEND: Send data to RAM shared memory.
- RAMON: Read RAM shared memory and Display results.
- VSOP: VSOP MENU of screens which display downlink telemetry data.
  - RAWVSOP: Complete raw VSOP downlink header data.
  - TEMPVSOP: Downlink VSOP hardware module temperatures.
  - SYNVSOP: VSOP synthesizers and receiver status.
  - TPVSOP: Latest Total Power measurements from VSOP downlink.
  - LINKVSOP: Uplink and downlink state measured on VSOP.
  - RCVVSOP: Receiver and front end status of VSOP.
  - ACSVSOP: Attitude Control System status of VSOP.

DEMOD: GBES Down-link Demodulator screen, displays lock and sweep modes as well as tuning frequency.

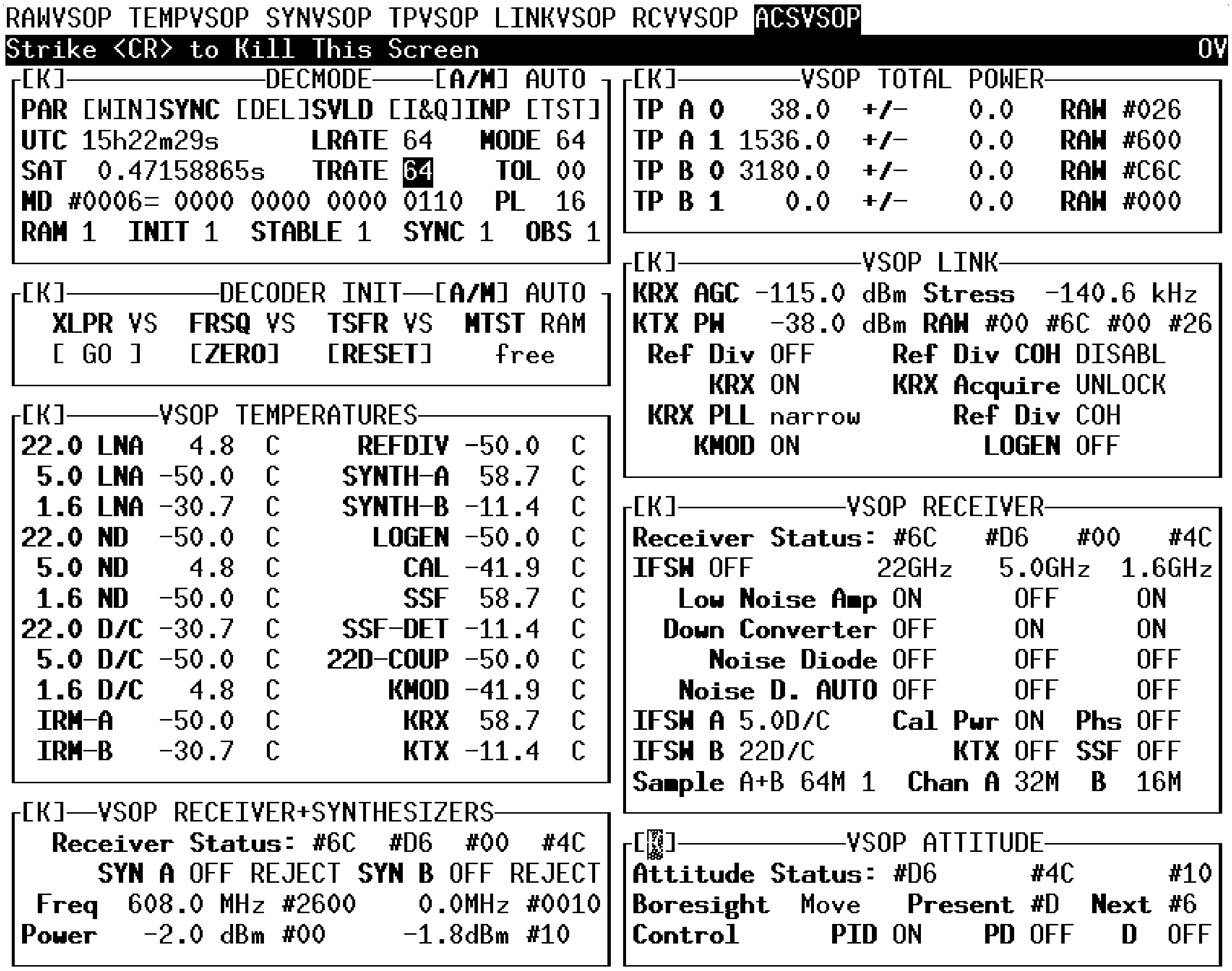

Figure 5: SCREENs to monitor the VSOP downlink header status.

TWT: New Two Way Timing menu of SCREENs, which display phase transfer status to the satellites.

BBC: Screen for monitor/control the Base Band Converters.

IFDIST: Screen for monitor/control of the IF Distributors.

FE: Modified version of the VLBA Front end monitor/control functions. Only 4cm and 2cm are present for the GBES.

FECRYO: Monitor and control cryogenics of all receiver front ends.

FELEC: Monitor and control electronics of all receiver front ends.

FEXMIT: Monitor and control the 4cm Transmit/Receive Switch. The 2cm system uses a circulator instead of a switch.

HELIUM: Display Helium Pressure from supply and return inlets.

UP: Go up to the main menu.

TAPE: Unmodified MENU of screens to Monitor and Control VLBA tape recorder.

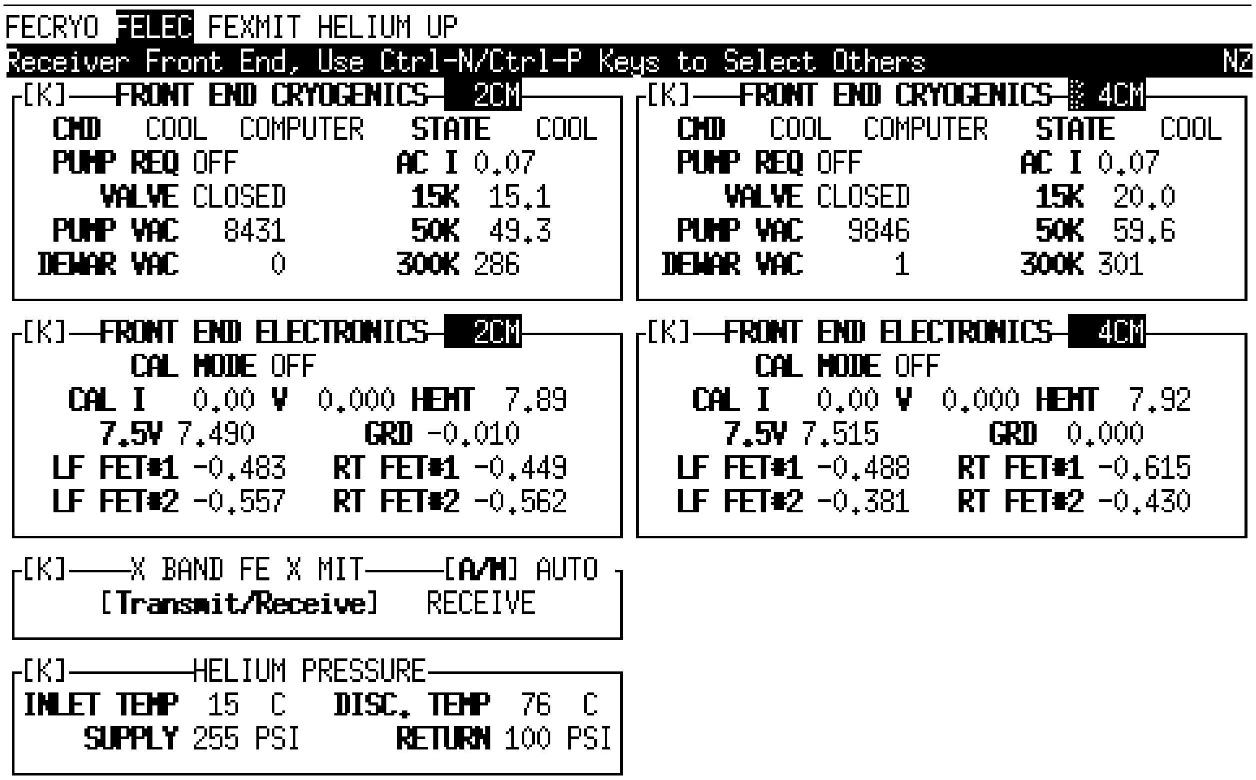

Figure 6: GBES SCREENs for monitor and control of the 2 and 4cm Front Ends, 4cm transmit switch and Helium supply. Formatter.

MOTION: Monitor and Control recorder tape motion.

MONITOR: Monitor and Control recorder decoder section.

HEAD: Monitor and Control head stack movement.

RECORD: Monitor and Control write section.

RECERR: Display tape recorder error status.

TDC: Starts MOTION, MONITOR, HEAD, RECORD, RECERR and TDCCMD.

TDCCMD: Tape Drive command line interpreter.

PREPASS: Perform a Tape prepass. This screen is executed for each tape that is loaded on the recorder.

MOUNT: Mount a tape in preparation for writing. This screen is used to enter the tape VSN.

RDBK: Control automatic tape read-after-write system, Readback.

MINI: Read Frame Header Info Using the Mini-Decoder.

INCH: Derive Parameters fro the Tape Drives Inchworm controller.

UP: Strike $< CR >$ to Return to the Main Menu.

FORMAT: Unmodified MENU of screens to Monitor and Control Formatter.

TRAK: data track assignments

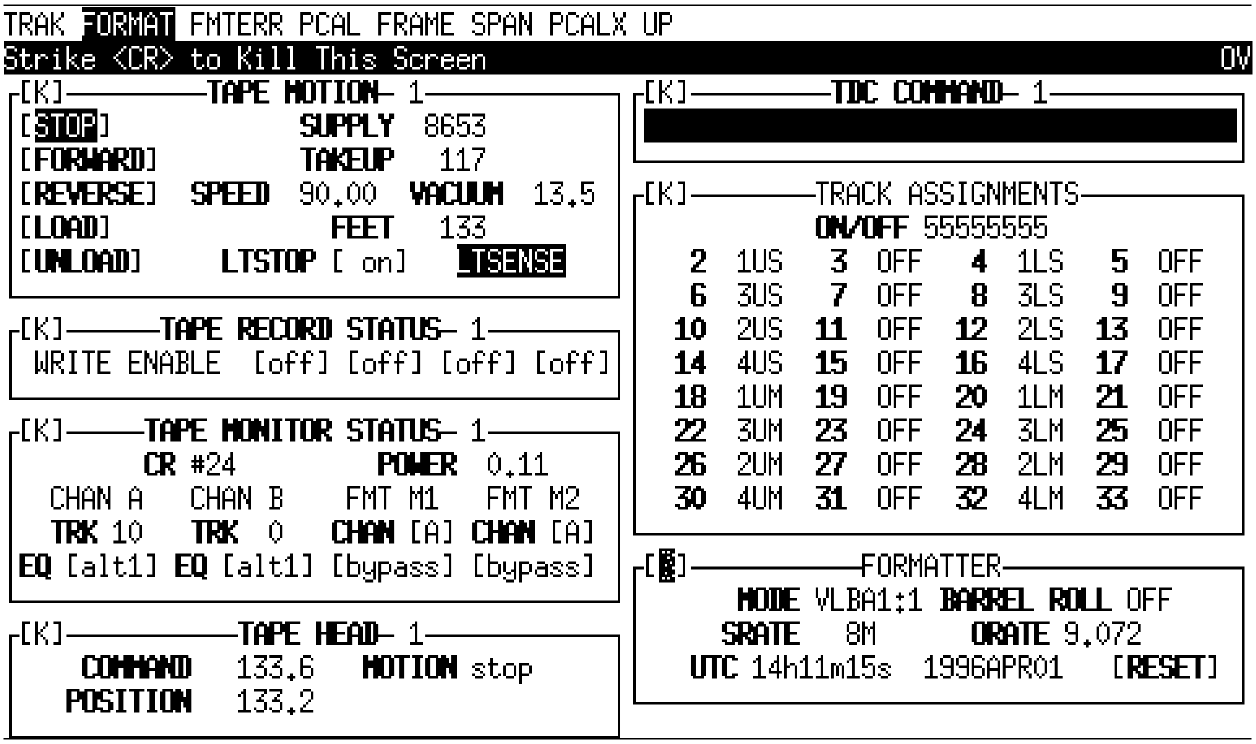

Figure 7: GBES SCREENs for monitor and control of the Tape Drives and Formatter.

FORMAT: Monitor and Control Formatter.

FMTERR: Display formatter status and errors.

PCAL: Display current phase calibrations.

SPAN: Collect formatter data and perform spectral analysis.

PCALX: Configure and operate phase calibration extractors.

UP: Strike $< CR >$ to Return to the Main Menu.

WEA: Unmodified SCREEN to Monitor and control weather station.

PARM: Unmodified MENU of screens to Read and Set station parameters.

FEPARM: Read and Set Front End parameters.

STATION: Read and Set Station parameters

RECPARM: Read and Set tape recorder parameters

DISPATCH: New GBES MENU of screens to monitor the automatic control of the GBES. The DISPATCH menu has several SCREENS:

COMMANDS: Displays the command file being executed and lists the next 4 commands to be executed.

LOG: Displays a summary of the last few DISPATCH entries into the LOGWRITER queue.

MESSAGES: Lists the output of DISPATCH MESSAGE commands. These messages summarize the type of tracking observations being executed and also prompt the operator to mount/dismount tapes.

TECH: Allows Technician entry of comments into the station log. This screen should be used to explain circumstances which can not be detected by the real-time system. This includes an entry for each time the antenna is taken out of service due to adverse weather.

MODES: Display and modify the current desired mode of the station. The observation code being served by the current tracking pass is displayed as is the astronomical source being observed by the satellite. The coordinates of this source are also displayed.

FILES: Display and modify the directories and files being used by the tracking station. This SCREEN is used to modify directory names under un-usual circumstances, such as a disk drive failure.

ENTER: Allows entry and execution of a screen. User is prompted for the VxWorks symbol name of the screen to spawn (unmodified from the VLBA).

STATUS: New GBES MENU of screens to display the GBES STATUS. The Status screens display the information to be written to the GBES status file at regular intervals. The SCREENs of the STATUS menu are:

ANOMALY: Listing of Anomalies detected by the Monchk Functions.

MONCHK: Listing of the Monchk Functions currently scheduled.

EQUIPTEMPS: Displays values gathered by the monchk functions measuring electronics rack temperatures.

FILESHOW: Utility function to display any ascii text file. By default, this screen displays the `status` file, which contains a short summary of the GBES status.

MONVALUES: Utility function to display the first few monitor values logged by a Monchk function.

UP: Returned to previous menu.

```
COMMANDS LOG MESSAGES TECH MODES FILES TAPES DECODERS UP
Display commands being dispatched.                                        NZ
┌[K]──────13h41m30──────DISPATCH COMMANDS────[A/M]MANUAL─[MORE][TOP ]─Page─  0┐
│   File: 96DEC09.cmd.a                                                       │
│Include: 96DEC09.cmd.a                                                       │
│21h31m59 INCLUDE FILE=astronomyStop.cmd                                      │
│21h36m59 INCLUDE FILE=surfsatStart.cmd                                       │
│21h51m59 DEFINE  PHASEFILE=9612092151.phr                                    │
└─────────────────────────────────────────────────────────────────────────────┘
┌[K]─────────────────────DISPATCH LOG─────────────────────[MORE][TOP ]─Page─  0┐
│13h41m07 INCLUDE    FILE=astronomyStart.cmd                                   │
│13h41m06 END-OF-FIL                                                           │
│13h41m06 SURVEY     SPAWN                                                     │
│13h41m06 SURVEY     DATADIR=/j2/ovlbi/out/SURVEY/                             │
└──────────────────────────────────────────────────────────────────────────────┘
┌[K]─────────────────────DISPATCH MESSAGES────────────────[END ][TOP ]─Page─  0┐
│13h38m01  surfsat rises at 96DEC09 21h51m59s                                  │
│                                                                              │
│                                                                              │
└──────────────────────────────────────────────────────────────────────────────┘
┌[K]───────────────────────────────TECH───────────────────[END ][TOP ]─Page─  0┐
│                                                                              │
│13h39m07 GIL: Morning tracking passes missed because command file ended.      │
│13h38m37 GIL: Antenna put in snow dump position                               │
│                                                                              │
└──────────────────────────────────────────────────────────────────────────────┘
┌[K]──────STATION MODE──────[A/M] AUTO ┐┌[K]──────STATION FILE──────[A/M] AUTO ┐
│MODE IDLE          #0000    SATID    0││ IN  /hd0/in/                          │
│PROG DOPLER            SRC DAY00      ││OUT  /hd0/out/                         │
│RA,DEC   0h00m00.0  90d00'00"    J2000││COPY /s3/ovlbi/out/                    │
└──────────────────────────────────────┘│ORB                                    │
                                        │TWT  9612082204.phr                    │
                                        │MON  monitorPoint.dat                  │
                                        │ANOM anomaly.dat                       │
                                        └───────────────────────────────────────┘
```

Figure 8: SCREENs display of a command DISPATCHer commands to be executed, log of recently executed commands, and messages to the operator. In the COMMAND screen the DISPATCH command file, `96DEC09.cmd.a` is being entered. This command file contains an include file for each section of the SURFSAT doppler tracking sequence.

```
ANOMALY MONCHK EQUIPTEMPS FILESHOW MONVALUES UP
Strike <CR> to Kill This Screen                                              NZ
[K]------------------------------ANOMALY--------------------[END ][TOP ]-Page-  0
  67 Anomalies:    0 Emergency,    0 Severe,    0 Error,    0 Warning,   63 OK

[K]------------------------MONCHK--------[MORE][TOP ]--Page-  0---Points- 12
Mon. ID  Pass  Rate        Log Rate  Code   Description/Error String Returned
TSYS       2 TENSEC       TWOMIN      = System/Cal ratio, Cal level
GPSTIME    1 TENSEC       TENMIN      = GPS Timing status
UPSSTATE   1 TENSEC       TENMIN      = Uninteruptable Power Supply
weather    2 THIRTYSEC    TWOMIN      = Weather station
ACU        2 ONEMIN       ONEMIN      = ACU status and positions
errno      1 ONEMIN       NOLOG       = Task errors

[K]--------------------FILESHOW--------------------------[MORE][TOP ]-Page-  0
IN : /s3/ftp/ovlbi/out/status
NRAO GREEN BANK OVLBI EARTH STATION STATUS        1996DEC09 13h50m00s
===============GENERAL=====================================================
Mode=0x0000 (IDLE)
Command file=96DEC09.cmd.a   Orbit file=(none)
Weather:  Temp=-4.7C  DewPt=-7.8C  P=916.89mb  Wind=62deg @ 0m/s

[K]--------EQUIPMENT TEMPS-
     Rack L  24.0 C      Bin Top  26.1 C
   Rack Top  18.4 C      8GHz FE  28.1 C
   15GHz FE  11.0 C     Eqpt Bld  26.7 C
   Humidity  15.8 %     Heater C   5.1 V
```

Figure 9: SCREENs display of a summary of the GBES status. The ANOMALY screen shows a list of anomalous conditions detected by the real-time task `monchk`. The MONCHK screen shows the functions currently scheduled by the `monchk` task. The FILESHOW screen allows display of any ascii file. The default is to display the contents of the most recent status file. The EQUIPTEMPS screen displays the values gathered by the monchk functions. The MONVALUES screens are used to display the monitor values last recorded. In this example, the temperatures (in Kelvins) of the equipment are listed in one screen, and in the other, the round trip phase measurement (seconds) is listed.

Appendix A: SCREENs On-Line Help

The VLBA screen system uses a two-level menu structure consisting of a main menu and several sub-menus. These command menus are lists of sub-menus and screens. The current command menu is always displayed on the top-most terminal line. A command menu item is executed by pressing the carriage return key (<CR>) when the menu item is in reverse-video (highlighted). Executing a menu item produces either another command menu, a sub-menu, or a display screen. Screens contain fields showing current parameter values and system status information. They can also be used to enter commands, change parameters, and perform tests.

The second terminal line is in reverse-video and always contains a terse description of the current cursor position. One or more screens may be displayed below this help line.

Notice NO action is ever taken or a value changed until you press <CR> (Return). When <CR> is pressed the field contents are checked for validity, and if bad, elicit an error message and the terminal bell.

```
                         --- At Any Time ---
     Help(?) - get additional help information for current
                 cursor position including any error message
     Ctrl-C  - exit screen system
     Ctrl-R  - clear & rewrite entire terminal screen
      ^ or > - move cursor to next screen or command menu
     MOUSE   - mouse buttons may also be used  -more details later-

                     --- In the Command Menu ---
       Right Arrow (Ctrl-G) or Tab - select next command to right
  Left Arrow (Ctrl-F) or Backspace - select next command to left
              First Command Letter - select corresponding command
                 Up Arrow (Ctrl-T) - return to top level menu
                              <CR> - execute selected command
                 Left Mouse Button - select command under mouse cursor
                Right Mouse Button - same as Left Mouse and <CR>
```

To select a menu item, move the reverse-video to it. This is done using right-arrow, tab, left-arrow, backspace, left mouse button, or the command's first letter. Pressing a letter selects the next command to the right beginning with that letter. To execute the selected command press <CR> or the right mouse button.

After a menu item is executed, the cursor will move to that screen or sub-menu. Sub-menus replace the main command menu when executed. When the cursor is in a sub-menu, the up-arrow or selecting the "UP" command restores the main menu.

```
                     --- In a Screen ---
   Right Mouse or <CR> - enter field value or press button
     Left Mouse Button - move directly to the field under the mouse cursor
         Backspace/Tab - move to previous/next field left/right (or line)
                Delete - within entry window, delete character before cursor
  Right-arrow (Ctrl-G) - move cursor right in entry window, stop at right
                            If NO parameter can be entered acts like Tab key
   Left-arrow (Ctrl-F) - move cursor left within entry window,
                            at field left edge move to next field left
     Up-arrow (Ctrl-T) - move cursor to first field on previous line
                            at screen top move to first field on bottom line
   Down-arrow (Ctrl-V) - move cursor to first field on next line
                            at screen bottom move to first field on top line
                Ctrl-K - move to [K] field
                Ctrl-N - display next field value
                Ctrl-P - display previous field value
                Ctrl-U - clear field to re-enter value
                Ctrl-L - return cursor to command menu
                ^ or > - move cursor to next screen or command menu

                     --- The Mouse ---
```

Terminals equipped with a mouse that can send ANSI mouse strings (PC's with ProComm or a workstation) can use the mouse to move between fields, screens, and menus as well as executing a <CR> on the selected item.

Pressing the Left mouse button will select the field under the mouses pointer. If the screen is partially obscured by others, it will be popped to the surface of the display. Pressing the left button outside of a defined field, but within the borders of a screen, will pop the screen to the surface. Nothing will happen if the left button is pressed outside of a field and screen.

The Right mouse button has the combined effect of a Left button press on a field (selects that field) and a <CR>. Pressing the Right button outside of a field or anywhere a <CR> is invalid will result in a beep.

The Right button is useful for selecting menu items, pressing screen buttons, and killing screens. An "UP" menu item is available on most menu bars to take you up one menu level.

Every screen (including this one) contains a "[K]" field in the upper-left corner. It is used to remove (kill) the screen. To do so place the cursor on the K and press <CR> or press the right mouse button on the "K".

Once you have a screen up you can start a second screen by pressing Ctrl-L to return the cursor to the command menu line. Then select another (or the same) screen, and press <CR> to bring it up in an unused portion of the terminal screen. The mouse can be used to do this directly. By repeating this process you can bring up any number of screens. When all available space is used the screen is placed in the upper-left corner over the already running screens. Everything will still run in this state but it is difficult to know the cursor location.

You can also move the cursor from a screen to the menu line, or from screen to screen by pressing '^' or '>'. Pressing '^' or '>' enough times will rotate the cursor though all running screens and the command menu line. The difference between '^' and '>' is the direction the cursor travels. Again, the mouse makes this task much more direct.

The screens contain one or more "fields" and three levels of explanatory text:

1) An optional field name appears to the left of the field.

2) When the cursor is moved to the field, the second terminal line will have a short field description.

3) When the cursor is moved to the field pressing the ? key will pop up a detailed help window. Pressing any key will exit the help window and the screen will respond to the key.

Use the Tab and Backspace keys or mouse buttons to move the cursor through the fields. Screen fields shown in reverse-video indicate an error condition. Place the cursor on the field and press '?' for more information.

There are four basic field types: label, button, data and entry. Label fields are like field names, but the cursor can go to labels so users can get explanations of column headings, etc.

Button fields are enclosed in square brackets, like the [K] screen kill field. A <CR> or right mouse button will press the button when the cursor is in the field.

Data fields show the state of system parameters. They may be numeric or text but they cannot be changed by the user.

Entry fields are user changeable data fields. To change an entry field, use the Right-arrow or Ctrl-U key. The screen system will open a small entry window at the bottom of the screen.

You may change one or more characters of the original field contents using Right-arrow and Left-arrow to position the cursor as needed. Ctrl-U will open an empty entry window. Some fields use Ctrl-N and Ctrl-P to step through a list of entry choices.

The entry window can be aborted with any cursor movement key and the Delete key will remove the previous character. All the text in the entry window is considered to be input when <CR> is pressed, but evaluation of a numeric field stops at the first space. For numeric values you may indicate the base by using a prefix: either ' for octal, # for hexadecimal, or no prefix for decimal.

The input routine does some character by character checking according to entry type (numeric, text, etc.). After the <CR> is pressed, additional entry checking is done. Bad characters and bad entries elicit an error message and the terminal bell.