DISPATCH Users Guide

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Overview

This document describes the DISPATCH commands for the GB Earth Station real-time system. The function of DISPATCH is to read commands from command files and execute them at the correct UTC times. The DISPATCH design document describes the program structure and design principles.

The DISPATCH task is started by the initialize function and is restarted by the DISPATCH SCREEN. This document describes the command syntax and the individual DISPATCH commands.

Inputs

The input to DISPATCH is the name of the file containing DISPATCH commands.

After DISPATCH initialization, the command file is opened and the commands are executed until end of file is reached. When all commands in the command file are executed, the DISPATCH task cleans up and terminates. In order to change the command file used by DISPATCH , DISPATCH must be halted and re-started. If necessary, the antenna operator will change the command file name by halting the DISPATCH task and restarting DISPATCH with a new file name. It is possible to re-start DISPATCH via the SCREEN package.

The DISPATCH task searches in two places for the command file. By default, the first directory searched for the command file in directory `/hd0/in/` , on the local VME hard drive. If the file is found it is executed. If the file is not found on the local drive, the ovlbi home directory, `õvlbi/in` , on the Green Bank network is searched. If the file is found, it is opened and executed, else an error is returned.

Command Structure

Each DISPATCH command file line has four components:

1.optional Date,

2.optional Time,

3.the command Name, and

4.command Parameters.

#			Dispatch command file for 98MAY14
DEFINE			ORBITFILE=980511-980519-p.orb
98MAY14	6h31m00	VSOP_SC	PERGEE
98MAY14	7h24m08	INCLUDE	FILE=quickTest.cmd
98MAY14	7h29m08	MESSAGE	BEGIN LINK to vsop in 20 minutes
98MAY14	7h34m08	INCLUDE	FILE=tapeDrive0.cmd
98MAY14	7h39m07	PROGRAM	NAME=NAV
98MAY14	7h39m07	DEFINE	PHASEFILE=9805140749.phr
98MAY14	7h39m08	INCLUDE	FILE=vsopStart.cmd
98MAY14	7h48m08	INCLUDE	FILE=peakUpLink.cmd
98MAY14	7h49m08	INCLUDE	FILE=vsopLink.cmd
98MAY14	9h22m29	INCLUDE	FILE=vsopUnlink.cmd
98MAY14	8h19m08	INCLUDE	FILE=peakUp.cmd
98MAY14	9h32m29	INCLUDE	FILE=galaxyStart.cmd

Table 1: Sample of a simple command file for a VSOP tracking pass. Note that lines beginning with # are comments.

The Date, Time, Name and Parameters are separated by blanks. One and only one command is on each command file line. The input Date, Time and Name are case-insensitive and extra blanks between these items are ignored.

Upon encountering a command without a Time, DISPATCH executes it immediately. Until DISPATCH encounters a command with a valid Date, the time of the command is interpreted as the time on the command line *plus* the time when the command file was opened. (Ie. the times commands are *relative* to the time execution began.) Upon encountering a valid Date, DISPATCH executes that and all following commands assuming the time on the command line is exactly the *utc* time when the command should be executed. (I.e., it is an *absolute* time.) If the command has a time but no date, the date of the previous command is assumed.

Example Command File

A sample command file is shown in table 1. This command file INCLUDEs a second command file shown in table **??**. Table 1 contains comment lines beginning with #. It also shows the use of the DEFINE command which is used to pass the name of the orbit prediction file to the command file, surfsat.cmd, INCLUDEd.

Meta Commands

In order to make the Earth Station interface easier to use, three facilities are added to the DISPATCH's command syntax: DEFINE, MACRO and INCLUDE. DEFINEs allow definition of strings in command parameters, for example a satellite type, a variable called STYPE could be defined as RA or VSOP and used in MACRO definitions. MACROs are sequences of commands which are executed as a single unit. INCLUDEs are instructions to start execution of another command file before execution of the rest of the current command file. Control returns to the current command file when the end-of-file is reached in the INCLUDE file.

The file specified by the INCLUDE command can also contain INCLUDE commands, but this recursion has a depth limit of 10. Upon starting execution of each command in the file, the times of commands are interpreted in the manner described earlier. When returning from the INCLUDE file, the interpretation of the time remains as it was before executing the INCLUDEd file.

When encountering a MACRO command, DISPATCH stores the following command file lines in dynamically allocated memory until reaching an END MACRO command.

Date and Time input formats

The Date format is `YYMMMDD`, where `YY` is the calendar year and `YY` < 50 implies `20YY`, `MMM` is a three character month (ie `JAN`) and `DD` is day of the month. The Time format is `HH:MM:SS` and consists of `HH` integer hours (range 0-23), `MM` integer minutes (range 0-59) and `SS` seconds (range 0-59). The seconds field is optional, defaulting to 0 seconds. There must be no spaces between components of the Date or Time. (ie. 93aPr13 is a legal date, but 93 Apr 13 is not.) DISPATCH uses the VLBA `str2mjd` and `str2rad` routines for converting date and time to internal values. These routines are somewhat "user friendly" concerning input formats. Many other formats are also accepted. The date could be the mjd as a 5-digit number, and the time could be in radians, since these are also accepted by str2mjd and str2rad.

Dispatch Commands

Below the commands executed by DISPATCH are listed, and a table of command arguments are given. The † symbol indicates this DISPATCH command is implemented. The $^{\mathcal{M}}$ symbol indicates this DISPATCH command is implemented as a macro.

ACQUIRE† `CHANNEL=<digit> TIMEOUT=<timeout> MINSIGNAL=<volts> RADIUS=<distance> [DECODERSET]` Begin attempt to automatically acquire down-link signals from satellite. Includes execution of PEAKUP. Once adequate signal is being received, executes tracking pass initialization sequence (mainly clock setting). If not accomplished within timeout seconds, send alarm to operator. The `CHANNEL` indicates which total power detector should be used to search for satellite signal. The `TIMEOUT` indicates the time to search for the satellite signal before declaring ACQUIRE failure. The `MINSIGNAL` value indicates the minimum signal required before beginning a satellite search (-10 indicates no minimum). The `DECODERSET` parameter indicates the decoder time should be reset upon ACQUIRE completion.

ACU† `ACU | LOCAL START | STOP BRAKE=<ON|OFF>> POWER=<ON|OFF>> AZEL=<azimuth>,<elevation>>` Primitive antenna control commands. The `AZEL` function forces the antenna into the mode appropriate to cause antenna motion under computer control. When the antenna arrives at the require location, the antenna brakes are set. The `AZEL` argument does not include antenna pointing corrections.

ACUCPU$^{\mathcal{M}}$ Places the antenna control unit under computer control.

ACULOCAL$^{\mathcal{M}}$ Places the antenna control unit under manual/local control.

BRAKEOFF$^{\mathcal{M}}$ Sets the antenna brakes off.

BRAKEON$^{\mathcal{M}}$ Sets the antenna brakes on.

CALLOUT† `STOP|START|RESET *,EMERGENCY,CALL3,2m ANOMALY=DEM_COSTAUN` Enable or disable call-out for anomalies. Selected anomalies may be ignored by entering the anomaly name to ignore. Note that all anomalies with the matching strings will be ignored.

DECODER† `RATE=<72|64|36|18>` `TSTGEN=<72|64|36|18>` `PARITY=<NON|WIN>` `INPUT=<REC|TST>` `IFILE=<fileName.I>` `QFILE=<fileName.Q>` Set up decoder for Radioastron data rates of (RATE=72, 36 or 18 MHz) or VSOP data rate (RATE=64) MHz. Decoder test generator for Radioastron data rates of (TSTGEN=72, 36 or 18 MHz) or VSOP data rate (TSTGEN=64 MHz). Decoder Parity set to NON-windowed or WINdowed mode. Set decoder input to RECeiver or TST-generator.

The decoder contains a test frame generator that may be loaded with a test data pattern simulating the astronomical signals.

DEFINE† `<variableName>=<value>` Allows definition of strings to be substituted into the command parameter lists. The DEFINEd variable list is only used when determining *values* for command parameters, not keywords.

DEMOD† `INPUT=<A|RADIOASTRON|B|VSOP>` `CLOCK=<18|36|64|72>` `SURFSAT` `RESET=<0|1>` `INHIBITSWEEP=<0|1>` [`TUNE=<tuneFrequencyHz>` — `CODE=<tuneCodez>`] Sets up the Demodulator hardware. The `INPUT` to the demodulator is from one of two sources. The `CLOCK` frequency may have one of for allowed values (MHz). The `TUNE` frequency (Hz) has a range of 5×10^6 to 8×10^6. The `CODE=0xABCD` is used to send the tuning code to the demodulator. Two optional Demodulator commands are `RESET=1` to reset the loop integrater (`RESET=0` is the normal mode) and `SWEEP=0` for inhibiting sweep mode (`SWEEP=1` is the normal mode).

DOWNCONV† `UNIT=<4CM|2CM>` `ATTENLEFT=<value>` `ATTENRIGHT=<value>` `TRANSFER=<0|1>` Set Down Converter unit (4CM or 2CM), left attenuator (0-38 by 2), right attenuator and transfer switch (0=normal, 1=switched).

END MACRO† Terminates the macro defined by the previous MACRO command.

FILECOPY† `FILE=<fileName>` `[REMOVE]` `[REPLACE]` Copy files from the realtime system to the offline system for further processing. Optionally the file on the realtime system may be `REMOVE`d. Optionally if the file already exists on the offline system it may be `REPLACE`d.

FORMAT† `MODE=<VLBA4:1|VLBA2:1|VLBA1:2|VLBA1:4|MARKIII|MARKII|NONE>` `RATE=<250K|500K|1M|2M|4M|8M|16M|32M>` `BITS=<1|2>` `EVEN` `ODD` `FREQ1=<1E6>` `FREQ2=<1E6>` `PCAL=<AB>` Setup Formatter mode and output data rate and enable tracks. The `FORMAT` command must be used to set up internal variables used to calculate the tape speed. The tape speed is not set until the `TAPE` command is executed. See appendix on VLBA Format modes.

FRONTEND† `UNIT=<4CM|2CM>` `NOISE=<OFF|LOW-SWITCHING>` `CRYO=<PUMP|STRESS|OFF|HEAT|COOL>` Set the front end unit (4CM or 2CM), Noise cal (OFF or LOW-SWITCHING), and cryogenics (PUMP, STRESS, OFF, HEAT or COOL; COOL is normal mode).

GETZEROS† Turn on and off the down converter attenuators to measure the zero level of the IF distributor total power detectors.

GETDOWNZEROS† Turn on and off the down converter attenuators to measure the zero level of the down converter total power detectors.

GETCALS† Turn on and off the front end calibration signals while measuring the signal levels, in order to calibrate the total power detectors.

GALAXY† GBES galaxy mapping test mode.

INCLUDE† `<filename>` Include and executes a command file.

MACRO† `MACRO` defines all the following commands as a macro with name `<MACRO-NAME>`. The macro is terminated with the `END MACRO` command.

MCBWRITE† `ADDRESS=<address#>` `[ DATA=<data#> ]` Allows direct address to the monitor control bus. If the `DATA` argument is present, then the command bit is set in the MCB transaction address. If the `DATA` argument is not present, then the MCB transaction is assumed to be a monitor request, and the data are logged.

MESSAGE† `<level> <message>` Inserts a text string as an event record in the log file.

MONCHK† `FILE=<dispatchCommandFile> ANOMALY=<anomalyFileName>` — `STOP` Spawns the MONCHK task with two input file name arguments. The file names are required to specify the GBES functions to be monitored, and the meaning of anomalous conditions. The MONCHK task will be first stopped if already running. With the `STOP` argument the MONCHK task is stopped and not re-started.

PEAKUP† `UNIT=<4CM|2CM> RADIUS=<angular distance (radians)> POLAR=<A|B> <VSOP|RADIOASTRON|BIGSEARCH|POINTING>=<time (seconds)>` Causes antenna pointing to be scanned around the nominal position in order to peak up on the satellite signal. PEAKUP has four search modes and an input duration (seconds) for the maximum search. The angular radius searched is given by the `RADIUS` argument. The front end and polarization channel are given by `UNIT` and `POLAR`. Computes pointing error and applies appropriate pointing correction until next PEAKUP or RESET.

POINTCOR† Load 9 pointing coefficients into an array for use by the pointing tasks.

PROGRAM† define name of observation being supported.

REGION† Gathers a series of measurements of the sky brightness around a specified region. For diagnostic use only.

RESETMCB† Resets all MCB interfaces so that all future commands will be effective. Fixes problems due to module having power cycled or a power glitch.

RESET Reads the station parameters file and sets all station hardware to a default state. This is also done automatically at boot-up.

SATSIMOFF†,$\mathcal{M}$ Turn off the satellite simulator module.

SATSIMON†,$\mathcal{M}$ Turn on the satellite simulator module.

SATSIMKU†,$\mathcal{M}$ Set the satellite simulator in Ku band mode.

SATELLITE† `<RADIOASTRON|VSOP|digit>` Sets the station status satellite field. The strings for Radio Astron and VSOP are recognized, otherwise the satellite id number may be entered. (0=Satellite simulator)

SETFREQ `WAIT` Test function which attempts to set the uplink and down link frequencies to the current SURFSAT frequencies.

SETMODE† `<0|1|2|3|4|5|6>` High level summary of Tracking station status. 0=IDLE,1=SHUTDOWN,2=TEST,3=ACQUIRE,4=TRACKING,5=PEAKUP,6=ASTRONOMY.

SETPOWER† Set up total power detectors.

SETTEMP† Load measured values of the FRONTEND calibration resistor temperatures.

SHUTDOWN$\mathcal{M}$ Includes STOW, TRANSMITTER 0, and turning off power to antenna servo. May include other things, like closing files and copying them to other computers.

STARTTIME† `[CURRENT | <date> <time>]` Indicates that all commands in the file should be skipped until reaching commands starting after a specified time. By default the no commands are skipped. If `CURRENT` is specified, then all commands are skipped until reaching a time after the current time. Then DISPATCH waits until that command and begins normal execution. This function is used to implement selection of one command file out of several scheduled for future execution. Functions implementing this command are also used to handle certain restart functions.

STARTUP$\mathcal{M}$ Turn on power to antenna servo and cause computer to take control. Send position commands equal to the present position. Ensure that brakes are set.

STATUS† `INTERVAL=<timeSeconds> DIR=<output directory> COPY=<copy directory>` Restart the `STATUS` task with a specified `INTERVAL` in seconds. If the `INTERVAL` is not positive, the `STATUS` task is stopped and not restarted. The output main `DIR`ectory and `COPY` directories may also be specified, but are not required.

STOW$^{\mathcal{M}}$ Drive antenna to stow position and set brakes.

SURVEY† GBES survey test mode.

SYNTHES† `UNIT=<4CM|2CM> <FREQ=frequency GHz>` Set the synthesizer unit (4CM or 2CM) to specified frequency in GHz. Only a small number of input frequencies are allowed. For VSOP the input frequency will always be 13.6 GHz.

SYSTEM† `REBOOT|EXEC=<function Name>` Allows DISPATCH to execute some vxWorks system level commands.

TAPE† `DRIVE=<drive> [ POSITION=<feet> | HEAD=<head position` μ`m> | FORWARD|BACKWARD REWIND|END STOP]` Tape commands to select a drive and *a)* Positions tape at specified distance from beginning of supply reel, *b)* Write to tape moving forward, using a selected set of heads, *c)* Write to tape moving backward, using a selected set of heads, *d)* Move to beginning of tape (no write), *e)* Move to end of tape (no write), *f)* Stop tape motion. The `DRIVE=0|1|2` must be specified, for each TAPE command. Both drives may be commanded simultaneously by `DRIVE=2`. Valid Head position range is -3276.8 to 3276.7 μm. The `FORWARD|BACKWARD` commands set the tape drive hardware to the speed appropriate for the last `FORMAT` command sent.

TRACK† `[ FILE=<orbitFilePath> | AZEL=<azimuth,elevation> | RADEC=<right ascension,declination> | KEPLER=<value1,value2,value3,value4,value5,value6> | STOP]` Drive antenna according to the tracking mode. Normal operation uses the `orbit file`. DISPATCH also spawns the two way timing task to set the up/down-link synthesizers accordingly. The antenna must have previously been given `STARTUP` and `BRAKEOFF` commands, otherwise it won't move. The `TRACK` command causes the geometry, point and two way timing tasks to be stopped. The `STOP` only stops the tracking tasks, and does not restart them. The `AZEL` argument includes antenna pointing corrections.

TWT† `STOP FILE=<Output Time Residuals File>` The two way timing task is spawned with an output file given by `FILE`. If no output file is specified, no output file is created. The `TWT` command first causes the TWT hardware to be reset in the manner specified in the station state structure.

TWTMODE†
`MODE=<0|1|RADIOASTRON|VSOP> LO2FREQ=<freq, MHz> UPFREQ=<freq, GHz> UPPOWER=<power> DDS=<freq1,rate1,doppler1,freq2,rate2,doppler2> DETECTOR=<gain1,gain2,gain3,gain4> | RESET | REBOOT | ZERO` Sets two-way timing subsystem to appropriate mode (`MODE=0` or 1 for testing, `MODE=RADIOASTRON` for Radioastron and `MODE=VSOP` for VSOP). Set second LO frequency (MHz), Up Link frequency (GHz), Up Link Power (fraction of nominal), DDS frequencies (MHz), rates (kHz/sec) and dopplers (Hz/sec/sec), and DETECTOR gains. Zero or negative power turns transmitter off. The DDS is reset with the `RESET` argument. The DDS is phase is set to zero with the `ZERO` argument. The DSP is reboot-ed with the `ZERO` argument.

VSOP_SC `SET_TS=GBANK,N` Transfer spacecraft commands to station state for monitoring and problem diagnosis.

WAIT† `[ LST=<timeString> | TASK=<taskNameString> | PAUSE=<durationString>]` The `LST` parameter commands the system wait until a specified LST time, input in standard 12h34m56s format. The `TASK` parameter commands the system wait until a task specified by name is *not* running. The `PAUSE` parameter commands the system wait for a specified duration, input in standard 1m23s format (note units are required as a part of the string, default is radians of time).

Diagnostic command file `quickTest.cmd`
In order to improve station reliability diagnostic tests are regularly run on the station. One of these tests is executed by the command file `quickTest.cmd`. The test sets up all of the station hardware (except antenna) for tracking and uses the satellite simulator at Ku band to provide downlink data for testing the demodulator and decoder. A quick test of the success of the test is made by examining the residual phase in the TWT phase screen or via the OPERATES screen.
In this command file all times are relative to start of execution of the file. Note that lines beginning with # are comments. Below is the latest version of the command file:

```
# File quickTest.cmd, version 1.7, released 00/04/25 at 13:33:36
#                    retrieved by SCCS 00/04/25 at 13:33:36
#Dispatch command file to run quick satellite simulator in long loop mode
#History
# 00Apr25 GAM change xmit power to 20%; add CALLOUT RESET
# 00Apr05 GAM change dem freq code: 0x0700 -> 0x06FB
# 00feb03 AHM add changes in callout times to detect errors sooner
# 98Aug27 GIL fix order for stopping tasks
# 98Apr21 GIL set satsim in K band
# 98Mar11 GIL Use new, very odd frequency
# 98Jan20 GIL Remove all commanding of the antenna and tapes
# 97Nov05 GIL add STARTUP and brakes off
# 97Sep12 GIL reduce execution time
# 97jul10 GIL satellite simulator quick test; do not overwrite ORBITFILE

# pass prediction and output residual file names
DEFINE TESTORBIT.DEF=zenith.1.4.orb
DEFINE  TESTPHASE.DEF=quickTest.phr

#stop all known tasks
TRACK STOP
MONCHK STOP
TWT STOP
GALAXY STOP
SURVEY STOP
REGION STOP
#
PROGRAM SNAME=SATSIM
VSOP_SC SET_TS=GBANK,N
        VSOP_SC OBSCOD=SATSIM
# prepare to detect total power
DOWNCONV UNIT=2CM TRANSFER=0 ATTENA=0 ATTENB=0
# turn cals off
FRONTEND UNIT=2CM NOISE=OFF
SYNTHES UNIT=2CM FREQ=13.6

# get zero level on detectors
GETZEROS
GETDOWNZEROS
# get cal signal level on detector
GETCALS
GETDOWNCALS

# prepare for strong satellite signal
DOWNCONV UNIT=2CM TRANSFER=0 ATTENA=6 ATTENB=10

# Start twt warm up
TWTMODE XMTR=ON

# decoder in VSOP mode
DECODER RATE=64

# Software
SATELLITE 0
SETMODE   2 5
SETFREQ UPRATIO=109 DOWNRATIO=99
```

```
# Satellite simulator
SATSIMKU
SATSIMON
# Downconversion
SYNTHES UNIT=2CM FREQ=13.4
DOWNCONV UNIT=2CM TRANSFER=0 ATTENA=25 ATTENB=31
# TWT system
TWTMODE MODE=3 DOWNFREQ=14.028298713e9 LO2FREQ=640.e6
TWTMODE UPFREQ=15.445298583e9 UPPOWER=0.2
DEMOD INPUT=VSOP CLOCK=64E6 TUNE=628.3e6 RESET=0 INHIBIT=0
DEMOD INPUT=VSOP CLOCK=64E6 CODE=0x06FB  RESET=0 INHIBIT=0
# decoder in VSOP mode test generation
DECODER TESTGEN=64 INPUT=REC
DECODER IFILE=RAIL6MHZ.I
DECODER QFILE=RAIL6MHZ.Q

#track previously defined test orbit file
TRACK FILE=TESTORBIT.DEF

# Set up software
MONCHK  FILE=monitorVsop.dat ANOMALY=anomaly.dat

# Two-way timing: file name is passed by a defining PHASEFILE
# Turn on transmiter at satellite rise
        WAIT PAUSE=2s
TWT FILE=TESTPHASE.DEF
TWTMODE ZERO

# Put a clock set event in log at satellite rise; set decoder clock
ACQUIRE CHANNEL=2 TIMEOUT=1m MINSIGNAL=-10. RADIUS=3.5' DECODERSET
# Update station mode
SETMODE 2

# Change callout times
CALLOUT RESET
        CALLOUT ERROR=120.0s
        CALLOUT SEVERE=120.0s
        CALLOUT EMERGENCY=120.0s

MESSAGE Satellite simulator test for a short time
WAIT PAUSE=5m
# prevent eroneous log entries after end
MONCHK STOP
TWT STOP
# turn of the transmitter and satellite simulator
TWTMODE XMTR=OFF
        SETMODE 0 0
SATELLITE 0
SATSIMOFF

# Change callout times
        CALLOUT ERROR=30m
        CALLOUT SEVERE=10m
        CALLOUT EMERGENCY=5m

# start normal monitoring
MONCHK  FILE=monitorIdle.dat ANOMALY=anomaly.dat
```

```
# move phase file offline
WAIT PAUSE=5s
# copy and remove output file
FILECOPY FILE=TESTPHASE.DEF REMOVE REPLACE
```