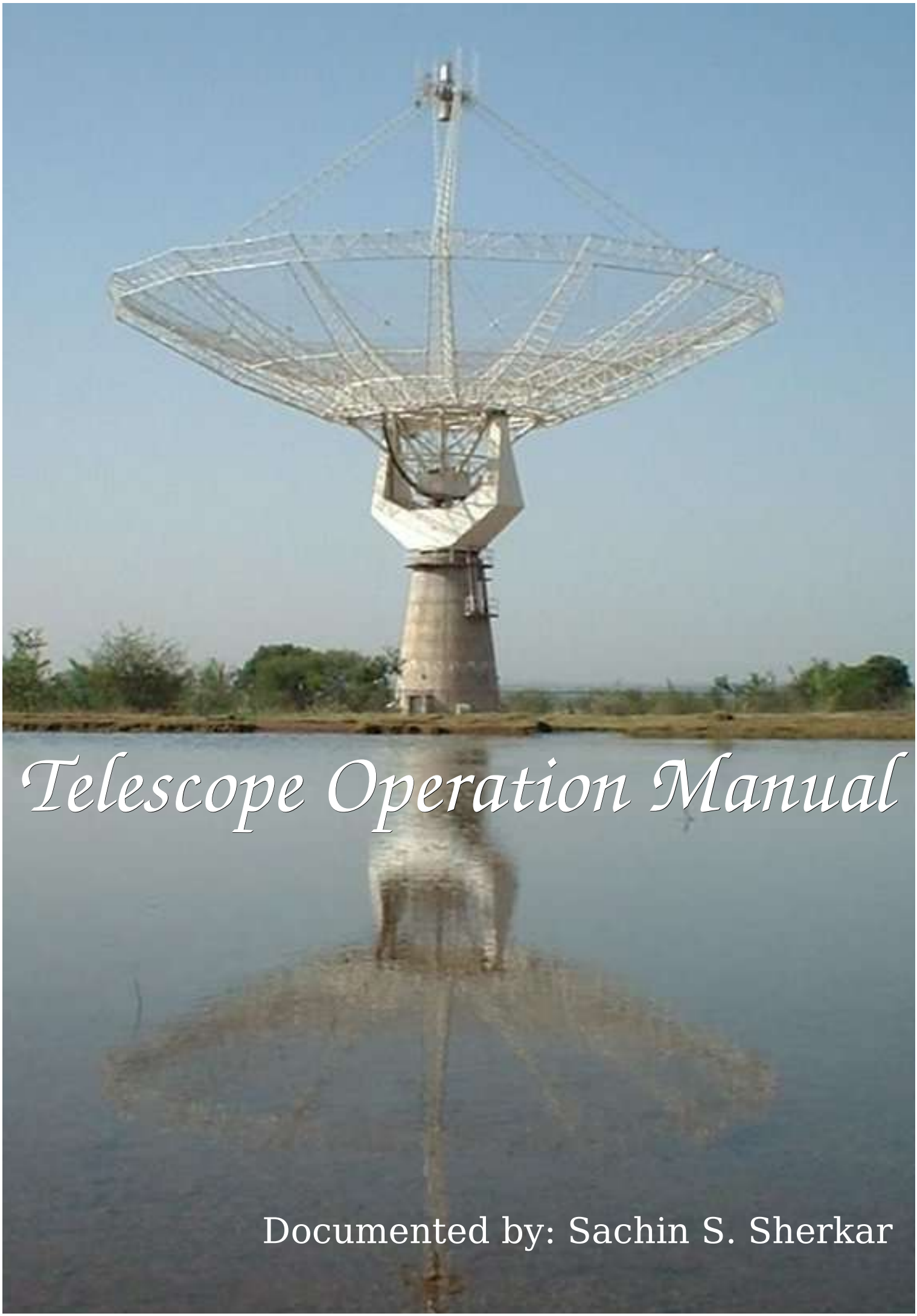

Telescope Operation Manual

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Table of Contents

1 How to start the ONLINE....4

2ONDISPLAY....8

2.1Ondisplay commands with figures....8

2.2Details of ondisp subw Flags....32

3Communication-Handler (COMH)....33

4Defining Subarray....35

5Feed Rotation & their calibration....37

6Running Correlator....39

7Settings for RF, LO & IF....42

7.1Single frequency settings....42

7.2Dual frequency settings....43

7.3Example of a cdsetX file....43

7.4Frequency and releted parameter setting....44

7.4.1Band Selection....45

7.4.2Solar Attenuator....45

7.4.3Polarization....45

7.4.4Cal-Noise level....46

7.4.5LO Frequency....46

7.4.6IF Attenuation....46

7.4.7IF band width....46

7.4.8ALC status....46

7.4.9Front End Parameter....46

7.4.10Baseband Related Parameters....47

7.4.11Baseband LO frequency(fourth LO) setting....48

8Baseband settings....49

9Power Equalisation....52

9.1Power equalisation using Baseband output....52

9.1.1Power equailise through mithun....52

9.1.2Power equailise through astro0....53

9.2Power Equalisation Using 30-to-1....54

10How to do the POINTING....56

10.1Pointing with Self Power.....57
10.2With Cross Correlations 59
11On Off deflection test for 30 to 1.....61
11.1On source recording.....61
11.2Off source recording.....62
11.3Measuring the deflection between on & off source data.....62
12How to start the observation.....63
13TroubleShooting.....69
13.1MSEB Power fails for some or all antennae. 69
13.2Antenna applies brakes in elevation.....69
13.3Antenna applies brakes in azimuth.....69
13.4Antenna applies brakes in both elevation and azimuth.....69
13.5Antenna gives ABC time out.....69
13.6Antenna got reset (see Flags in ONDISP).....70
13.7If antenna goes in "I" mode 70
13.8If ONLINE disk gets full.....70
13.9If servo doesn't go in "z" mode.....70
13.10Servo not releasing brakes.....70
13.11Servo reads high current 204 or 203 Amps.....70
13.12All MCM's are giving time out except MCM 0.....71
13.13Das doesn't get initiated.....71
13.14Ist LO is not getting lock.....71
13.15No fringes in antennas.....71
13.16No fringe on newly added antenna.....71
13.17Low amplitude.....72
13.18Wind goes high.....72
14Appendix.....73
14.1ABC IDs.....73
14.2Feed information.....74

14.3Online Commands.....75
14.3.1Old ONLINE Procedures.....75
14.3.2New ONLINE Procedures For SUN Machine 75

1 How to start the ONLINE

To start *ONLINE*:

1. Start the *Master*
2. Start *ONDISP*
3. Start *COMH* i.e. communication handler
4. Start *sub-array-0* with USER0 for all antennae
5. Start *sub-array-1* with USER1 for CEB
6. Start other users

NOTE: *While giving commands please observe the ONDISP window.*

a) Starting ONDISP

Start the ONDISP window by giving the command ondisp on any bhaskar terminal.

```
> ondisp
```

b) Start the MASTER

First of all kill all running processes of ONLINE by giving command `killon -a`.
Open any new terminal in BHASKAR and give following commands

```
> work
> ./ONLINE & ~onsoft/data/3jun.dat
```

From here the MASTER window will start.

Then it will ask for the user ID,

```
user ID ?
>40
```

Then to start the the 3rd june log (i.e. Today's log)

```
> startup'3jun.log'
```

c) Setting up the communication of *antennas* with the *COMH*

We have to start ROUTER first on the BHASKAR machine.
Give the following commands,

```
> ssh router@jupiter
password:.router
> rtrlinux &[1]
```

Click the *record* file option and enter a filename as,
rtr_3jun.dat

Give
`> scctask` command in MASTER.

Click *Start* on the ROUTER interface.

After starting the ROUTER go to MASTER window and type,

```
> stcomant
```

d) To start USER0 window

In the same i.e. MASTER window you type

```
> strtproc'user0'
```

And watch ONDISP.

After this command it will give the token no. say=xxxxxxxxxx

Now you have to open new terminal on BHASKAR & type in that,

```
> work
> USER0 > & ~onsoft/data/u0_3jun.dat
```
Again it will ask for user ID,
```
user ID ?
>40
```

Then to connect the user0 to ONLINE give,
```
>userconn
```

Now it will ask for token no. ? Give the token no. as
```
>xxxxxxxxxx
```

Inserting all antennas in user0:
```
>allant
>cp 0
>defs 0
```
defining subarray 0

1 This will start router interface in background.

```
>suba 0
```
calling subarray 0

```
>sndsacant
```
send antenna mask to specified subarry 0

Watch the ONDISP window.

e) To start the USER1 window

We have to give follwing commands in USER0

```
>strtproc'subac1'
```
it will start subarray 1.

Now to add CEB in the USER1

```
>ante 1 0
>cp 0;defs 0;suba 0
>sndsacant
>strtproc'user1'
```

Then it will give the token no. in the USER0 window say=yyyyyyyyyy

Open new terminal on the BHASKAR & give the commands,

```
>work
>./user1.5
```

It will ask for user ID,

```
user ID ?
>40
>userconn
```

Give the token no. which is displayed in the USER0 window.

```
Token no.?
>yyyyyyyyyy
>ante 1 0
>cp 0;defs 0;suba 0
>sndsacant
```

f) To start the USER4

Give following commands in USER0,

```
>strtproc'subac4'
>allant
>cp 0;defs 4;suba 4
>sndsacant
```

It will give the token no. say=zzzzzzzzzz

Go to ADITYA machine and on that login to the BHASKAR machine & in that you type,

```
>work
>./user4.5
user ID ?
>40
>userconn
```

Give the token no.

```
Token no. ?
>zzzzzzzzzz
>allant
>cp 0;defs 0;suba 0
```

```
>sndsacant
```

So this way you can start the ONLINE and the output can be seen on ondisp window.

2 ONDISPLAY

On-display is a very important utility which interfaces the user to the system. It gives the status of the all antennas and their all sub-systems every second. Using this interactive module user always can know observatory status.

The ondisplay has following general commands:

`>help`
To see what type of display windows/ commands are available.

`>sels n`
Select sub-array number n (n=0, 1, 2, 3, 4, 5).

`>sela n`
Select antenna having ABC ID (refer Appendix 14.1) n.

`>sela c00`
Select antenna C00 i. e. you can select antenna with name also. Name should be three character wide.

`>sela 77`
Enables selective ABC messages.

`>sela 33`
Enables all ABC messages.

`>redr`
Redraw / refresh the selected window for display.

2.1 Ondisplay commands with figures

This topic explains the command generated monitoring windows with their figures.

```
>gens
```

This gives us the general status of antennae i.e. distribution among various sub-array and their configuration. Configuration means under which sub-array how many antennae are defined.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 16: 5:16      LST: 12:43:33.2     PACKET: 3245707
 USR4 3244949    user4.5: ABC SET TIME16:00:58,09-08-2005
|gens
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
|COMH USING    0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17 |
|             CEB C00 C01 C02 C03 C04 C05 C06 C08 C09 C10 C11 C12 C13 C14 E02 E03 E04 |
|SUB0 PERM    C00 C01 C02 C03 C04 C05 C06 C08 C09 C10 C11 C12 C13 C14 E02 E03 E04 E05 |
|USR0 USIN    C00 C01 C02 C03 C04 C05 C06 C08 C09 C10 C11 C12 C13 C14 E02 E03 E04 E05 |
|SUB1 PERM    CEB                                                                    |
|USR1 USIN    CEB                                                                    |
|                                                                                    |
|                                                                                    |
|                                                                                    |
|                                                                                    |
|SUB4 PERM    C00 C01 C02 C03 C04 C05 C06 C08 C09 C10 C11 C12 C13 C14 E02 E03 E04 E05 |
|USR4 USIN    C00 C01 C02 C03 C04 C05 C06 C08 C09 C10 C11 C12 C13 C14 E02 E03 E04 E05 |
|                                                                                    |
|                                                                                    |
|                                                                                    |
|                                                                                    |
-------------------------------------------------------------------------------
```

DATE : Shows current date. TIME : Shows current indian standard time. LST : Shows the local sidreal time.

ABC SET TIME : Shows the time of latest updated time for ABC (Antenna Base Computer). PACKET : Packets received by the online thruogh COMH.

If any antenna is not in the SUB-ARRAY and it is in USER then all the commands which you give will not reach to that antenna , similarly if any antenna is in the SUB-ARRAY and not in the USER, still all commands will fail for that antenna. Therefore SUB N and USR N must contain identical elements.

>coms
Shows COMH status.

```
--------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 16:58: 9      LST: 13:36:34.9     PACKET: 3255220
 SAC4 3254530    subac4.5: ABC SET TIME16:54:15,09-08-2005
|coms
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
|                               COMHSTAT                                         |
| Debug Mode :                  Disabled    Broadcast Cmds Issued:        0      |
| Comh cycle time:              20          Abc Pkts Rcvd:                6573344  |
| Prog Ver:                                 Pkts To Unix :                1078644  |
| Abc Timeouts:                 7287        Pkts To ABC:                  23059    |
| Abc Chksums:                  279         BR CMDS IN Q:                 0        |
| To Unix Errors:               5           BR CMD  SENT FLAG :           0        |
| From Unix Errors:             1           CRC:Overrun                   206 : 0  |
| Unix cmds Rcvd:               5541        TxUndrun:Abrt                 0 : 73   |
| Comh Cmds Rcvd:               90          Rec Tm:Xmit Tm                1 : 0    |
| Cmdoverflowlnk.errcnt:        0           Reset Chip :                  19       |
| To Abc Xmittmouts:            0                                                |
| Abc Notreadycnt:              22358                                            |
| Ring Buffer err cnt:          0:0:0:                                           |
| Abcs:                         10                                               |
| ABC Cmds Issued:              0                                                |
--------------------------------------------------------------------------------
```

In this window we are able to get the status of the Communication Handler.

Here `Abc Timeouts`: will give the no. which will increase when Communication Handler is timeout or unconnected to the COMH PC.

Otherwise instead of this window we can use PC ROUTER window in the ONLINE desktop.

```
>subw
```

Shows sub-array window containing information about number of antennae in sub-array, which source whole sub-array is tracking ,with their target azimuth and elevation angles and many more.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 17:15:46      LST: 13:54:14.8     PACKET: 3258367
 SAC4 3258211    subac4.5: ABC SET TIME17:14:53,09-08-2005
|subw
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
| ProgID: 4                NoAnt:  30     State:TRKG   OUTTRK                    |
| Source: NGC4151   12h10m32.73 39d24'19.6"       Offs How much deg or dec. offs |
| Target: Az: 137d49'05.2"         El:  59d52'37.5"                             |
|                                                                               |
| C00  C01  C02  C03  C04  C05  C06  C08  C09  C10  C11  C12  C13  C14  E02     |
| 0"   -80" -17' 98"  48"  7'   3'   3'   -5'  2'   14"  -2'  -2d  54"  -2'    |
| 11'  -55" 6'   23"  9'   -85" 9'   7'   -10' 5'   14'  -3'  43"  -6'  -16"   |
|                                                                               |
|   m         m    m         m                   m                            |
|                                                                               |
| E03  E04  E05  E06  W01  W02  W03  W04  W05  W06  S01  S02  S03  S04  S06     |
| 0"   9'   -84" -6'  -3'  53"  18d  -137 -3'  -4'  2'   19"  4'   -11' 3'      |
| 22'  5'   5'   -15' -8'  5'   10'  -60d 12'  -6'  28'  -85" -9'  -14' -9'     |
|                                                                               |
|                            B    MBb  m                                       |
|                                                                               |
-------------------------------------------------------------------------------
```

ProgID : Sub-array number. NoAnt : Number of antennae in the sub-array.

State : Gives the state of the antennae (TRKG or IDLE) & the track (OUTTRK or INNER).

Source : Gives source RA and DEC. Offs : When it is off from the source it shows how much deg or dec apart from the source.

Where each character under antenna name (e.g. m, B, MBb)is having its own meaning, which is given in section 2.2.

For example z means antenna is slewing, b means antenna applied elevation brakes etc.

```
>sacw
```

It is same as the sub-array window except there is difference in the naming that is we call this window as sub-array control window and the `subw` window shows MCM time-outs but `sacw` window doesn't show MCM time-out symbol.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 17:16:52      LST: 13:55:21.0     PACKET: 3258564
 SAC4 3258211    subac4.5: ABC SET TIME17:14:53,09-08-2005
|sacw
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
| ProgID: 4   TRUE         NoAnt:  30     State:TRKG   OUTTRK                   |
| Source: NGC4151   12h10m32.73 39d24'19.6"       Offs                         |
| Target: Az: 137d34'38.5"         El:  59d42'06.2"                            |
|                                                                               |
| C00  C01  C02  C03  C04  C05  C06  C08  C09  C10  C11  C12  C13  C14  E02     |
| 25"  37"  29"  93"  64"  66"  41"  72"  51"  2'   85"  68"  2'   2'   -31"   |
| -16" 3"   -22" 31"  5"   4"   -25" -13" -11" 17"  12"  -15" 11"  26"  -8"    |
|                                                                               |
|                                                                               |
|                                                                               |
| E03  E04  E05  E06  W01  W02  W03  W04  W05  W06  S01  S02  S03  S04  S06     |
| -34" -2'  -92" -3'  30"  43"  37d  -137 -4'  -5'  2'   3'   5'   6'   9'      |
| 36"  47"  68"  92"  8"   67"  75"  -60d 3'   4'   -98" -2'  -3'  -4'  -6'    |
|                                                                               |
|                              B    MBb                                         |
|                                                                               |
-------------------------------------------------------------------------------
```

>abcs

This command will gives the ABC status of selected antennae i.e. to see the ABC status of any antenna we have to first select it by `sela xxx` command here `xxx` refers to the antenna name in three characters otherwise it will show status of the previously selected antenna.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 17:21:43      LST: 14:00:12.8     PACKET: 3259425
 SAC4 3258211    subac4.5: ABC SET TIME17:14:53,09-08-2005
|abcs
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
|   ABCSTATC00(7) [APPLN]          time  017:21:39   pkt no: 903300    0          |
| Prog  Ver                     03-06-1998,01.30    MCM STATUS                    |
| Debug Mode                    1                   Mcm Timeouts          1427    |
| LINK STATUS                                       Mcm Chksums           1       |
| For Link Timeouts             0                   ABC Timeouts By MCM   0       |
| For Link Chksums              0                   ABC Chksums By MCM    0       |
| Ret Link Timeouts             126                                               |
| Ret Link Chksums              0                   SERVO STATUS                  |
| ABC Sent large Pkts           0                   Servo Cmds Issued     873740  |
| Cmds Issued/Aborted For ABC   0:0                 Naks From/To Servo    0:119   |
| BR Cmds Issued/Aborted For ABC 3540:0             Enqs From/To Servo    115:1956|
| ABC Not Ready                 6                   Servo Cmd Tm Out      32      |
| Mcm Cmds Issued               1710455             BufErrCnt BufFulcnt   0:10    |
| Mcms Active     0: 2: 3: 9: e:                                                  |
| Mcm Link       --:--:--:--:T-:                                                  |
|                                                                                 |
-------------------------------------------------------------------------------
```

`time` : This is the current time of the Antenna base computer, which becomes idle when ABC is time out. When antenna gets reset then the time will show for how much time the antenna is in reset state, after this we have to initialise antenna.

`Ret Link Timeouts` : When ABC times out then this number increases.

`Mcms Active` & `Mcm Link` : Shows how many MCMs are active and there link status.

In the above figure ABC status of `C00` antenna is shown. This will show if the antenna is time-out or it is communicating well. Also the MCMs configured with their link status is given. If MCM is time-out it shows 'T', in above window MCM 14 is showing time-out status.

>srvw

Shows the servo status for selected antenna. This window shows antenna's azimuth & elevation position, motor current, tacho of motors, servo mode (i.e. remote, manual, off or local), antenna's brake status, wind speed.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 17:47:12      LST: 14:25:46.0     PACKET: 3263968
 SAC4 3263911    subac4.5:  LOAD NEW SRC SPECIFIC TRAK PARA
|srvw
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
|  SERVO C00(07)  servo time  017:47:03         DIG STAT  2: 2: 2: 0: 6c:3:          |
|                 AZIMUTH     ELEVATION          ELEV     AZIM     GEN               |
|  astro po  +310:52:38    +055:38:24      D                                        |
|  encod po  +130:52:38    +055:38:24      I     run        run                     |
|  targe po  +130:08:49    +058:57:45      G                       remo[auto],[loc] |
|  poten po  -002:55:00    +009:00:00      I                       acok             |
|  motor1        -20.17          4.30      T                                        |
|  motor2         -4.87         -9.02      A                       ssok             |
|  tacho1      -1328.20       1261.35      L                       posn             |
|  tacho2      -1371.18      -1223.87           [stwd]             [trkg]           |
|  wind12          0.00          0.00      S    [stps]              slwg             |
|                                          T     strl               cwrp             |
|                                          A    [brk1]   [brk1]                     |
|                                          T    [brk2]   [brk2]                     |
|                                                                                    |
|                                                                                    |
-------------------------------------------------------------------------------
```

The terms in the bracket are showing the possibilities of the status or flag which may come during the process of observation.

`poten po` : not in use nowadays, `encod po` : parameter to see the encoder position, `astro po` : shows astronomical coordinates of the source, `targe po` : shows the current encoder position of antenna. `wind12` : wind speed at antenna by wind meters 1 & 2.

`[stps]` : (stow position) : elevation of antenna at 90d,

`[stwd]` : (stowed) : antenna stowed, `strl` : stow released, `[brk1]` & `[brk2]`: antenna applied brakes in respective axis, `remo`, `[auto]`,`[loc]`: in which mode antenna is. In servo off-mode no flag comes at the mode position & servo time stops, `acok` : servo A.C. (alternating current) okay, `ssok` : servo station computer okay, `posn` or `[trkg]` : whether antenna is in tracking or positioned mode, `slwg` : antenna is slewing, `cwrp` : cables are wraped.

`>srvs`

Shows servo status like offsets, stowangle,wind limit, software lower limit, software higher limit .We are able to see the servo set parameters by giving `rdsrvs` in the user window by defining that particular antenna.

```
-------------------------------------------------------------------------------
|DATE: 2005aug9     TIME: 22:10: 7      LST: 18:49:24.2     PACKET: 3311380
 USR4 3311061    user4.5:SERCMD  RDSE
|srvs
 -------------------------------------------------------------------------------
 -------------------------------------------------------------------------------
|  SERVO A(07)    servo time  022:08:22        Date  9- 8-2005                   |
|           AZIMUTH       ELEVATION           Version 2.51                      |
|  states                                     Station C0                        |
|  offset      -000:28:59    +000:02:59       Selftest 30 30                    |
|  stowang     +000:00:00    +090:00:00                                         |
|  softlow     -265:00:00    +016:30:00                                         |
|  softhigh    +264:00:00    +105:00:00                                         |
|  G11              0.00          0.29                                         |
|  T11              0.00          0.00                                         |
|                                                                              |
|  T13              0.00          0.00                                         |
|  G21              0.12          0.17                                         |
|  T21              0.00          0.00                                         |
|  T22              4.20          4.20                                         |
|  T23              0.30          0.30                                         |
|  windlimit       40.00         40.00                                         |
 -------------------------------------------------------------------------------
```

The above figure shows the servo status of an antenna C00 but here the antenna name is not displayed only the antenna ID is shown i.e. 07 (Refer Appendix 14.1). Also it is showing the gains of Type I as well as Type II systems which are not for user, these parameters are for the engineers.

```
>losm OR losw
```

Use `losm` command when LO1 is greater than 600 MHz & `losw` when LO1 is less than 600 MHz.
The above command gives the information about which LO is set at what time also whether it is lock or unlock & many other parameters which are helpful for LO engineers. But for normal user which LO is set at what time & its lock or unlock status is important.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug10    TIME: 19: 5:11      LST: 15:47:54.3     PACKET: 100205
 USR0 100128    user0.5: SENDING QUED COMMANDS
|losm
 -------------------------------------------------------------------------------------------------
- -----------------------------------------------------------------------------------------------
|    018:45:47              LOS MONITOR - ABC( 7)C00             STATE: 015                     |
|                                                 M=8 N=19                                     |
|VCO ON   :          YIG       MCM      : 3      Mode: AUTO  OLI      : LOCKED [UNLOCK]       |
|VCO Pow  : 09.3     dBm       Map      : Syn1-Ch1 Syn2-Ch2  ATTR     : 06 dB                 |
|LO Freq  : 1040.00  MHz       Syn Step : 5 MHz              YIGDAC   : 33                    |
|LO Pow   : 09.3     dBm   LOW Rack Temp:                    LV-C     : 01.7 V                |
|ALI-CV   : 02.4 V   LOCK      SP4TS    : OK                 HTRV     : 21.4 V                |
|POWER SUPPLY : Voltage :  Current                Voltage                                      |
|VCO YIG:(+18V:220) 238 :(150) 162 CONTROL:(+ 5V:240) 237                                      |
|VCO YIG:(-12V: 20) 021 :(110) 113 CONTROL:(- 6V: 20) 018                                      |
|LOPAM  :(+12V:240) 238 :(140) 130 MCM    :(+12V:240) 240                                      |
|MOTOROL:(+ 5V:240) 239 :(150) 130 MCM    :(-12V: 20) 019  Req Frq    Set Frq                  |
|GIGABIT:(+ 5V:240) 240 :(160) 130 MCM    :(+ 5V:240) 240  -15078472 MHz   1040 MHz            |
|YIG    :(+ 5V:240) 237 :(150) 143 WALSH  :(+ 5V:240) 241  LAST UPDATE AT                      |
|YIG    :(+15V:240) 233 :(150) 238 YIG    :(+ 9V:240) 231   018:45:47                        |
|MESSAGE:  Error code  100                                  COMMAND EXEC ERR                   |
- -----------------------------------------------------------------------------------------------
```

`LO Freq` : Which LO1 is selected. `LOCKED` or `[UNLOCK]` : Whether it is lock or unlock. (Bracketed option is the possibilities of flags coming that flag on same location.)

`LAST UPDATE AT` : The time of LO1 setting.

```
>losr
```

It gives the LO system's raw status of various monitoring channels, this status is for the LO engineers. Normally telescope users do not use this window for LO monitoring. The detail information can get from `losm` and `losw` windows.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug10    TIME: 18:50:56      LST: 15:33:37.0     PACKET: 97708
 USR2 97696    user2.5: SELECT MCM MONITOR   1FOR MCM   2TYPE  0
|losr
 ------------------------------------------------------------------------------------------------
- -----------------------------------------------------------------------------------------------
|    018:46:08         LOS MONITOR - ABC( 7)C00 - RAW MODE                                      |
|                      130 130 130 249 130 134 129 222     130 130 250 129 250 255 222 129       |
|                      130 130 130 250 130 134 129 132     130 130 251 129 128 253 129 129       |
|                      130 130 130 250 130 255 129 222                                          |
|                      231 131 130 130 252 255 215 128                                          |
|                      066 131 130 129 252 255 215 244                                          |
|                      233 142 130 130 130 255 236 127                                          |
|                      137 127 134 129 128 255 021 128                                          |
|                      236 140 130 130 128 250 240 129                                          |
|                      023 105 130 130 128 228 234 129                                          |
|                      130 128 128 130 128 166 021 129                                          |
|                      130 128 128 129 250 029 234 129                                          |
|                      130 130 250 129 128 255 132 129                                          |
|                      130 130 250 129 128 255 221 129                                          |
|                      130 130 250 129 250 234 132 129                                          |
|                      130 130 250 129 250 255 222 129                                          |
- -----------------------------------------------------------------------------------------------
```

```
>lorm
```

It shows IF and LOR status for all antennae.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug10    TIME: 18:56:15      LST: 15:38:56.9     PACKET: 98663
 USR2 98641    user2.5: SELECT MCM MONITOR   1FOR MCM   3TYPE  0
|lorm
 -------------------------------------------------------------------------------------------------
- -----------------------------------------------------------------------------------------------
|                          IF AND LOR STATUS ALL ANTENNA                                        |
|                                                                                               |
|  [ANC=>ABC NOT Confg. MCM?=>ABC TIMEOUT/MCM NOT Confg. X=>ERROR ]                             |
|  [OK=>Command exec OK (ATTN,BW,ALC set as Reqd.),ER=>Command exec ERROR]                      |
|  [N=>ALCFBV(Normal,Over,Under),M=>DETV(Exlow,Low,Medium,High,Vhigh) ]                         |
|  [F=>OLI+LI=>(1111=> 1st bit OLI,last 3 bits for 1,105 & 200MHz LI ]                          |
|                                                                                               |
|CEB     C03     C12     C04     C09     C02     C01     C00     W01     C11                  |
|MCM?    MCM?    ER_XXX  MCMT    ER_XXX  ER_XXX  MCMT    ER_XXX  ER_XXX  MCMT                 |
|                ER_XEX          ER_XEX  ER_XEX          ER_XEX  ER_XEX                       |
|C14     C13     C10     W02     W03     W04     W05     E02     E03     C05                  |
|ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX  ER_XXX               |
|ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX  ER_XEX               |
|                                                                                               |
|                                                                                               |
|                                                                                               |
- -----------------------------------------------------------------------------------------------
```

Normally users do not use this monitoring window.

```
>mcmw
```

It shows MCM window, shows different MCM channels output.

For example, consider antenna C00 is defined and we want to see its MCM status. By giving above command ondisp will show status of MCM 0 default with channel 0 onwards.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 16:20: 9      LST: 13:22:08.0     PACKET: 1123716
 SAC4 1123383    subac4.5: ABC SET TIME16:18:17,15-08-2005
|mcmw
 -------------------------------------------------------------------------------------------
| M(00)A(07)-00:01:02:03:04:05:06:07:08:09:10:11:12:13:14:15:16:17:18:19:20:21:
| 016:19:35 e4:ff:e3:ab:ab:ab:ab:aa:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:                |
| 016:19:37 e4:ff:e3:aa:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:39 e4:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:42 e4:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:44 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:48 e3:ff:e3:ab:ab:ab:ab:ab:aa:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:51 e3:ff:e3:ab:aa:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:53 e3:ff:e3:ab:aa:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:55 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:19:58 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:20:00 e3:ff:e3:ab:ab:ab:ab:aa:aa:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:20:02 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:20:04 e3:ff:e3:ab:aa:ab:ab:ab:aa:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:20:07 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
| 016:20:09 e3:ff:e3:ab:ab:ab:ab:ab:ab:81:--:--:--:--:--:--:--:--:--:--:--:--:               |
|                                                                                           |
- -------------------------------------------------------------------------------------------
```

`M(00)A(07)` : Shows MCM status of 0th MCM for antenna 07 (i.e. antenna C00 refer Appendix) on channel 0 onwards.

If some body wants to select other MCM then there is command which is explained on next page.

```
>selm n
```

Selects MCM n i.e. if some body wants to see MCM 5 then give command `selm 5`.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 16:38:41      LST: 13:40:43.1     PACKET: 1127044
|                                                                                          |
|selm 5                  MCM   5
 -------------------------------------------------------------------------------------------
| M(05)A(00)-00:01:02:03:04:05:06:07:08:09:10:11:12:13:14:15:16:17:18:19:20:21:
| 016:19:35                                                                                |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
|                                                                                          |
- -------------------------------------------------------------------------------------------
```

If you want to see the channel-wise status of MCM then give a command `selc n`. It will enable to monitor all channels above the selected channel including same.

```
>selc n
```

Which will monitor all channel above this defined channels. For example we select channel 8.It will show all the channels above channel 8, including channel 8.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 17:12:35      LST: 14:14:42.6     PACKET: 1133105
 SAC4 1132916    subac4.5: ABC SET TIME17:11:32,15-08-2005
|selc 8
 -------------------------------------------------------------------------------------------------
|M(00)A(07)-08:09:10:11:12:13:14:15:16:17:18:19:20:21:22:23:24:25:26:27:28:29:
| 017:11:54 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:11:56 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:11:59 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:01 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:03 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:10 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:12 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:15 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:21 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:24 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:26 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:28 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:30 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:33 aa:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
| 017:12:34 ab:81:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:--:                  |
|                                                                                                |
- -----------------------------------------------------------------------------------------------
```

If the condition that you want to monitor only selected channels then give command `selc n chan1 ... chan n`.
e.g. `selc 2 8 64` i.e. selected channels are 2 and the channels are 8th and 64th.

```
>iflo
```

Shows status of set IF parameters.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 18:19:30      LST: 15:21:48.6     PACKET: 1145045
 USR0 1144876    user0.5: SELECT MCM MONITOR   1FOR MCM   9TYPE  1
|iflo
 ------------------------------------------------------------------------------------------------ -----
|IF (Set)CH1(Req) (Set)CH2(Req) LOR        LOCK & CV           POWER
|AGC_CV   :216 NORMAL    211 NORMAL   OLI   :218 LOCKED      97.5RM : 165 NORMAL              |
|AGC_STS  :136 ON(OFF)   137 ON(OFF)  1MHzCV:182 NORMAL      106RM  : 169 NORMAL              |
|DETV     :000 VLOW      000 VLOW     105_CV:186 NORMAL      201RM  : 165 NORMAL              |
|PRE_ATTN : 16 dB ( 16)   12 dB ( 16) 200_CV:193 NORMAL      105VCXO: 161 NORMAL              |
|POST_ATTN: 14 dB ( 16)   10 dB ( 16) 1MHzLI:150 LOCKED      105PAMP: 158 NORMAL              |
|BANDWIDTH: 32 MHz( 16)    ERROR( 16) 105_LI:150 LOCKED      100VCXO: 153 NORMAL              |
|ADDR_ENBL:     OK                    200_LI:150 LOCKED      FRDOB  : 130 NORMAL              |
| SUPPLY  C41A C41B C42  C43    D41  D42  D43  D44  D45      200PAMP: 161 NORMAL              |
|  +5V     --   --   OK   OK     --   OK   OK   --   OK                                       |
|  -5V     --   --   --   --     --   OK   --   --   --     IF AND LOR STATUS                 |
| +10V     --   --   --   --     --   OK   --   --   --         ABC( 7) C00                   |
| +12V     OK   OK   OK   OK     OK   OK   OK   OK   OK                                       |
| -12V     --   --  ERR  ERR     OK   OK   OK   OK   OK    LAST UPDATE AT                    |
| +18V     --   --   --   --     --   OK   --   --   --     018:18:40                        |
| -18V     --   --   --   --     --   OK   --   --   --    COMMAND EXEC ERR                  |
- ------------------------------------------------------------------------------------------------
```

The `iflo` shows monitoring of the IF and LOR system's parameters.

`PRE_ATTN` : Set pre-attenuations for the respective channel. (like `16 dB` for CH1 & `12 dB` for CH2)

`POST_ATTN` : Set post-attenuations for the respective channel.(like `14 dB` for CH1 & `10 dB` CH2)

`BANDWIDTH` : Set bandwidth here it is `32 MHz`.

The required values are given under the `(Req)` column.

The rest flags are for the IFLO system engineers for monitoring PIU (Plug in unit), voltage, power counts.

```
>winw
```

Shows wind speed for all antennae.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 18:41:50      LST: 15:44:12.3     PACKET: 1148970
 SAC4 1148323    subac4.5: ABC SET TIME18:38:07,15-08-2005
|winw
 ------------------------------------------------------------------------------------------
- -----------------------------------------------------------------------------------------
|                                                                                         |
|                    WIND MONITOR -- ALL ANTENNA STATUS (kmph)                            |
|                                                                                         |
|   [ANC=>Antenna NOT Configured.]  Wind >= 35 -   HIGHLIGHTED                            |
|                                                                                         |
| C03     C12     C04     C09     C02     C01     C00     W01     C11     C14            |
| 0.00    0.00    0.00    0.00    11.00   0.00    0.00    0.00    0.00    0.00           |
| 0.00    0.00    0.00    0.00    8.00    0.00    0.00    0.00    0.00    7.00           |
|                                                                                         |
| C13     C10     W02     W03     W04     W05     E02     E03     C05     C06            |
| 0.00    10.00   8.00    0.00    0.00    7.00    0.00    0.00    11.00   0.00           |
| 0.00    10.00   16.00   0.00    0.00    10.00   0.00    14.00   0.00    0.00           |
|                                                                                         |
| E04     E05     E06     C08     W06     S01     S02     S03     S04     S06            |
| 0.00    6.00    5.00    0.00    0.00    0.00    0.00    0.00    13.00   12.00          |
| 0.00    11.00   10.00   0.00    0.00    0.00    0.00    0.00    14.00   21.00          |
- -----------------------------------------------------------------------------------------
```

S06 : Antenna.

12.00 : Speed at wind meter 1.

21.00 : Speed at wind meter 2.

```
>trkp
```

This is the tracking parameter window, which gives information about the longitude, latitude of the defined antenna.
It shows the minimum & maximum software allowed angles for azimuth and elevation with a tracking state.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 19:39:17      LST: 16:41:48.7     PACKET: 1159053
 SAC4 1158451    subac4.5: ABC SET TIME19:35:51,15-08-2005
|sela c00               ABC   7 C00
 ------------------------------------------------------------------------------------------
- ----------------------------------------------------------------------------------------
|                                      TRKPARA C00(7)                                    |
| LAT:LONGITUDE     +019:06:00:-074:06:00          CDEC:SDEC         21284    :23895      |
| AZERR:ELERR       +000:00:00:+000:00:00          SLSD:SLCD         250114461:222784523  |
| AZMAX:AZMIN       +260:00:00:-260:00:00          CLSD:CLCD         722576676:643620923  |
| ELMAX:ELMIN       +105:00:00:+020:00:00          INOUT:OVER90      OUTER    : UNDER     |
| STOWPOS:LONGCOR   +090:00:00:+000:00:00          DRA:DDEC          +000:00:00:+000:00:00|
| RA0:DEC0          +241:59:12:+048:18:27          DAZ:DEL           +000:00:00:+000:00:00|
| SINLT:COSLT       1046723    :3023966            TRD0:TAZEL        +000:00:00:+000:00:00|
| RAOFF:DECOFF      +000:00:00:+000:00:00          T0:LST0            011:30:26: 008:27:41|
| AZOFF:ELOFF       +000:00:00:+000:00:00          TMAX:STIME         000:00:00: 000:00:00|
| RA:DEC            +241:59:12:+048:18:27                                                 |
| AZFLG             105147                                                                |
|                                                  TRACK STATE:      REM TRK             |
|                                                  TRACK STATUS:      0                  |
|                                                                                        |
|                                                                                        |
- ----------------------------------------------------------------------------------------
```

Here the tracking state of the defined antenna is shown `REM` with its condition written in front of it i.e. `TRK`. If antenna is in OFF mode then `Track State` will be `TRK OFF` and also all the parameters will show `000:00:00` every where.

>msgw

Shows message window for the selected antenna. If the terminal is set to xterm then messages will come below the ondisp window. If the terminal is set to vt100 then messages will not come.

>tmpn

Shows temperature for all antennae at their base.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 19:53:35      LST: 16:56:09.1     PACKET: 1161564
 SAC4 1161525    subac4.5:  LOAD NEW SRC SPECIFIC TRAK PARA
|tmpn
 -------------------------------------------------------------------------------------------
- -------------------------------------------------------------------------------------------
|                                                                                           |
|                  TEMPERATURE AND SMOKE MONITOR -- ALL ANTENNA STATUS                      |
|                                                                                           |
|   [ANC=>Antenna NOT Configured.  MCM?=>ABC TIMEOUT or MCM NOT Configured.]                |
|                                                                                           |
|  C03      C12      C04      C09      C02      C01      C00      W01      C11      C14    |
|  23.46    18.66    23.89    22.59    23.17    22.73    22.88    22.59    20.70    20.70  |
|   OK       OK       OK       OK       OK       OK       OK       OK       OK       OK   |
|  C13      C10      W02      W03      W04      W05      E02      E03      C05      C06    |
|  MIDL     18.81    20.55    22.88    23.17    21.57    18.08    22.88    25.20    18.52  |
|            OK       OK       OK       OK       OK       OK       OK       OK       OK   |
|  E04      E05      E06      C08      W06      S01      S02      S03      S04      S06    |
|  21.28    21.13    22.59    20.99    19.10    20.70    18.08    19.68    20.99    18.08  |
|   OK       OK       OK       OK       OK       OK       OK       OK       OK       OK   |
|                                                                                           |
|                                                                                           |
- -------------------------------------------------------------------------------------------
```

MIDL : Antenna is not scanning temperature.

```
>ifbb
```

Shows LOs status for all antennae. This is not frequently used monitoring window.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 20:49: 3      LST: 17:51:46.2     PACKET: 1170966
 SAC4 1169389    subac4.5:  LOAD NEW SRC SPECIFIC TRAK PARA
|ifbb
 -------------------------------------------------------------------------------------------
- -------------------------------------------------------------------------------------------
|                               LOS STATUS ALL ANTENNA                                      |
|                                                                                           |
|  [ANC=>ABC NOT Confg. MCM?=>ABC TIMEOUT/MCM NOT Confg.        ]                           |
|  [OK=> (FREQ set as Reqd.),ER=>ERROR,LK =>LOCK                ]                           |
|                                                                                           |
|                                                                                           |
|CEB     C03     C12     C04     C09     C02     C01     C00     W01     C11              |
|MCM ?   VCO ?   0355ER  ERRVCO  ERRVCO  MODERR  MODERR  MODERR  MODERR  MODERR           |
|MCM ?   YIG ?   YIG ?   0680ER  0680ER  MODERR  MODERR  MODERR  MODERR  MODERR           |
|C14     C13     C10     W02     W03     W04     W05     E02     E03     C05              |
|MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR           |
|MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR  MODERR           |
|                                                                                           |
|                                                                                           |
|                                                                                           |
|                                                                                           |
- -------------------------------------------------------------------------------------------
```

```
>rffe
```

Shows front-end status for whole sub-array, like which RF box, noise, attenuations.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 21:11: 3      LST: 18:13:49.8     PACKET: 1174667
 SAC4 1174510    subac4.5: ABC SET TIME21:10:06,15-08-2005
|sels 4                 SUBAC   4
 ------------------------------------------------------------------------------------------
- -----------------------------------------------------------------------------------------
|Subarray 4             RF FRONTEND STATUS                                                |
|                                                                                         |
|                  RF STATUS                       TURRET STATUS(Not imp)                 |
|                                                                                         |
|             Request          Status                                                     |
|  RFBox         0     0                                                                  |
|  Noise       Off   Off                                                                  |
|  Atten         0     0                                                                  |
|  PolSwitch     0     0                                                                  |
|  NoiseAtttn    0     0                                                                  |
|                                                                                         |
|                                                                                         |
|                                                                                         |
|                                                                                         |
|                                                                                         |
|                                                                                         |
- -----------------------------------------------------------------------------------------
```

```
>fpss
```

Shows FPS status like Fps packet no., current position, target angle, the status of feed, the command given to the feed.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 21:38: 0      LST: 18:40:51.2     PACKET: 1179213
 SAC4 1179204    subac4.5:  LOAD NEW SRC SPECIFIC TRAK PARA
|fpss
 -------------------------------------------------------------------------------------------
- -------------------------------------------------------------------------------------------
|                              FPSSTAT                                                      |
|FPS          ABC    C00(7)                                Error:              32           |
|Fps Packet no:      128787                                CMDFAILCNT:         0            |
|Fps Version:        5.5                                   TIMEOUTCNT:         32           |
|CURNT POS:          -4.952                                CHKSUMCNT:          0            |
|CURNT RPM:          0.00                                  RESETCNT:           3            |
|TARGET ANGLE:       0.000   **                            OVER CURNT:         0            |
|TRNGPT Angle:       0.000                                 MAXPWM:             0.000 %      |
|SLOPE:              0                                     MAX ANGLE:          0.000        |
|LRPM LMT/LRPM TMCNT 0.000  :0                             MIN ANGLE:          -15.956      |
|BRKCNT DIFF:        0                                     UA0 ANGLE:          0.000        |
|STP SLEW TMCNT:     0                                                                      |
|RMPUP TIME:         0                                                                      |
|FINE TUNE PWM:      0                                                                      |
|Status :            Feed Calibrated & Idle                                                 |
|Cmd:                RD VERSION                                                             |
- -------------------------------------------------------------------------------------------
```

Above window shows the feed status of C00 antenna.

```
>fpsr
```

This command also shows the feed status. The difference between the fpss and fpsr is that fpss shows the angle wise status and fpsr shows feed count wise status.

```
-------------------------------------------------------------------------------------------
|DATE: 2005aug15    TIME: 21:53:38      LST: 18:56:31.8     PACKET: 1181849
 SAC4 1181268    subac4.5: ABC SET TIME21:50:10,15-08-2005
|fpsr
 ------------------------------------------------------------------------------------------
- ------------------------------------------------------------------------------------------
|                              FPSRAW                                                      |
|FPS          ABC C00(7)                                  Error:              32           |
|Fps Packet no:      129076                               CMDFAILCNT:         0            |
|Fps Version:        5.5                                  TIMEOUTCNT:         32           |
|CURNT POS:          1357                                 CHKSUMCNT:          0            |
|CURNT RPM:          0.00                                 RESETCNT:           3            |
|TARGET ANGLE:       1639  **                             OVER CURNT:         0            |
|TRNGPT Angle:       0.000                                MAXPWM:             0  H         |
|SLOPE:              0                                    MAX ANGLE:          1639         |
|LRPM LMT/LRPM TMCNT 0.000  :0                            MIN ANGLE:          731          |
|BRKCNT DIFF:        0                                    UA0 COUNT:          1639         |
|STP SLEW TMCNT:     0                                                                     |
|RMPUP TIME:         0                                                                     |
|FINE TUNE PWM:      0                                                                     |
|Status :            Feed Calibrated & Idle                                                |
|Cmd:                RD VERSION                                                            |
- ------------------------------------------------------------------------------------------
```

```
>mcml
```

For all antennae it shows the MCM 0,2,3,5,9 & 14 link status.

```
-------------------------------------------------------------------------------------------------
|DATE: 2005aug26    TIME:  3:37: 5      LST: 01:20:20.8     PACKET: 340509
 SAC4 339153    subac4.5: ABC SET TIME03:29:24,26-08-2005
|mcml
 ------------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------------
|                                                                                               |
|                  MCM LINK STATUS - MCM 0,2,3,5,9,14 resp.                                     |
|                                                                                               |
|   [ - => OK. T=>MCM TIMEOUT, B=> Busy, N=>MCM NOT Conf. A=>ABC Not conf]                      |
|                                                                                               |
| C03     C12     C04     C09     C02     C01     C00     W01     C11     C14                  |
| ---     ---     ---     ---     ---     ---     ---     NNN     ---     ---                  |
| N--     N--     N--     N--     N--     N--     N--     NNN     N--     N--                  |
|                                                                                               |
| C13     C10     W02     W03     W04     W05     E02     E03     C05     C06                  |
| ---     ---     ---     ---     ---     ---     ---     ---     ---     ---                  |
| N--     N--     N--     N--     N--     N--     N--     N--     N--     N--                  |
|                                                                                               |
| E04     E05     E06     C08     W06     S01     S02     S03     S04     S06                  |
| ---     ---     ---     ---     ---     ---     ---     ---     ---     ---                  |
| N--     N--     N--     N--     N--     N--     N--     N--     N--     N--                  |
-------------------------------------------------------------------------------------------------
```

The upper row showing three '-' symbols, it mean that MCMs 0,2 & 3 are all right and the lower row shows MCM 5 is not configured and MCMs 9 & 14 are all right. Normally after setting RF, MCM 5 is turned off. Therefore here it is showing that MCM 5 is not configured.

`>intr`
All 30 antennas, Intruder alarm info through mcm 0.

`>femo`
Common box info if mcm 5 all channels in scan mode for all antennas.

`>fest`
Displays bytes for FE and CB mon for selected antenna.

`>ants`
Display antenna state(setting if rf,if,lo,bb) info if set these parameters in specific way to get the info

2.2 Details of ondisp subw Flags

The program ondisp displays the ONLINE status window. In this status window,the lowest line is a single character error indicator,

`B` Azimuth brakes applied for antenna.
`b` Elevation brakes applied for antenna.
`I` Antenna in subarray is Idle and not in tracking mode.
`M` Servo system of antenna is in 'Manual' mode.
`R` Antenna got ABC reset.
`z` Antenna in subarray is positioning to the source coordinates for azimuth and elevation axes.
`K` Either antenna has not communicated since start of ONLINE or antenna(abc) is in kernal mode.
`L` Servo system of antenna is in 'Local' mode.
`s` Antenna stowed in elevation axis (overrides b flag).
`S` Antenna stowed in azimuth axis (overrides B flag).
`t/T` Servo computer/ABC is timing out(CEB time and unit time difference more than 20 sec).
`m` MCM time out.
`02IBb` Antenna got ABC reset.
`02I` Antenna got ABC reset.
`C` Motor current is high in Azimuth.
`c` Motor current is high in elevation.
`N` Antenna to configured for communicaton for COMH.
`V` 'acok' problem as indicated by antenna servo.
`P` Azimuth axis in positioning (hold) mode.
`p` Elevation axis in positioning (hold) mode.
`E` Azimuth encoder fault (angle not bet -270 to 270).
`e` elevation encoder fault (angle not between 0 and 110).

3 Communication-Handler *(COMH)*

For setting the communication of antennas with the COMH

We have to start ROUTER first on the BHASKAR machine.

Create a new desktop named as ROUTER on BHASKAR & in the **ROUTER desktop** give the following commands **in BHASKAR's terminal**

```
>ssh router@jupiter

password:********          [Refer to operator]

>rtrlinux &
```

Then a graphical window will come, in that
Click the *record* file option and enter a filename,
For example,

```
rtr_3jun.dat
```

In **MASTER window** in USER0 desktop,
`>scctask` command in MASTER.

Click *Start* on the ROUTER interface.

After starting the ROUTER go to **MASTER window** and type,

```
>stcomant
```

Suppose any problem comes in the Router then restart it, as given by above stated method.

Other than this we can use the following commands for the COMH settings.

Show antennas to which COMH talks.
```
>shcomant
```

Get COMH error statistics.
```
>shcomerr
```

Set COMH which antennas talks.

```
>stcomant
```

Software reset for COMH.

```
>rstcomh
```

Reset error counters of COMH.

```
>rstcoerr
```

Reset command respective counters.

```
>rstcr
```

4 Defining Subarray

Online has one MASTER control and other six SubArray Control (SAC) out of which Subarray 0 (SAC0) has got the same authority as MASTER control. With SAC0 and Master you can have all kind of control for antennae and the electronics in Central Electronic Building(CEB). Other than Telescope Operator (Observer) all user like (engineers for testing system) may use the remaining Subarray controls. Viz.

SAC 1 (USER 1)
SAC 2 (USER 2)
SAC 3 (USER 3)
SAC 4 (USER 4)
SAC 5 (USER 5)

All user mentioned above are interface to corresponding SAC.

To insert required no. of antennas in any one of the subarray say sub-array4 the following commands can be given **in the USER0.**

NOTE:- *Before inserting antennae into subarray, please ensure that the scan is not running, if running then please stop that.*

Suppose 10 antennas(with antenna ID's 1 to 10) in suba 4 you want to add then give the following commands **in USER0 window**.

```
>ante 10 1 2 3 4 5 6 7 8 9 10
```

The first number followed by the ante is the number of antennae to be defined in subarray followed by that many ABC Ids.

```
>cp 0
```

cp variable can have only values 0, 1 and -1 before defining subarray.
Any other value will create error message.
cp=1 will add defined antennas to subarray.
cp=-1 will remove the defined antennas from subarray.
Define subarray

```
>suba 4
>defsub 4
```

We have to send the defined antennae to the respective subarray control.

```
>sndsacant
```

Then go to the respective subarray window & there also give the same commands as above **for subarray 4 go USER4**.

```
>ante 10 1 2 3 4 5 6 7 8 9 10
>cp 0
>defs 4
>suba 4
>sndsacant
```

Now all the defined antennae will come under the control of the USER4.
After subarray is defined whatever command you enter here, will go to the defined antennae.

Suppose in between observation any antenna shows any problem, to do the settings for only that antenna we have to define it separately in a subarray 0, you can define that antenna from **USER4** window for subarray 0.

For e.g. S06 applied brakes then **from USER4 window**,

```
>ante 1 30
>cp 0;defs 0;suba 0
>hold
```

Like this way we define it in the subarray 0 from USER 4. You can control single or any number of antennae by this.

Suppose at any time you want to see in which subarray you are working, by using the following command in the respective USER window.

```
>type suba
```

If this show "0" then to see the content of subarray "0" use command.

```
>shsub 0
```

It will give the ABC ID's of the antennae in the working subarray.
So this was all about the subarray defining.

5 Feed Rotation & their calibration

The MCM-5 controls the feed rotation.There are five feeds operating at freqencies of 150,235,327,610 and 1420 MHz. The counts for positioning the different feeds on each antenna is different.
Suppose to rotate the feed for some selected antennae or all antennae, then first we have to define required antennae in working subarray. Add them in respective subarray, and give the commands.

For example if we want to move the feed at 1420MHz then give the following commands.

Go to USER0
Load the FPS counts, for all antennae.
```
>run fpscnt
```

Initialise the FPS system.
```
>initfps
```

Move the feed to 1420MHz
```
>mvfps1420
```

Other than these commands to calibrated, preset, boot the FPS we have the following commands.

If somebody wants to set different lower R.P.M. limit then before this command he/she should define a limit by,
```
>cp(1)=XXX
>stlrpmlmt
```

Read lower rpm limit. It will read the lower RPM counts and show those in fpss or fpsr windows at LRPM count position for defined antennae.
```
>rdlrpmlmt
```

Set minimum angle.
```
>stminangle(xxx)
```

Read minimum angle
```
>rdminangle
```

Set maximum angle.
`>stmaxangle(xxx)`

Read maximum angle.
`>rdmaxangle`

Run to preset ; In bracket we have to give a count number at which we have to position the feed. (These counts are different for different feeds, refer Appendix.)
`>runcpreset(xxxxx)`

Run to preset angle. In bracket we have to give an angle at which we have to position the feed.
`>rundprest(xxx)`

Preset known position of feed in *count*.
`>prstcfps(xxxxx)`

Preset known position of feed in *angle*.
`>prstafps(xxx)`

Run to calibrate position.
`>runclbrt`

Reboot FPS.
`>fpsboot`

Calibrate to UA0 angle. If `CP=1` then it will calibrate in clock wise direction i.e. -10d side. `CP=0` then it will calibrate in anticlock wise direction. This is not frequently used command, instead of this we can use `runclbrt`.
`>ua0clbrt(x)`

6 Running Correlator

First login to Correlator PC.
You can login in correlator PC for USB, LSB & BOTH, by giving commands which are written on the respective correlator windows on the left side of the colon sign.
For example :-

```
>ssh corracqa        for USB.
>ssh corracqb        for LSB.
>ssh corrctl         for BOTH.
```

Etc.....
Then login into mithunA:collect & mithunB:collect windows by same procedure.
For example :-

```
>ssh mithuna     for USB.
>ssh mithunb     for LSB.
```

If you are not able to login in mithunA or mithunB by this method then try the regular method of login with the login name “observer”.

To set BB bandwidth, go to USER0 and do baseband settings as per the instructions in Chapter 8 & edit “temp2/data/init.hdr.new” (change CLK_SEL). The following table gives relation between the baseband bandwidth and clock selection.

BB Bandwidth (MHz).	Samp_freq, CLK_SEL
16	0
8	1
4	2
2	3
1	4
0.5	5

Then go to each correletor window, “mithunA:collect”, “mithunB:collect” and “bhaskar/aditya:dassrv” windows and give the commands written on the right side of the colon sign in each desktop with putting all processes in the background.

For example run “acq” following **in each desktop i.e. USB,LSB & BOTH**:

```
>acq &                  [In the window corracqa:acq for USB]
>acq &                  [ In the window corracqb:acq for LSB]
>acq &                  [ In the window corrctl:acq for BOTH]
```

etc.....

The sequence of starting the correlator,

1)“acq”, 2)“acq 30”, 3)“sockcmd”, 4)“collect” in each desktop

After this start the “dassrv” by going into the **“bhaskar/aditya:dassrv” window**.

```
>dassrv &
```

Now go to the **BOTH desktop** and in the **windows “corrctl:dlytrk” & “corrctl:fstop/corrconfig”** give following commands

```
>newdlytrk              in dlytrk window
>corr_config            in fstop/corr_config window
>dlytrk --clk_sel 0 &   in dlytrk window
>fstop &                in  fstop/corr_config window
```

For recording you have to go to the record **window of mithuna for USB & mithunb for LSB** and give the commands,

```
>record prjcode filename.lta X &        for USB
>record prjcode filename.ltb X &        for LSB
```

The term X is used for the integration time for recording the LTA. (which is equal to the integration time multiplied by 2 secs.)

Here you should mention the prj CODE (In capital letters) for recording data for that particular Subarray. Note that Online maps all characters in UPPER case. These files are recorded in the mithuna & mithunb computers.

In **User0 window**

```
>allant                         (all antennas that likely to be added for session.)
>tpa(11)=15                     3 for USB.
                                12 for LSB.
                                15 for BOTH.
>cmode 3                        1 for USB.
                                2 for LSB.
                                3 for BOTH.
>initndas '/temp2/data/init.hdr.new'
>ante N n1 n2 n3 . . . . . nN  where N is the no. of
                                antennae you want to take for observation
                                & n1,n2 ...nN are antenna Ids.
```

`>suba X`	X=1,2,3,4,5 the subarray taken for observation
`>prjtit'title'`	Title of the project upto 80 characters.
`>prjobserv'NAME'`	Name of observer upto 8 characters.
`>initprj(15,'prjcode')`	15 for BOTH. 3 for USB. 12 for LSB.

Then **go to the subarray X** and give follosing commands there,

`>tpa RF RF LO1 LO1 LO4 LO4`

`>prjfreq`	Copy frequency parameters into ONLINE shared memory.
`>lnkndasq`	Setup the link between ONLINE and DAS.
`>gts'sourcename'`	Get source parameters.
`>sndsacsrc(1,12h)`	Track given source.

After reaching all antennae on the source start recording data by giving command.

`>strtndas`

This command record the data on the source got by the last gts'sourcename' command.

Check the MATMON see the fringes are proper or not .

After getting required amount of data if you want to stop the recording give the following command in the suba X window.

`>stpndas`

If you want to start Sacfile or Command file, do the following.

`>opsacfil 'command_file_name_with_full_path'`

`>strtsacfil`

To stop the command file

`>stpsacfil`

To stop the project go to **USER0 window.**

```
>stpprj
>hltndas
```

7 Settings for RF, LO & IF

There are two types of settings for the antennae
1.Single frequency.
2.Dual frequency.

7.1 Single frequency settings

For setting the RF, LO and IF parameters, the user needs to edit a file called setupnew.txt in the BHASKAR. The name of the file is aliased as the `cdsetX` where X=1,2,3,4,5.

Edit the file as per your requirement. The example of the setupnew.txt file is given at the end of this chapter.

Then send the control word to the antennae you need. A `cdsetX` (x=1, 2, 3, 4, 5 or m) is the general purpose aliasing done to ease editing of the proper parameter file (setupnew.txt) and run corresponding program which create the control word.

ONLINE has five different user control for general purpose named user1, user2, user3, user4 and user5. For example observer having control of user4 should use cdset4. It creates a control words for RF, LO, IF and BB in separate files which has to be sent to the antennas and baseband system using the following commands.

NOTE:- *Please check the RF-swap status before setting the front-end.*

One can check RF-swap on ADITYA by giving the command in home area,
for example,

```
>more sw150
```

Then edit the `cdsetX` file for the front-end.

After doing all the settings **go to the USER4 window**

```
>run set4rf
>run set4if
>run set4lo
```

NOTE:- *Nowadays new facility is added for IF settings i.e. the "NEW ALCs" for some antennae. Therefore for these antennae we have to edit file* `cdset6` *which is containing*

pre-attenuations and post-gains with a dollar sign as a prefix for post-gains.

For run IF settings for all New ALC antennae then edit cdset6 file by giving command in the ADITYA's terminal as,

```
>cdset6 new
```

And give following command in the respective user window as,

```
>run set6if
```

If suppose somebody wants to set IF for one or more New ALC antenna/antennae then write the names of those New ALC antenna/antennae in front of the cdset6 in ADITYA's terminal,

For example,

```
>cdset6 C01 C03
```

Then give same command in user window as,

```
>run set6if
```

7.2 Dual frequency settings

For setting dual frequency there is *cdsetd* file(We can edit it by giving `cdsetd` command in any BHASKAR's terminal.) which we can run after doing required settings, rest all procedure is same only we have to give two RF, IF, & LOs.

NOTE:- *For more information on frequency & related parameters settings refer the next topic* ***Freqency and related parameter setting***.

7.3 Example of a cdsetX file

```
*FRONT END PARAMETERS.
* select freq. of observation (50/150/235/325/610/1060/1170/1280/1390 Mhz.)
235

* select solar attenuator (0/14/30/44 dB. -1 for FE Termination.)
0

* select polarization unswapped(0) or swapped(1).
0

* select cal-noise level.(E-HI(0)/HI(1)/MED(2)/LO(3) (-1 for RF OFF).)
1

* LO PARAMETERS.
* select LO freq.(100 - 1600 MHz.)
308
308
* IF PARAMETERS. (Default is 14 14)
* select pre_attenuator and post_attenuator for CH1.(0,2,4,...,30 dB)
16
16
*select pre_attenuator and post_attenuator for CH2.(0,2,4,...,30 dB)16
```

```
16
* select IF band width for CH1 and CH2 resp.(6/16/32 MHz).
16
16

* select ALC OFF(0) or ON(1). for CH1 and CH2
0
0

* New parameters being added :
* enter NG in time domain (0,25,50 or 100) percent duty-cycle
0

* enter Walsh Enable(1) or Disable(0)
0

* Select the Walsh Group : Low Group(0) or Higher Group(1)
0

* BASEBAND PARAMETERS ( set_para[16] onwards ):
* Select the antenna group :
*  [0   if all ant bb mentioned below   ]
*  [1   if (C0 , C1 , C2 , C3  :130 MHz)]
*  [2   if (C0 , C1 , C2 , C3  :175 MHz)]
*  [3   if (C4 , C5 , C6 , C8  :130 MHz)]
*  [4   if (C4 , C5 , C6 , C8  :175 MHz)]
*  [5   if (C9 , C10, C11, C12 :130 MHz)]
*  [6   if (C9 , C10, C11, C12 :175 MHz)]
*  [7   if (C13, C14, SP1, SP2 :130 MHz)]
*  [8   if (C13, C14, SP1, SP2 :175 MHz)]
*  [13  if (W1 , W2 , W3 , W4  :130 MHz)]
*  [10  if (W1 , W2 , W3 , W4  :175 MHz)]
*  [11  if (W5 , W6 , E2 , E3  :130 MHz)]
*  [12  if (W5 , W6 , E2 , E3  :175 MHz)]
0

* Select Base BANDWIDTH in KHz(16000/8000/4000/2000/1000/500/250/125/62)16000

* Select BB Gain (0/3/6/9/12/15/18/21/24)
0

* Select BB LO (Hz) Synth # 1 Freq.(MHz) (50.0 <= LO <= 90.0 / step 100 Hz)
70.0000

* Select BB LO (Hz) Synth # 2 Freq.(MHz) (50.0 <= LO <= 90.0 / step 100 Hz)
70.0000

* Select Map

*       Chan  # 1       Chan  # 2

* 1 -   Synth # 1       Synth # 1
* 2 -   Synth # 2       Synth # 2
* 3 -   Synth # 1       Synth # 2
* 4 -   Synth # 2       Synth # 1
3

BACK
```

7.4 Frequency and releted parameter setting

7.4.1 Band Selection

GMRT Receiver system has got the five main band. The band selection can be either of the following.

150 MHz.
235 MHz.
325 MHz.
610 MHz.
1420 MHZ.

The 1420 MHz band has got four sub-band out of which user can select individual band listed below or single band as a whole. The available sub bands available in it 1420 MHz are
1060 MHz.
1170 MHz.
1280 MHz.
1390 MHz.

7.4.2 Solar Attenuator

The solar attenuator available in GMRT front end are

0 dBm.
14 dBm.
30 dBm.
44 dBm.
Termination.

7.4.3 Polarization

User has to take care of the polarization switch to get fringes on antennas.
polarization convention in each antenna is available here.
The Polarization switch can be either of the following.

Unswapped.
Swapped.

7.4.4 Cal-Noise level

E-HI-Extra High cal noise
HI-High cal noise.
MED-Medium cal noise.
LO-Low cal noise.
Front End off

7.4.5 LO Frequency

Two different polarization have two different LO frequency. Also there are two LO frequency synthesizers

Synth-1 Sets LO frequency from 100 MHz to 600 MHz in steps on 1MHz.
Synth-2 Sets LO frequency from 600 MHz to 1600 MHz in steps on 5MHz.

7.4.6 IF Attenuation

IF attenuation vary from 0 dB to 60 dB in steps of 2 dB for each of the polarization. This attenuation is divided in two parts as Pre-Attenuation and Post-Attenuation. So Pre Attn. can have value 0 through 30 in steps of 2dB and same is true for Post Attn.

7.4.7 IF band width

Possible bandwidth that can be set for each polarization are.

6MHZ
16MHZ
32MHZ.

7.4.8 ALC status

ALC's can be put either ON or OFF independently on different polarization.

7.4.9 Front End Parameter

NG duty cycle can be either.

0 percent duty-cycle.
25 percent duty-cycle.
50 percent duty-cycle.
100 percent duty-cycle.

Walsh status can be either of the following:

Enabled
Disabled.

The walsh group can be either of the following:

Low Group.
Higher Group.

Now new Baseband setting procedure is given, as per that it is not need to do the setting as per our setupnew.txt file, still for reference the baseband parameters are as follows.

7.4.10 Baseband Related Parameters

The **Baseband Bandwidth** can be set either of the following.

16000 KHz.
8000 KHz.
4000 KHz.
2000 KHz.
1000 KHz.
500 KHz.
250 KHz.
125 KHz.
62.5 KHz.

Corresponding **Baseband Gain** should be selected from following list.

0 dB.
3 dB.
6 dB.
9 dB.
12 dB.
15 dB.
18 dB.
21 dB.
24 dB.

7.4.11 Baseband LO frequency(fourth LO) setting

Base Band has got two LO synthesizers each of which can be set to individually any frequency from 50 MHz to 90 MHz in steps of 100 KHz. Then by selecting proper mapping desired BB LO (4 th LO) frequency can be set to both polarization.

8 Baseband settings

General procedure for baseband settings is,
1.Initialise the baseband server.(If done then no need).
2.Set the baseband ALC ON or OFF.
3.Set the baseband BANDWIDTH with GAIN.
4.Set the baseband LO.

NOTE:- *Please do the above settings in same order religiously.*

Steps 1 to 6 should be followed ONLY ONCE AFTER STARTING ONLINE, if 'bbserv' program window is not running on the BHASKAR.

1.Put Switch at PC mode,in the Reciever Room.

2.Check for program window of 'bbserver' program running on the baseband PC.

3.By default 'bbserver' runs after boot, if not running Click on the 'bbserver' icon on PC desktop and run it.

4.Run 'bbserv' in one of the ONLINE machine. If 'bbserver' is running on PC in Reciever Room, it will show following,

Connected to the socket.
Got:Connected to BB
Got:CONNECTED TO BBPC
All the stale messages cleared msgid=1.

5.The BaseBand command settings will get executed to the defined antennae in the subarray only. **Only USER 0/MASTER can control BaseBand.**

6.In USER 0 or MASTER window of ONLINE, type:

```
>run nbbproc
```

By this, following commands will become available to do the baseband settings through **USER0/MASTER.**

Initialise the baseband server
```
>initbbserv
```

Set both Polariazation and Sidebands: **IPA=BW & JPA=Gain**.
```
>stbbwgnall(IPA,JPA)
```
Suppose anybody wants to set the bandwidth & gain separately then,
```
>stbbandall(IPA)
>stbbndgain(JPA)
```

Set for the separate polariazation=STRA2(130/175/both) as well as sideband=STRA3 (usb/lsb/both) with bandwidth=IPA and gain=JPA,
```
>stbblosyn('STRA2','STRA3',IPA,JPA)
```

To set the baseband LO: STRA2=LO1,STRA3=LO2,
```
>stbblo('STRA2','STRA3')
```

Set baseband ALC:STRA2=130/175/both, STRA3=lsb/usb/both, IPA=0/1,
```
>stbbalc('STRA2','STRA3',IPA)
```

For example The baseband settings to be done are

i)ALC—OFF for both sidebands & polariazations.

ii)Baseband LO—70MHz.

iii)Bandwidth & Gain—16000 & 0.

Then following commands should be given as follows in **USER 0/MASTER** , by defining the antennae to be include in the settings.
```
>stbbalc('both','both',0)
>stbblo('70','70')
>stbbwgnall(16000,0)
```

But before that you should have the knowledge of the **Baseband parameters.**

The baseband parameters are as follows:

Baseband Related Parameters:

The **Baseband Bandwidth** can be set either of the following.

16000 KHz.
8000 KHz.

4000 KHz.
2000 KHz.
1000 KHz.
500 KHz.
250 KHz.
125 KHz.
62.5 KHz.

Corresponding **Baseband Gain** should be selected from following list.

0 dB.
3 dB.
6 dB.
9 dB.
12 dB.
15 dB.
18 dB.
21 dB.
24 dB.

Baseband LO frequency(fourth LO) setting:

Base Band has got two LO synthesizers each of which can be set to individually any frequency from 50 MHz to 90 MHz in steps of 100 KHz. Then by selecting proper mapping desired BB LO (4 th LO) frequency can be set to both polarization.

9 Power Equalisation

We do power equalise by two methods,
1.Power equalisation using Baseband output.
2.Power equalisation using 30-1.

First we will see power equalise using baseband output.

9.1 Power equalisation using Baseband output

In this method there are two ways of doing power equalise,
1.By giving the commands through mithun.
2.Using the graphical user interface of the pulsar through astro0.

NOTE: *a. Switch off the baseband & IF ALCs.*
b. Go to the source.

9.1.1 Power equailise through mithun

For power equailise remember the following things
a. Switch off the baseband & IF ALCs
b. Go to the source.
Open a new terminal.
Login as: `>observer@mithuna`
Change the working directory as: `>cd power_eq/`
Run the program: `>./power_eq`
Please ensure that the following options are given with the command as arguments.
The following command line arguments are essential.

Optimum Level for Power Eq. Default:256.0	`-o OptLevel`
Power above this is taken as upper level. Default:5000.0	`-u UpperLevel`
Power below this is ignored. Default:10.0	`-l LowerCutoff`
Integration Cycles. Default=1	`-i  Integ`

The optional commands can also give which can be viewed by giving the command line argument as `-h`.

For more help & more options use the options `-h for help`

It will take help of a file for the IF attenuations, named as *antenna_ifsetup.cur* in the same directory for power equalise. If you want to take other file for attenuations then there is option.

After entering all the required entries it will ask ,
`password: >.astro1`

In USER0 give the command as

```
>run setlev
```

Do the same atleast for three times.
It will create a file with modified IF attenuations named as *antenna_ifsetup.cur*.

9.1.2 Power equailise through astro0.

Login as:
```
>pulsar@astro0
>tcl
>./antenna
```
Then a graphical interface named as “ANTENNA” will come,

In the ANTENNA window

Click on `Antenna Setup >>`

Select all using antennae and put already set IF attenuations.

Click on `Save`

Minimize this `Antenna Setup >>` window & keep it aside.

In the ANTENNA window

Click on `>Power Eq`

Select the band as well as the power levels at you want to equailise power with the options.

Then click a button `>Power Eq`

Attention: Wait for the clicked button to come out.

In USER0 give the command as

```
>run setlev
```

Do the same atleast for three times.

9.2 Power Equalisation Using 30-to-1

Login as: `>elab@tcc-l1`

Change working-directory to: `>/home/elab/powereq/`

Run the program: `>./ofmpeq.pl`

Ensure that the following options are supplied as proper arguments when program is run.

The following command-line arguments are essential.

Bandwidth: `-b <IFBW> 6/16/32 Mhz`

Side Band: `-B <SideBand> U/L for USB/LSB`

Ants Used: `-U <AntList> '*' forall antennae`

Attention: Option -U must be given with some antenna name(s) as argument. By default, no antenna is used.

The following command-line options may also be provided.

RF Frequency: `-R <Freq> in Mhz`

Source Name: `-S <Source>`

Unused Ants: `-F <AntList> 'C00,E04,S03'`

The AUTHIF attenuation files, for the respective frequency (the one provided with **-R** option), are read from the following area:

/home/elab/powereq/ifsys/[freq].atn

In case a non-standard IF attenuation file is to be used as input, it can be provided with option **-f**. *The format of this file should be the same as that of the standard AUTHIF attenuation file.*

Attenuation File: `-f <AttnFile>`

The program will create a *runfile* for setting *RF* and *IF* settings. This *runfile* should be run in ***ONLINE*** **(USER0/USER4).**

When program is run, it will get the fresh spectrum-dump from 30-to-1 switch. Depending on the attenuations, set, it will calculate what IF attenuations will bring the channel power to **-33 dBm**. Then, it will create a new *runfile* for new IF attenuation values. Again, this *runfile* is run to set the IF attenuations.

The program keeps on iterating, until the user gets the **resonable power levels,** for all antennae.

10 How to do the POINTING

Pointing can be done in one of the two ways:

1. With Self power.

2. With Cross correlations.

General procedure for pointing(both),

1.Feed rotation.

2.Antennae on the Extended source.

3.Antenna settings.

4.Power equilisation (If Required).

5.Azimuth & Elevation scans on the source.

6.Analysis.

7.Loading pointing offsets.

First make sure that all the feeds are properly focussed.

Antenna Settings

Antenna settings are done from *bhaskar* using program ***cdset4***. RF, LO, and IF settings are mentioned in *cdset4*, and then these settings are run from ***USER4.***

Following commands are used for this:

```
>run set4rf
>run set4if
>run set4lo
```

Keep IF & BB ALC's OFF. Do the default settings for the required frequency. Do the BB settings as per the Baseband settings document.

Then start Correlator(Refer Chapter 6 Running Correlator).

10.1 Pointing with Self Power

First go to any strong **extended** source.

by giving the following commnads

```
>suba 4
>gts'sourcename'
```

Send antennae on that source

```
>sndsacsrc(1,12h)
```

Make all the pointing offsets for the required axis to be scan zero in the BHASKAR's terminal with the program 'mkzerooff' having the procedure of operation as follows,

On BHASKAR's terminal

```
>mkzerooff [AZ/EL]
```

This program reads the input file *"/home/operator/runfil/NLDANTO.001"* and depending on the options it produces the output file "/home/operator/runfil/ZERO_OFFSETS.001"

1. If you run only "mkzerooff" with no options it will set the

   both offsets (EL and AZ) to 0

2. If you run "mkzerooff AZ" then it will set azimuth offset to 0

   without changing the elevation offsets.

3. If you run "mkzerooff EL" then it will set elevation offset to 0

   without changing the azimuth offsets.

For loading these offsets in online,give it **IN USER0.**

```
>run zero_offset
```

Do the power equilisation on the source if required. (Refer section 9.1)

Following things to be NOTE:

Synchronize ONLINE PC time and Correlator PC time. While scaning rate should be 20'/1m or less.(It is beamshape dependent factor.)

Give the following command **IN USER4.**

`>stabct` synchronization of time.

For Elevation Scan say,

```
>scanelsrc(20'/1m,18h30m)
```

Here **20'** is slewing rate of antennas per minute. and **18h30m** is the expected peak time. Depending upon User's requirement these parameters can be changed.

```
>strtndas
```

NOTE :- *Remember while recording the data in MITHUNA & MITHUNB please don't use any integration time like '8m' or '4' etc. Because we want large records in less time.*

For e.g. In mithunA record it like,

```
>record prjcode(in capitals) filename.lta &
```

Stop the scan after the time (2 times the time difference between the starting time & the peak time.).

```
>stpndas
```

Restore the position of the antennae on the source.

```
>gts'sourcename'
```

```
>sndsacsrc(1,12h)
```

For Azimuth Scan say same procedure as that of the elevation scan with change,

```
>scanazsrc(20'/1m,18h45m)
```

```
>strtndas
```

Then follow the same thing like elevation.

Analysing data

Log on **astro0**

Login as `>ssh backup@astro0`

Change the directory `>cd /d1/online/pointing`

Make current date directory `>mkdir ddmm`

`>cd /d1/online/pointing/ddmm`

Run programme *getoffsets* (programme written by Vasant Kulkarni).

Here following you have to give as input.

```
Lta file name with full path.
scan rate
scan number in Lta file
start time
stop time
expected peak time ( this should be correct)
```

NOTE :- *For start time, stop time & expected peak time please use the LTA time stamps.*

This programme will create PS files in the current area.

Then you have to update the offsets in Pointing Offsets file.For that go to any BHASKAR's terminal in that,

```
>cd $RUNFIL
```

Edit the file with added antenna offsets for both elevation & azimuth, carefully.

```
>sccsvi NLDANTO.001
```

10.2 With Cross Correlations

For pointing with cross correlation values you need any **point source** like 3C48, 3c286, 3c147 etc.

Then put antennae which you are going to take as reference (this should be reliable) in

separate subarray to trake same source(Refer the defining subarray document).

Then make sure that **ALC's** at both **IF and BB are ON**. The BB ALC's you have to refer the **Baseband settings.**

Then start pointing for rest of the antennas.

Next procedure is same as above.

Analysis

Only while analysing the data you have to run *vxget* (programme written by Vasant Kulkarni).

Rest all is same as above only the change is to include the name of the reference antenna as Ref.antenna.

Then load the pointing offsets same as above.

11 On Off deflection test for 30 to 1

Login as	`ssh elab@tcc`
Change directory	`cd /data/cspa/data/`
Create current date directory	`mkdir curntdate`
Change directory	`cd /data/cspa/data/curntdate`

The order of doing test is

1. *On source 30 to 1 recording.*
2. *Off source 30 to 1 recording.*
3. *Measuring the deflection between On source & Off source.*

Do all the settings for required antennae.

11.1 On source recording

Go to any strong source & in working sub-array's user make all antennae to track the source,while tracking the source record the 30-to-1 data by the following method.

Run the following program for recording with the command line arguments
```
>csprecord  [option/s]
```

The following command line arguments are essential,

-m < SPA/VVM > Acquisition Mode
-d < number > No. of record for each antenna
-f < filename >

The other arguments are optional

-l < FirstLO >
-c < strt:stop:incr > Channels Selection (-Not Implemented)
-i < intg value > Integration (- Not Implemented)
-s < SwLoss Correction File> Without SwLoss Correction

Then give command for example as,
```
> csprecord -m SPA -d 3 -f sourcename_on.spd
```

After this wait till the 3 dumps over.

11.2 Off source recording

Go off source some degrees by giving command in the working user say USER4.

If the source has its own offsource coordinates then give command as

```
>gts 'offsourcename'
>sndsacsrc(1,12h)
```

Otherwise give commands as,

```
>gts'sourcename'
>trkeloff(-10d)
>sndsacsrc(1,12h)
```

Wait till the antennae reach on the destination.

Record the data in the 30 to 1 in the as,

```
>csprecord -m SPA -d 3 -f sourcename_off.spd
```

Wait till the 3 dumps over.

11.3 Measuring the deflection between on & off source data

Run the program

```
>getdefl [options] onsrcfile offsrcfile
```

Here the option is

```
-b < IF bandwidth in MHz >
    (default is 6 MHz.)
```

It will create new files, one of them will be postscript & the other one will be text file.

In the postscript file the plots of onsource & offsource data with there deflections.

This was all about the deflection tests

12 How to start the observation

The order of starting the observation.

1. **Edit the file */temp2/data/init.hdr.new* for proper CLK_SEL.**
2. **Start acq, acq30, and sockcmd _ in LSB, USB, and BOTH.**
3. **Start collect program in LSB, USB.**
4. **Start the dassrv.**
5. **Start dlytrk with proper CLK_SEL.**
6. **Start fstop.**
7. **Set the RF, LO, IF in *cdset5* as per the observer's requirement.**
8. **Set IF ALC's ON/OFF.**
9. **Run RF, LO,IF settings.**
10. **Run newauth for the observing frequency.**
11. **Run nauth.**
12. **Load antenna offsets _(using *run nldanto).***
13. **Set Baseband ALC's ON/OFF.**
14. **Set Baseband Bandwidth & Gain.**
15. **Set Baseband LO.**
16. **Give initndas.**
17. **Give initproject.**
18. **Give proper tpa.**

a) **Go to BHASKAR's terminal** & to start the new header file with proper clock selection, edit the file by giving the command,

```
>vi/temp2/data/init.hdr.new
```

b) To start the acquisition for USB & LSB as well as BOTH,

Go to **USB desktop** & in corracqa:acq window type

```
>acq &
```

Go to **LSB desktop** & in corracqb:acq window type

```
>acq &
```

Go to **BOTH desktop** & in corrctl:acq window type

```
>acq &
```

c) To start the correlated acquisition for each as well as both bands

For USB

Give following commands in USB desktop in respective windows

```
>acq30 &          [in corracqa:acq30 window]
>sockcmd &        [in corracqa:sockcmd window]
```

To collect the data into the mithuna

```
>collect &        [in mithunA:collect window]
```

For LSB

Give following commands in LSB desktop in respective windows

```
>acq30 &          [in corracqb:acq30 window]
>sockcmd &        [in corracqb:sockcmdwindow]
```

To collect the data into the mithunb

```
>collect &        [in mithunB:collect window]
```

For BOTH

Give the commands stated below in BOTH desktop in respective windows

```
>acq30 &          [in corrctl:acq30 window]
>sockcmd &        [in corrctl:sockcmd window]
```

In this desktop find 'corrctrl:dlytrk' window , now we are going to type in that an optional command which is necessary but not each time at the beginning of the observation,if it is already given then do not give it again,

```
>newdly_config
```

This command will add new delays in the correlator to compensate the phase difference. Now in the another window 'corrctl:fstop/corr_config' window type

```
>corr_config
```

So that it will configure the correlator for the newly added delays
Again go to the 'corrctrl:dlytrk' window and type

```
>dlytrk  --clk_sel  0 &
```

NOTE:- *Here we have taken the clock selection as 0, it is from the file '/temp2/data/init.hdr.new'*

Then start the fstop i.e. stop the fringe by giving the command fstop in the 'corrctl:fstop/corr_config' window

```
>fstop &
```

This way we have started the correlated acquisition.

d)Now to start the DASSRV go to the ADITYA &
in **'bhaskar/aditya:dassrv' window**
Change the directory
```
>cd /export/home/onsoft/01dec2002/dassrv-0.96
```
and give the command,
```
>dassrv &
```

e) **Go to the online USER 0**
Here we will start the init.hdr.new
```
>suba 0
>allant
>tpa(11)=15        [for both bands]
```
this tpa is optional i.e.For USB recording tpa(11)=3
For LSB recording tpa(11)=12
For BOTH sidebands recordings tpa(11)=15
```
>cmode 3           [for both bands]
```
this is also optional i.e. For USB recordings cmode=1
For LSB redordings cmode=2
For BOTH sidebands recordings cmode=3
then start the file i.e. init.hdr.new which we have already edited in section 2.a) by giving the command **in the USER0 window,**
```
>initndas '/temp2/data/init.hdr.new'
```

Here onwards we will start the project
```
>suba 4
>prjtit 'universe'
>prjobs'GMRT'
>initprj  (15, 'prjcode')  15 ==>BOTH
                           3 ==>USB
                           12 ==>LSB
```

f) Now the important part is to do the settings for required RF,LO & IF, which we usually do in special files in respective area which are accessible by the ONLINE, so that it will set the saved settings for all the required antennae by using some commands.

For that you have to edit the file for respective sub-array named as *'cdsetx'* where x is the sub-array number e.g. cdset4, cdset5, ...etc.

NOTE :- *For dual observation the filename we use is 'cdsetd' where d stands for dual.*

These files are in the *'/export/home/operator/set/user/userx'* area on the BHASKAR where x stands for the sub-array number, as per our requirement of the sub-array we have to set the above settings for required sub-array.

Here as an example we will take sub-array 4 as our observational array in which we are going to do the observation, so go to any logged in terminal of BHASKAR and give command there as *'cdsetx'* . Edit the file and save the changes you have made.

Uptill these are the settings for the RF,IF,LO1 settings. Now we will do the settings for LO4 as per the baseband settings (Refer Chapter 8).

For LO1 we have to edit the file *'cdset5'* and after that give command *'set5l'* in the BHASKAR's terminal so that it will save the changes for the LO1.

g) To do the settings for edited files first go to the USER4
You have to type the tpa for the given settings of the RF with their LO values, for the two polarisations

```
>tpa RF1 RF2 LO1 LO2 LO4 LO4
>prjfreq
>lnkndasq
>suba 4
>run set4rf      [in general  run setxrf]
                 [here x refers to the no. of cdsetx where we made
                 changes in the cdsetx file]
```

This command takes time for the settings so you have to wait for a minute, but during setting the symbol w will come per second like `qwwwwws.`

After successful command run give the commad for setting IF.

```
>run set4f       [in general run setxif]
```

wait for the completion of the command successfully.
Now same as above we have to give the command for the LO1 in USER4 but here only the change to note is that we set previoulsy the LO1 in cdset5 so here we will give command as run set5lo.

```
>run set4lo
```

h) For base-band settings and setting LO4 on BHASKAR in USER0 give commands as follows,

```
>allant
>cp 0;defs 0;suba 0
>run stbbalc('both','both',0)          [optional: if changed w.r.t. The previous
observation,                           otherwise not required]
>run stbbwgnall(16000,0)               [optional: if changed w.r.t. The previous
                                       observation, otherwise not  required]
>run stbblo('70.0','70.0')             [optional: if changed w.r.t. The previous
                                       observation, otherwise not required]
```

i) To make AUTHIF settings in the BHASKAR's terminal give command

```
>newauth -h              [read help and choose options for required frequency]
```

Then go to the **USER0** and give the command,

```
>discmdmon
>run nauth
```

j) Give the following commands in the **USER0**

```
>discmdmon
```

Loading the antenna offsets,

```
>run nldanto
>enacmdmon
```

k) Here all the settings for starting the continuum observation are conmpleted.
After this we have to record the data is recorded for two sidebands i.e. USB & LSB in MITHUNA and MITHUNB respectively.
By giving the command,

For lta

```
>record projectcode filename.lta c&
```

For ltb

```
>record projectcode filename.ltb c&
```

Here `c` means the integration time divided by two i.e. For e.g. if integration time is 16 seconds then the c will be of 8m here m is meridean filter only substituted for the 16 seconds integration, otherwise c is always like described above.

Like this way we start the observation. Depending on the conditions of the user the starting methods can differ from the method stated above. This is decided by the Scientific Assistance who operates the telescope.

l)Now the next job is to check that is observation going in the right way?

Therefore you have to check the following outputs,

i) Is MATMON giving the proper fringes,
[Question is how to see the MATMON:- Open the new terminal and login to MITHUNA for USB and then give the command
`>ampmon -h` [read the help and see the desired output]
Do same for the LSB MATMON by log in into the MITHUNB.

ii) Is `'dasw'` window showing the tpa, obsname, obstitle, the starting status of DAS. (i.e. `0` for off & `1` for on)

iii) The MithunA & MithunB are recording or not.

iv)The gnuplots of USB & LSB for relevant frequencies and their related bandwidth.

v) ADITYA message window for the current status is showing messages or not.
vi) Check the ondisp window continuously so that you will come to know that is any antenna having problem or not.

.
.
.
.
.
.
.
.
etc.....

This was all about the starting the observation.

13 TroubleShooting

13.1 MSEB Power fails for some or all antennae.

First stop command file by (**Usually in USER4 window**)

```
>stpsacfil
```

Stop das scan by

```
>stpndas
```

Define all affected antennae in subarray (usually all are in subarray 4).

```
>suba 4
>allant
>cp 0;defs 0;suba 0
```

Initialise all antennas by command initialize

```
>initabc
>gts'srcname'
>sndsacsrc(1,12h)
```

Set RF, LO , IF and BB parameters.

Load Pointing Offsets to all antennas.(**In USER 0 window** give following command)

```
>run nldanto
```

Then start command file.

```
>opsafil '/temp2/data/cmd/cmdfile'
>strtsacfil
```

13.2 Antenna applies brakes in elevation

Define that particular antennas in separate subarray give command in defined subarray's user say USER4,

```
>hldel
```

13.3 Antenna applies brakes in azimuth

Define that particular antennas in separate subarray say,

```
>hldaz
```

13.4 Antenna applies brakes in both elevation and azimuth

Define that particular antennas in saperate subarray and in same USER give,

```
>hold
```

13.5 Antenna gives ABC time out

If antenna gives continuous ABC time out, then raise the callsheet.

13.6 Antenna got reset (see Flags in ONDISP)

Initialise ABC (Refer 13.1), by defining the antenna in any sub-array.
Set RF,LO,IF parameters.

Pointing Offsets to be load for the particular antenna.

13.7 If antenna goes in "I" mode

First give the source by
`>gts'srcname'`
Then say

`>sndsacsrc(1,1h).`

13.8 If ONLINE disk gets full

Move the big files in /home/onsoft/data to /temp2/data/online/ or /d1/online1/online/

13.9 If servo doesn't go in "z" mode

First give the source by
`>gts'srcname'.`
say
`>posn`
After reaching near source say

`>sndsacsrc(1,1h)`

13.10 Servo not releasing brakes

Define that particular antenna in saperate subarray.
Say
`>rstser` for h/w reset of servo.
Or
`>run srvrst` for s/w reset of servo.

`>hold` for releasing brakes.

13.11 Servo reads high current 204 or 203 Amps.

Here no need of defining particular antenna in saperate subarray.
Go to USER1 window say
`>run sft` for s/w ABC reset.
then the sleep time for 10 seconds will come,in between that time,
Dial the no.=50+Antenna ID. (Refer Appendix 14.1)
Then antenna will reset.

Initialise ABC (Refer 13.1).

13.12 All MCM's are giving time out except MCM 0.

Define that particular antenna in saperate subarray.

give

```
>ana 00000x
>st32dig(0)
```

then give

```
>ana 0ffffx          for MCM s/w reset.
>st32dig(0)
```

13.13 Das doesn't get initiated.

This will happen for following possibilities.

1.If more than one 'dassrv' or 'sockcmd' are running.

2.Subarray get killed while data acquisition is going on.

Then kill dassrv and sockcmd.

Otherwise stop the scan if running **go to USER0.**

Define the subarray in which observation is going say subarray 4.

```
>suba 4
```

Stop the project.

```
>stpprj
```

Halt the das.

```
>hltndas
```

13.14 Ist LO is not getting lock.

Try to set Ist LO for another frequency and if sets then revert back to previous one.

13.15 No fringes in antennas

1.See whether baseband is set in proper order.

i.Baseband **ALC's**

ii.Baseband **BANDWIDTH & GAIN.**

iii.Baseband **LO.**

check whether pointing offsets have been loaded ?

2.See whether fstop is crashed?

If yes then start it,also check the delay track is running if not please run it.

Stop the scan give the source by gts'srcname'.

Then 'strtndasc'

13.16 No fringe on newly added antenna.

See whether antenna is tracking source.

See whether all settings have been done ?

See whether pointing offsets has been loaded?

13.17 Low amplitude.

Incorrect Pointing offsets have been loaded ?
Correct it.

13.18 Wind goes high.

If wind goes higher than 45 kmph (Kilo meter per hour) then

Stop observation.

Park all antennas by following process

```
>suba 4
>stpsactrk
>mvel 90d
```

Wait for all antennas to go to 90d then say 'brake'.

14 Appendix

14.1 ABC IDs

Below all ID wise antennae and antennae wise IDs are given.

ID wise antennae		Antenna wise IDs	
01	C03	C00	07
02	C12	C01	06
03	C04	C02	05
04	C09	C03	01
05	C02	C04	03
06	C01	C05	19
07	C00	C06	20
08	W01	C08	24
09	C11	C09	04
10	C14	C10	12
11	C13	C11	09
12	C10	C12	02
13	W02	C13	11
14	W03	C14	10
15	W04	S01	26
16	W05	S02	27
17	E02	S03	28
18	E03	S04	29
19	C05	S06	30
20	C06	E02	17
21	E04	E03	18
22	E05	E04	21
23	E06	E05	22
24	C08	E06	23
25	W06	W01	08
26	S01	W02	13
27	S02	W03	14
28	S03	W04	15
29	S04	W05	16
30	S06	W06	25

14.2 Feed information

Following is the information about the feeds at various frequencies with their counts and degrees.

Feed	*610/235MHz*	*150MHz*	*1420MHz*	*325MHz*
Degrees	0	90	180	270
Counts	1200	6500	11500	16500

14.3 Online Commands

14.3.1 Old ONLINE Procedures

`gmrtstart`	Define variables used in GMRT procs.
`sleep(ipa)`	Sleep for IPA sec.
`svdc`	Save DEST and COMM in XSV&YSV.
`rstdc`	restore DEST & COMM from XSV & YSV.
`svcdc`	SVDC+ZSV=CPA(1).
`rstcdc`	RSTDC + CPA(1)=ZSV.
`svdca`	SVDC+USV=AXIS.
`rstdca`	RSTDC + AXIS=USV.
`svcdca`	SVCDC+USV=AXIS.
`rstcdca`	RSTCDC + AXIS=USV.
`svdcs`	SVDC + USV=SUBARRAY.
`rstdcs`	RSTDC + SUBARR=USV.
`svdcat`	SVDCA + TARGET in UVWSV.
`rstdcat`	RSTDCA + TARGET FROM UVWSV.
`svdcatd`	SVDCAT + SRVCRD in TSV.
`rstdcatd`	RSTDCAT +SRVCRD in TSV.

14.3.2 New ONLINE Procedures For SUN Machine

`startup(stra3)`	Start display and control programs & log packet in STRA3.
`shutdown`	Stop display and control programs.
`defsub(ipa)`	Define antennas associated with sub-array IPA.

`shsub(ipa)`	Show antennas associated with sub-array IPA.
`strtproc`	Starts specified process.
`abrtproc`	Aborts starting of specified process.
`hltproc`	Stops specified process.
`userconn`	Connect User to COMH.
`ondbgunic`	Set debug on in unixcomh.
`offdbguni`	Turn off debug in unixcomh.
`logpkt(stra3)`	Start packets logging in file STRA3.
`hltpktlog(ipa)`	Stop logging packets for file name i.e. IPA.
`shloglist`	List opened log files for packet log.
`coldstart`	Cold start of antenna.
`mv(ipa,jpa)`	Move antenna to azimuth=xsv, elevation=ysv (astronomical).
`mvazim(ipa)`	Move antenna to azimuth=wsv (astronomical).
`mvelev(ipa)`	Move antenna to elevation=wsv (astronomical).
`amv(ipa,jpa)`	Move antenna to azimuth=xsv,elevation=ysv (antenna).
`amvazim(ipa)`	Move antenna to azimuth=xsv (antenna).
`goinner`	Request antenna to move on inner track.
`goouter`	Request antenna to move on outer track.
`track(ipa,jpa,kpa)`	Servo track , parameters=2, angles & time.
`trkazim(ipa,jpa)`	Servo track , parameters=azimuth and time.
`trkelev(ipa,jpa)`	Servo track , parameters=elevation and time.
`atrack(ipa,jpa,kpa)`	Servo track in ant cord, parameters=azimuth, elevation & time.
`atrkazim(ipa,jpa)`	Servo track in ant cord, parameters=azimuth and time.

`hold`	Request servo to release brakes and hold.
`hldazim`	Release azimuth brakes and hold.
`hldelev`	Release elevation brakes and hold.
`brakes`	Apply brakes on both axis.
`brkazim`	Apply brakes on azimuth axis.
`brkelev`	Apply brakes on elev axis.
`close`	Close down observations.
`stow`	Stow the antenna.
`swelev`	Stow antenna in elevation.
`swrele`	Release antenna from stowed position.
`swrelel`	Release antenna elevation stow.
`stop`	Abort servo's previous command(to stop in moving both axes).
`abrtsrvcmd`	Abort servo's previous command.
`rdsrvspc`	Read servo set parameters (in srvs, servo specific in ondisp window).
`rstservo`	Reset servo computer.
`stsrvtim`	Set servo time IPA sec ahead.
`stmcm`	Set MCM for ABC using mpa(I).
`stabctim`	Set ABC and Servo time, and set LST on ABC.
`stabcdly`	Set ABC delays to values set in TPARM(1-18).
`stabcdly`	Set ABC default delays and cycle values.
`stabc3cyc`	Set ABC delays and 3 sec cycle time.
`stabc4cyc`	Set ABC delays and 4 sec cycle time.
`enabcq(ipa)`	Start queuing ABC commands for destination=IPA.

`enamcmq` Enable MCM qued commands.

`dismcmq` Disable MCM command quing.

`stabcdbg(ipa)` Set ABC in Debug mode IPA.

`abrtabcq(ipa,jpa)` Abort JPA commands from IPA in ABC que.

`talk(ipa,outfil)` Send talk message to ABC.

`rdabcver` Read ABC program version.

`rdabcdbg` Read ABC error statistics.

`rdabcdly` Read the values of ABC delay.

`dissrvlnk` Disable servo communication for antenna.

`enasrvlnk` Enable servo communication for antenna.

`abrtprkant` Abort ante parking sequence.

`mchabcctr` Match command respective counters for ABC.

`goabcappl` Ask ABC kernel to goto application and execute.

`gopromappl` Ask kernel to transfer from PROM and execute.

`strtabcdnl` Start ABC code downloading (obj.dat in current area).

`rdqtime` Read ABC que timing info.

`enalo1mon` Enable LO-1 monitor for antenna through MCM 2.

`enalo2mon` Enable LO-2 monitor for antenna through MCM 3.

`dislo1mon` Disable LO-1 monitor for antenna.

`dislo2mon` Disable LO-2 monitor for antenna.

`enaifmon` Enable IF monitor for antenna.

`disifmon` Disable IF monitor for antenna.

`ldantparam`	Load antenna specific parameters for local track (current hard coded in procedure in TPA array).
`ldantoffs`	Load antenna offsets parameters for local track(current hard coded in procedure in TPA array).
`ldsrcparam`	Load source specific parameters for local track:IPA=1=OUT,JPA=trckg time.
`ldtimtrk`	Load time parameters for local track.
`stifabc(ipa)`	Set IF attenuations loaded in ABC for IPA frequency.
`strtloctrk`	Start local track mode for antenna or antennae in SAC.
`stploctrk`	Stop local track mode for antenna or antennae in SAC.
`addmcms`	Additionally configure MCMs defined in MPA array.
`delmcms`	For ABC deselect only those MCMs defined in MPA array.
`goabcker`	Ask ABC to go to kernel mode.
`rstaberr`	Reset error counters of ABC.
`rdantpara`	Read ant parameters for local track.
`rdsrcpara`	Read source parameters for local track.
`rdtimtrk`	Read time parameters for local track.
`strtloctrk`	Start local track mode for antenna or antennae in SAC.
`initabcmd`	Initialise ABC command: tally command-respective counters, reset flag, `stoptalk`, `rdabcv`, `stabct`.
`enaanccmd`	Start accepting ABC commands for `abcs` (init abc after abc reset).
`nullcmd(ipa)`	Issue null command.
`stidltim(ipa)`	Set idle time for MCM IPA.
`stscan(ipa)`	Set scan mode for MCM IPA.
`stmean(ipa)`	Set mean mode for MCM IPA.

`stthrmd(ipa)`	Set threshold mode for MCM IPA.
`stana(ipa)`	Set analog mask for MCM IPA.
`st16dig(ipa)`	Set 16 bit digital mask.
`st32dig(ipa)`	Set 32 bit digital mask.
`st64dig(ipa)`	Set 64 bit digital mask.
`rdana(ipa)`	Read analog values.
`rd16dig(ipa)`	Read 16 bit digital mask.
`rd32dig(ipa)`	Read 32 bit digital mask.
`rdmcmver(ipa)`	Read MCM program version.
`rd64dig(ipa)`	Read 64 bit digital mask.
`rdmode(ipa)`	Read current mode.
`rdthrval(ipa)`	Read threshold values.
`feedsel(ipa)`	Feed select old.
`rbmcm(ipa)`	Reboot MCM.
`feedselm(ipa)`	Feed select modified.
`monfe`	FE-Box monitor box no IPA.
`moncb`	Common Box monitor.
`gtsrc`	Get source RA, DEC & precess.
`riseset`	Find rise/set time of source.
`posn`	Move antenna to current position of source.
`addlist(outfil)`	Add source list in 'outfil' to default list.
`shlist`	Show the path of source lists available.
`dellist(ipa)`	Delete source list by number IPA given by shlist.

Procedures For COMH

`stcomant`	Set antennas to which COMH talks (CPARM).
`shcomant`	Show antennas to which both COMH units talk.
`stcomtim(ipa)`	Set COMH cycle time from CPARM(1) for IPA COMH/S.
`shcomerr`	Get COMH error statistics.
`rdcomver`	Read COMH version for both COMH.
`oncomdbg(ipa)`	Set DEBUG ON in COMH IPA.
`offcomdbg(ipa)`	Set DEBUG OFF in COMH.
`rstcrcnr(ipa)`	Reset command resp counters for comh IPA.
`addcomant(ipa)`	Add antennae to communication from ANTE=no_of_ant addr1 addr2 ... for COMH IPA.
`delcomant(ipa)`	Deselect antennae for COMH IPA from ANTE=no_of_ant addr1 addr2 ...
`rstcomh(ipa)`	Software reset for COMH IPA.
`rstcoerr(ipa)`	Reset error counters of COMH IPA.

Procedure For Command Monitor

`stcmoff(ipa)`	Set IPA seconds as command monitor offset.
`enacmdmon`	Enable Command Monitor.
`discmdmon`	Disable Command Monitor.
`enacminfo`	Enable Command Monitor Info Log.
`discminfo`	Disable Command Monitor Info Log
`abrtdnld`	Abort ABC program down load.
`stdnldpkt(ipa)`	Set ABC program down load packet size=IPA bytes.

Procedures For Sub Array Control

`sndsacsrc`	Send source coordinates to sub-array controller modified to send track/position,TMAX.
`stsactolr`	Set tolerance for sub-array controller using CPA.
`sndsacant`	Send antenna mask to sub-array controller.
`sndsacant`	Send antenna mask to sub-array controller.
`sndsacant`	Remove antenna mask to sub-array controller.
`trksacsrc`	Request sub-array controller to track source.
`stpsactrk`	Request SAC to stop tracking source.
`gosacout`	Request SAC to track on outer track.
`gosacinn`	Request SAC to track on inner track.
`onsacdbg`	Request SAC to turn on debug mode.
`offsacdbg`	Request SAC to turn off debug mode.
`trkeloff(ipa)`	Track elevation offset by IPA.
`trkazoff(ipa)`	Track azimuth offset by IPA.
`trkraoff(ipa)`	Track right ascension offset by IPA.
`trkdeoff(ipa)`	Track declination offset by IPA.
`scanelsrc(ipa,jpa)`	Scan source in elevation with degrees/minute=ipa, peak time=jpa.
`scanazsrc(ipa,jpa)`	Scan source in azimuth with degrees/minute=ipa, peak time=jpa.
`scanrasrc(ipa,jpa)`	Scan source in RA with degrees/minute=ipa, peak time=jpa.
`scandec(ipa,jpa)`	Scan source in DEC with degrees/minute=ipa, peak time=jpa.
`sndsaccmd(outfil)`	Send local pops command to SAC from OUTFIL.
`strtsacfil`	Start remote control for SAC from opened file.
`stpsacfil`	Stop remote control for SAC from opened file.

`opsacfile(outfil)` Open a SAC control file from OUTFIL.

`opsacfile(outfil)` Close a SAC control file.

`shsacfile` Show a SAC control file which is open.

`shsacline` Show current line of SAC control file.

`rewsacfile` Rewind the sac control file.

`mvsaccon(ipa)` Move control to point(ipa) in SAC file.

`skpsacline(ipa)` Skip n=ipa lines from SAC control file.

`stpsacline(ipa)` Step by one line from SAC control file.

`nullfps` Issue null command.

`sttngpt(ipa)` Issue set turning point CP(1) : turning point angle/pulse.

`strmpdcnt` Issue set ramp down count.

`stlrpmlmt` Issue set lower rpm limit.

`stbrcntdiff(ipa)` Issue set brake count difference count CP(1) : pulses.

`rmpuptmcnt` Issue set ramp up time count.

`stptmcnt` Issue set stop time count.

`stmaxpwm` Issue set Max pwm count.

`stmaxangle(ipa)` Issue set Max angle CP(1)=maximum angle.

`stminangle(ipa)` Issue set Min angle CP(1)=minimum angle.

`rdsttngpt` Issue read turning point.

`rdrmpdct` Issue read ramp down count.

`rdlrpmlmt` Issue read lower rpm limit.

`rdbrcntdiff` Issue read brake count difference count.

`rdrmpuptmcnt` Issue read ramp up time count.

`rdstptmcnt`	Issue read stop time count.
`rdmaxpwm`	Issue read Max pwm count.
`rdmaxangle`	Issue read Max angle.
`rdminangle`	Issue read Min angle.
`rdversion`	Issue read version.
`rdua0ang`	Issue read UA0 angle.
`rdua0ang`	Get the first set UA0 angle.
`rdua0ang`	Calibrate to UA0 angle CP=1=>Clockwise i.e. -10d side,0=>anticlockwise.
`runclbrt`	Issue run to calibrate.
`freerun10`	Issue free run towards -10deg limit software.
`freerun280`	Issue free run towards 280 deg limit software.
`rundprest(ipa)`	Issue run to preset, IPA target angle.
`runcprest(ipa)`	Issue run to preset, IPA target counts.
`finectune(ipa,jpa)`	Issue run to preset,IPA is target counts, JPA is PWM counts.
`finedtune(ipa,jpa)`	Issue run to preset,IPA is target angle, JPA is PWM counts.
`runpasswd`	Issue run passworded.
`fpsboot`	Issue reboot fps.
`fpsstop`	Issue stop fps.
`prstcfps(ipa)`	Preset known position of feed in counts.
`prstafps(ipa)`	Preset known position of feed in angle.
`initdasco(outfil)`	Initialise DAS control using file OUTFIL.
`stpdasses`	End DAS session.
`initsacdas(ipa)`	Init DAS control for sub-array IPA.

`strtdascan`	Start DAS scan for sub-array.
`stpdascan`	Start DAS scan for sub-array.
`sndasstr(outfil)`	Send command through string for DAS.
`stabctim`	Set CEBABC and Servo time, and set LST on ABC.
`stcebmcm`	Set MCM for ABC 0 from ANTE(I) array.
`stabcdbg`	Set CEBABC in Debug mode.
`stabcdly`	Set CEBABC delays to values set in CPARM(1-9).
`rdcebdly`	Read the values of CEBABC delay.
`rdcebver`	Read CEBABC program version.
`rdcebdbg`	Read CEBABC error statistics.
`mchcebctr`	Match command -resp counters for ABC.
`gocebappl`	Ask CEB ABC kernel to goto application and execute.
`gocebprom`	Ask CEB ABC kernel to goto application and execute.
`gocebker`	Ask CEB ABC to go to kernel mode.
`rstceberr`	Reset error counters of CEB ABC.
`enacebq`	Enable MCM qued commands for CEB ABC.
`discebq`	Disable MCM command quing for CEB ABC.
`initcebabc`	Initialise ABC command: tally command-respective counters, reset flag reset, stoptalk, rdabcv, stabct.
`addcebmcm`	Additionally configure MCMs defined in ANTE array.
`delcebmcm`	For ABC deselect only those MCMs defined in ANTE array.
`initndas(outfil)`	Initialise DAS control using file OUTFIL.
`hltndas`	End DAS session.

`lnkndasq`	Initialise DAS control for sub-array IPA.
`strtdascan`	Start DAS scan for sub-array.
`stpdascan`	Start DAS scan for sub-array.
`sndasstr(outfil)`	Send command through string for DAS.
`initprj(ipa,outfil)`	Start DAS project with Code in OUTFIL for IPA sideband.
`stpprj`	Start DAS scan for sub-array.
`prjtitle(outfil)`	Set DAS project with Code in OUTFIL.
`prjobserv(outfil)`	Set DAS observer with Code in OUTFIL.
`prjtitle`	Set DAS frequencies (in TPARM) with Code in OUTFIL.
`ldsrccode(outfil)`	Set in OUTFIL the source code.
`ldfpspos(ipa)`	Loads the fps counts in TPA.
`mvfps610`	Move FPS to 610 to counts loaded by above command.
`mvfps150`	Move FPS to 150 to counts loaded by above command.
`mvfps1420`	Move FPS to 1420 to counts loaded by above command.
`mvfps325`	Move FPS to 325 to counts loaded by above command.
`initfps`	Does add MCM 14,read version, set min angle to -10d, set.
`initfps`	Does add MCM 14,read version, set min angle to -10d, set low rpm. respectively.
`initpsr`	
`lnkpsrq`	
`iainit`	
`iastrt`	
`iastp`	
`iafin`	
`painit`	

pastrt

pastp

pafin

pmtinit

pmtstrt

pmtstp

pmtfin

pmbinit

pmbstrt

pmbstp

pmbfin