

AUSTRALIA TELESCOPE NATIONAL FACILITY PC DISTRIBUTED CLOCK COMMAND LANGUAGE and NATIVE DISPLAY DESCRIPTION

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1.0 General.

1.1 Introduction.

The PC based Australia Telescope Distributed Clock (ATDC) MK-VI is controlled by software using either the pSOS[®] Real Time Operating System or Linux Operating System. The pSOS[®] Real Time Operating System version has all the features outlined in this manual, while the Linux Operating System version contains a subset of these. In both cases, the software allows adjustments to the Clock's settings, and the retrieval of time information as well as the Clock's status.

The Clock is connected to the Ethernet, and acts as a server to whoever wishes to connect. Connection to the Clock is achieved by opening a TCP/IP socket to the Clock's IP address at port 4000 (pSOS[®]) or port 4010 (Linux). There is an upper limit of 10 (pSOS[®]) or 4 (Linux) simultaneous connections. For the pSOS[®] version there is also an RS-232 control connection available on the COM1 port.

Access to alter any of the Clock's settings requires a password that may be appended to the command, or by specifically setting "Super User" access. There can be only one "Super User" at any time. **All "Super User" access failures are logged.**

The Clock also supports a VT100 compatible Native Display connected to the COM2 port. This Native Display produces a continuous display of the Clock's time and other key parameters.

Some key features include:

- * Up to 100 IERSA time correction values may be preloaded into the system.
- * Fixed phase relationship between 1 second tick and reference frequency.
- * Time adjust to 200nS resolution.

* Time information and current correction value maintained during reboot.

1.2 Function.

The AT Distributed Clock (ATDC) generates time information for the various AT systems. This data is distributed over a twisted pair hardware link or by ethernet and RS-232 data channels. Only the twisted pair hardware link can provide precise timing information. All other distribution channels are subject to those channels' timing vagaries.

The ATDC generates and maintains derived time information based on up to 5 fundamental values; Binary Atomic Time (BAT), delta UTC (dUTC), delta UT1 (dUT1), longitude, and Timezone. BAT is the number of micro-seconds since xx-xx-xxxx, and is incremented every micro-second by hardware counters in the ATDC's hardware. dUTC and dUT1 are the corrections supplied by International Time to correct for the various perturbations in the Earth's cosmic travels. Longitude is the precise location in milliseconds of time east or west of Greenwich, England, and Timezone is the timezone of the clocks site.

At first startup, the ATDC, must have these 5 values loaded. In the case of BAT, the current UTC is given, and the ATDC calculates the BAT from this. As Longitude is always constant for a given site, this value may be specified in the startup initialization file.

Value	BAT	dUTC	dUT1	Longitude	TZ	Comment
BAT	X					H'ware counters.
dUTC		X				Externally provided.
dUT1			X			Externally provided.
Longitude				X		Externally provided.
Timezone					X	Externally provided.
UTC	X	X				
LMST	X	X	X	X		
MJD	X	X				
Local Time	X	X		X	X	
Date	X	X				
Ext Tick Phase	X	X				H'ware counters.

X - Used in calculation.

1.3 Initialization.

1.3.1. pSOS[®].

The pSOS[®] version contains both the operating system and the application as one.

Upon booting the ATDC performs the following operations:

- i. Mounts the local Floppy Disk Drive.
- ii. Initialize all internal parameters to default values.
- iii. Non destructively initializes the ATDC hardware and sub system.
- iv. Executes under Super User privilege the command file "sys_init.cmd" on the FDD.
- v. Starts the COM2 command shell.
- vi. Starts the network command shell if the IP address has been set.

1.3.2. Linux.

The Linux version consists of an installable driver and a user interface program. The driver must be installed first and like the pSOS[®] version, non destructively initializes the ATDC hardware and sub system. After that the user interface program can be run interactively or via the inetd super-server (for network access). If run interactively, the '-initialise' option can be specified to run the initialisation file "/etc/atdcd.conf" (similar to the "sys_init.cmd" with the pSOS[®] version).

When the software initializes the ATDC hardware and sub system it reads the contents of the small RAM on the ATDC card, and if this is a warm reboot, recovers the previously set values of:

- a. dUTC.
- b. dUT1.
- c. Longitude.
- d. current day's IERSA settings.
- e. Super User password.

and applies them to the current instance. Thus warm booting the system at any time will leave the clock in a valid working state. All other time values generated by the ATDC are calculated from the above information and the BAT counters (which run independently of the software). It should be noted that during the actual booting process, only the BAT on the Clock Bus continues to be valid. All other fields will be toggling between the values loaded just prior the Clock Task stopping and the previous ms.

1.2 Initialization File.

The initialization file, "sys_init.cmd", contains a series of standard commands that are executed at Super User privilege automatically at startup before any external communications channels have been opened. This allows any site specific information to be loaded before anyone can access the ATDC. There is no need to include the SU password with any of the commands that would normally require it. By excluding the password, this file cannot be successfully executed by referencing it in the .EX command unless already logged on as SU. A typical list of commands may include:

- i. .ip - set the IP address and subnet mask,
- ii. .site - set the site's longitude, name and timezone,
- iii. .pass - set the machines SU password if the default one is deemed unsuitable.
- iv. .ex - execute a secondary initialization file, such as the default IERSA file.

As an example:

```
.ip 130.155.196.190 255.255.240.0
.site 35582800 Parkes 10.0
.pass mypass mypass
.ex 8.0/ier_init.cmd
.iersa a
```

The IERSA initialization file ier_init.cmd is created each time the IERSA data is loaded from the host computer. This file is basically the IERSA table that was downloaded the last time the ".iersa w" command was executed. It does not include a

“.iersa a” operation, which must be executed separately if desired. It is not necessary to perform a “.iersa a” command during a warm reboot, as the IERSA information for the current day is stored elsewhere. A “.iersa a” command will always occur just after midnight UTC.

1.3 Obtaining Timeframe Data over the network.

The ATDC is a passive server for timeframe data over the ethernet network. This means that data is only supplied as a result of a specific request. Timeframe data may be obtained by opening a TCP/IP SOCK_STREAM socket to port 4000 of the ATDC host and executing a .GF x command. The exact value of “x” will depend upon the type and form of the data required. Once a network connection has been established, repeated requests for Timeframe data may be made as required.

Software to interface an NTP daemon to the ATDC is currently under construction.

2.0 Getting going quickly.

2.1 General.

Once an ATDC has been properly installed at a site, only the time will need to be set after a power failure or any other major disturbance (eg extended period of loss of reference signal). To get the ATDC up and running quickly, perform the following operations:

- a) If performing the time reset over the network find out your local SU password. An SU password is not required if using the Native Display. Your SU password is:

- b) Find out the current value of UTC leap seconds (delta UTC). This can be found in the Astronomical Almanac.
Currently UTC is: _____ seconds at ___/___/___ (date).
- c) If setting the ATDC over the network, find out the ATDC's IP name or IP number. Your ATDC's IP name is: _____.
Telnet to the ATDC at port 4000. On UNIX systems this is:
telnet atdc_name 4000
- d) Use the .st command to set the ATDC's time. The time is in UT. The commands format is:
.st • Day • Mth • Yr • Hrs • Mins • Secs • Leap Secs • SU password<ret>
The Mth value is the 3 letter abbreviation for that month. As an example, to set the time at 12:35:40 on 13 March 2001 with UTC leap seconds of 32:
.st 13 mar 2001 12 35 40 32 password<RET>

Hit the return key (<RET>) during the one second when the entered time is equal to the current time.

You should get a return error value of 0. If a non-zero error is returned, it is most likely one of:

0x7022 ER_NoClock.
0x7026 ER_IncorrectPassword.
0x7027 ER_SuperUserAlreadyActive.
0x7028 ER_NotSU.

Any non-zero error will mean that the clock was not set.

- e) Finish the session with the .quit command.

3.0 Commands.

3.1 General.

The structure of the commands follows that of the Block Control Computers. Standard format is:

.COMMAND • [[[value_0] • value_1] •..... •[password]] <ret>

and the response is:

ErrorCode<ret>

if there is no return data, and:

```

[[%<ret>]
[data.....]
[data.....]
[~<ret>]]
ErrorCode<ret>

```

if there is return data.

An example is to get the current BAT and DUTC.

Issue the command:

```
.GT<ret>
```

The clock returns:

```

%
00000018918998e8 1b
~
0

```

Note: the value 00000018918998e8 is the current 64 bit BAT and the value 1b is the current DUTC (both in hex).

Commands to the ATDC are case insensitive. A • in the following descriptions means <SPACE>.

3.2 Command Summary.

Command	SU req'd	Returned Data Block	Command Description
.ao	yes/no	yes/no	Set/get Auxiliary output.
.cr	yes	no	Set Clock running.
.cs	yes	no	Stop Clock.
.dut1	yes/no	yes/no	Set/get current DUT1.
.dutc	yes/no	yes/no	Set/get current DUTC.
.error	no	no	Translates the last command error code.
.ex	no	no	Execute a command script.
.gt	no	yes	Get current BAT and DUTC.
.gf	no	yes	Get Frame.
.iersa	yes/no	yes/no	Set/get the IERSA correction table.
.ip	yes/no	yes/no	Set/get the IP address and subnet mask.
.info	no	yes	Displays various internal time data.
.lo	yes	no	Log off as SU.
.mjd	yes/no	no	Set/get current MJD.
.pass	yes	no	Change current SU password.
.rs	yes	no	Reset Status counters.
.sc	yes	no	Slide Clock.
.site	yes/no	yes/no	Set/get Clock site.
.st	yes/no	yes/no	Set/get Clock's time.

.stat	no	yes	Get current status of Clock.
.su	no	no	Log on as SU.
.tlh	yes/no	yes/no	Set/get Clock's Tick log host information.
.tp	no	yes	Get current Tick Phase.

3.3 Command Descriptions.

.AO

Auxiliary Output.

Requires SU privilege.

.AO

Sets or gets the Auxiliary Output signal setting. On some versions of the ATDC, the BNC output normally producing a 1ms signal, can be configured to produce other signals. This command allows that output to be set, or the current setting to be got.

Format:

.ao [**•** Setting [**•** SU password]]<ret>

Setting: 0, 1....

Returns:

ErrorCode<ret>

This command requires SU privilege if performing a set operation. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

.ao 1<ret>

Sets the Auxiliary Output to signal #1; the user would have had to claim SU privilege beforehand.

Likely ErrorCodes:

0 ER_OK.

0x7026 ER_IncorrectPassword.

0x7027 ER_SuperUserAlreadyActive.

0x7028 ER_NotSU.

See also .CR, .SU .STAT.

.CR

Clock Run. Requires SU privilege.

Sets the clock running. This command takes effect at the start of the next External 1 Second tick if available, or from the next Internal 1 Second Tick.

Format:

.cr [**•** SU password]<ret>

.CR

Returns:

ErrorCode<ret>

This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

.cr<ret>

Starts the clock running; the user would have had to claim SU privilege beforehand.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7025	ER_UnableToStartClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.

See also .CR, .SU .STAT.

.CS

.CS

Clock Stop. Requires SU privilege.

Stops the clock from running. This command takes effect from the end of the current millisecond frame. The internal BAT counters are stopped.

Format:

.cs • [SU password]<ret>

Returns:

ErrorCode<ret>

This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

.cs • qwerty<ret>

Stops the clock; the password is “qwerty”

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.

0x7025 ER_UnableToStartClock.
0x7026 ER_IncorrectPassword.
0x7027 ER_SuperUserAlreadyActive.
0x7028 ER_NotSU.

See also .CR, .SU .STAT.

.ERROR

Print the last error condition error code phrase.

The last (non zero) error code is translated to a short text phrase and returned to the sender in a data block.

Format:

.error<ret>

Returns:

ErrorCode<ret>

Example:

.error

To help the user interpret the error code from a particular command without having to resort to the manual, issuing a .error command will translate the last error condition error code into a possibly meaningful phrase.

.ERROR

.EX

Execute a command script.

Executes a command script held in a file.

Format:

.ex filename<ret>

Returns:

ErrorCode<ret>

Example:

.ex a:/test.cmd

On startup the ATDC attempts to execute the command script file "sys_init.cmd".

This allows each clock to be configured with site specific information such as Longitude, site name, SU password, IP address. etc.

"sys_init.cmd" example:

.ip 130.155.196.197 255.255.240.0

.site 35582800 Parkes 10.0 #sets the ATDC's Longitude, Name, and TZ

.ex 8.0/ier_init.cmd

.iersa a

.EX

Line 1 sets the ATDC's IP address and subnet mask, line 2 sets the ATDC's Longitude, Name, and Timezone, line 3 executes the IERSA command file, and line 4 activates the previously loaded IERSA table.

.GF

Get Frame.

Returns a frame of data. There are several different types of frame to choose from.

Format:

`.gf [type]<ret>`

where type is f, r, 1, 2. default type is r (raw).

Returns:

`%<ret>`

`value<ret>`

`.`

`.`

`~<ret>`

`ErrorCode<ret>`

The 4 types are:

'f' - formatted,

'r' - raw (default),

'1' - type 1 for network clock display,

Type 'r' returns frame data identical to what is being transmitted on the Clock Bus. This is 55 X 16 bit hexadecimal words as specified in the ATDC hardware manual. Data is presented as 11 lines each with 5 words per line. Leading 0's are displayed. Type 'f' returns a formatted version of a type 'r'. Currently fields are interpreted and appropriately annotated.

Type '1' data has been specifically designed for network clock displays. This display replicates that currently on the AT distributed Clock MK IV, and also includes additional information. Some of this information is not available in the Clock Bus data. Type '1' contains data required regularly, and so is fairly compact.

Type '1' format.

Line	Description	Layout	Radix	Size
1	BAT	μS (msw) • μS (lsw)	hex	32
2	UTC	hhmmssss	BCD	32
3	LMST	hhmmssss	BCD	32
4	MJD	day count	hex	32
5	Local Time	hhmmssss	BCD	32
6	Date	ddmmyyyy	BCD	32
7	Day of Week	day count	hex	32
8	Day of Year	day count	hex	32
9	dUTC	seconds	hex	32
10	dUT1	mS + 500	hex	32
11	Phase tick	20nS counts	hex	32

.GF

12 Status bit field hex 32

Status field definitions:

Mask	Description
0x00000001	PLL out-of-lock.
0x00000002	Invalid Tick.
0x00000004	IERSA error.
0x00000008	Clock not set.

Note:

hhmmssss - 10h 1h 10m 1m 10s 1s 0.1s 0.01s

.IERSA

.IERSA

Get/load/apply IERSA table information. Requires SU privilege.

Get, load or apply the IERSA time correction table information.

Format:

```
.iersa • [operation] • [SU password]<ret>
[%
MJD • dUTC • dUT1<ret>
MJD • dUTC • dUT1<ret>
MJD • dUTC • dUT1<ret>
.....
~<ret>]
```

Returns:

 ErrorCode<ret>

Valid operations include:

- a apply currently loaded correction table.
- r read currently loaded correction table [default].
- w write correction table and also save data to the FDD file ier_init.cmd.
- wn write correction table but don't save to the FDD file ier_init.cmd.

This command reads, loads, or applies the IERSA time correction table depending upon the value of *operation*. If operation is 'a', the currently loaded table is applied immediately. Normally, the table is not applied until 0:0:1 UTC each day. If operation is 'r', or not supplied, the contents of the table is displayed in a standard data block. If operation is 'w' or 'wn' the table will be loaded. In the case of 'w' a copy of the data is written out to the floppy disk file "ier_init.cmd" in such a format that it can be executed as a command script ("ex 8.0/ier_init"), and in the case of 'wn', no output file is written. In both these latter commands, the data is downloaded in a standard data block. Each line of the data block has MJD, dUTC and dUT1, terminated by a <ret>. The maximum size of the table is 100 entries. Any entries beyond this limit will be discarded, and an overrun error will be issued; the first 100 entries will be loaded into the table.

Loading of the table requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be

omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

```
.iersa w abcdefgh<ret>
%
50123 29 3
~
```

Loads one entry into the table. MJD is 50123, dUTC is 29, dUT1 is 3 and the password is “abcdefgh”.

Likely ErrorCodes:

0	ER_OK.
0x7006	ER_DataBlockValueError
0x7008	ER_TooManyDataBlockElement.
0x7022	ER_NoClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.

See also .SU, .STAT., .EX

.IP

.IP

Get/set the IP Address and Subnet Mask. Requires SU privilege.

Format:

```
.ip • [IP address] • [IP Subnet Mask] • [SU password]<ret>
[%
IP address IP Subnet Mask<ret>
~<ret>]
```

Returns:

```
ErrorCode<ret>
```

This command reads or sets IP address and IP Subnet Mask if the Network Interface Card. Both values are in decimal “dot” notation. When getting the IP address and IP Subnet Mask, the data is returned in a data block.

Setting of the IP Address and Subnet Mask requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

```
.ip 130.155.196.190 255.255.240.0 abcdefgh<ret>
```

Sets the IP address to 130.155.196.190 and the IP Subnet Mask to 255.255.240. The password is “abcdefgh”.

Likely ErrorCodes:

0	ER_OK.
0x7003	ER_IllegalArgument.
0x7022	ER_NoClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.
0x702e	ER_NICInUse
0x702f	ER_UnableToCreateNetworkSocket.

See also .SU, .STAT.

.LO

.LO

Log off. Requires SU privilege.

Log off current user as SU. This command removes current user as the super user (SU).

Format:

.lo<ret>

Returns:

ErrorCode<ret>

This command requires the current user to be the one with SU privilege.

Example:

.lo<ret>

Logs self off as current SU.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7028	ER_NotSU.

See also: .SU .STAT.

.PASS

.PASS

Set SU Password. Requires SU privilege.

Sets the SU password to a new value. The maximum length of the password string is 10 characters. There is no checking of password quality.

Format:

.pass • new_password • new_password [• SU password]<ret>

Returns:

ErrorCode<ret>

This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

```
.pass xyz xyz abc<ret>
```

This changes the current SU password from “abc” to “xyz”. All future attempts to set SU privilege must use “xyz” to succeed.

Likely ErrorCodes:

0	ER_OK.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.
0x702b	ER_ATDCPasswdNotValidated

.QUIT

.QUIT

Quits the current command shell.

The current command shell is terminated. In the case of network connections the ATDC server closes the connection. If using a “telnet” session to connect to the ATDC, a message like “Connection closed by foreign host” may be encountered. If accessing a command shell from the RS-232 serial display port (COM1:), the command shell terminated returning user to the display screen. The RS-232 serial command port (COM2:) cannot be quitted.

Format: .quit<ret>

Returns: Nothing.

Likely ErrorCodes: None.

.RB

.RB

Reboot the system. Requires SU privilege.

The computer system that the code is currently on is warm rebooted. During the reboot process the native counters in the ATDC locked to the Station Reference frequency continue counting which means that no time is lost; the time of the ATDC will not need adjustment after the reboot. Likewise the timeframe signal will continue to maintain the correct frequency along with the 64 bits of BAT data, however the remaining data will not be valid.

Depending upon the speed at which the reboot starts and network activity no error code may be sent.

Format: .rb [● SU password]<ret>

Returns: Nothing.

Likely ErrorCodes:

None.
0 ER_OK.
0x7026 ER_IncorrectPassword.
0x7027 ER_SuperUserAlreadyActive.
0x7028 ER_NotSU.

.RS

.RS

Reset Status. Requires SU privilege.
Resets the various status counters within the clock.
Format:

```
.rs [• SU password]<ret>
```

Returns:

```
ErrorCode<ret>
```

Various error counters internal to the ATDC keep a record of errors as they occur. These error counts can be displayed with the .STAT command. Issuing the .RS command resets these counters.

Example:

```
.rs <ret>
```

Likely ErrorCodes:

0 ER_OK.
0x7022 ER_NoClock.
0x7025 ER_UnableToStartClock.
0x7026 ER_IncorrectPassword.
0x7027 ER_SuperUserAlreadyActive.
0x7028 ER_NotSU.

See also .SU .STAT.

.SC

.SC

Slide Clock. Requires SU privilege.
Slides the Clock's time with respect to the External 1 Second Tick. This command takes effect 2 microseconds after the command has been interpreted.
Format:

```
.sc • time(nS) [• SU password]<ret>
```

Returns:

```
ErrorCode<ret>
```

The time to slide the clock is in nanoseconds. If the value is positive, the clock is slid in a positive direction (Tick phase will increase), and if negative, the clock is slid in a negative direction (Tick phase will decrease). The value is rounded down to a multiple of 200nS. The clock sliding process achieves the slide by altering the clock rate during

the slide. This, therefore, may result in any device that is using the clock's various outputs being disrupted during the operation.

This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

```
.sc 600<ret>
```

Slides the clock (+) 600nS.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7025	ER_UnableToStartClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.

See also .CR, .SU .STAT.

.SITE

Set/get Site information. Requires SU privilege on set.

Sets or gets the ATDC's longitude and site name and timezone.

Format:

```
.site • [Longitude • Site_name • Timezone [• SU password]]<ret>
```

```
.site • [[-]option]<ret>
```

Returns:

```
ErrorCode<ret>
```

The Longitude maybe in milliseconds or Degrees, Minutes and Seconds (dd:mm:ss.xx), the Site is the name of the location of the ATDC (as an ASCII string), and the Timezone is in hours (to the nearest 0.5 hours). A positive longitude is east, and a negative longitude is west. The site's name is treated purely as a label and is not used in any of the calculations. The Timezone is used in calculating the ATDC's local time. A positive timezone is east, and a negative timezone is west This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

When getting the current site information the following options are valid:

a	return longitude as an angle (dd:mm:ss.xxx)
t	return longitude as time (ms).

.SITE

If no option is specified the output defaults to time (ms). The '-' operator is optional. The get operation does not require SU privilege.

Example:

```
.site 35582800 Parkes 10.0<ret>
```

Sets the ATDC's longitude to 35582800ms (148° 15' 42") east of Greenwich, the ATDC's location at a place called Parkes, and a timezone of 10 hours east of Greenwich.

```
.site 148:15:42.0 Parkes 10.0<ret>
```

Same as above except longitude is in angular format.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.

See also .SU, .STAT.

.ST

.ST

Set the time. Requires SU privilege.

Sets the ATDC's time and DUTC.

Format: .st • Day • Month • Year • Hours • Minutes • Seconds • Leap Seconds [• SU password]<ret>

Returns:

ErrorCode<ret>

The .ST command sets the internal BAT counters on the ATDC. The BAT is then used

to calculate all other times in the ATDC. The <RET> key should be hit during the 1 second period that the entered value matches. If an external 1 PPS is connected then the ATDC is aligned with it, otherwise the time aligns with the ATDC internal 1 PPS. The time is UTC. The standard 3 letter abbreviations for the months are used.

This command requires SU privilege. It may be achieved either by explicitly setting SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Example:

```
.st 2 jan 1998 10 9 3 31<ret>
```

Sets the ATDC's time to UTC 10hrs, 9 minutes and 3 seconds on the 2nd of January 1998. The DUTC is set to 31 seconds.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.

0x7026 ER_IncorrectPassword.
 0x7027 ER_SuperUserAlreadyActive.
 0x7028 ER_NotSU.
 See also .SU, .STAT.

.STAT

Clock Status.

Returns the current status of the Clock in a data block. Each element of the status occupies one line, with the first word being the label.

Format:

.stat<ret>

Returns:

```
%<ret>
Label value [value [value.....]]<ret>
.
.
~<ret>
ErrorCode<ret>
```

The following fields exist:

Label	Description
ATDC_identity	The text string contained in the Serial Number PROM.
ATDC_address	The base address of the Clock's hardware.
Timebase_MHz	The timebase of the clock's oscillator. 10 or 50.
Software_uptime	Time that the Clock program has been running. Two value fields are returned; seconds and days:hours:minutes:seconds.
Hardware_uptime	Time that the Clock program has been running. Two value fields are returned; seconds and days:hours:minutes:seconds.
PLL_locked	The current state of the PLL. Returns either yes if locked or no if not locked.
External_tick	The current state of the External 1 Second Tick. Returns either yes if Tick has occurred in the last 1 second, or no if not.
SU	The current state of the SU flag. Returns either yes if someone has claimed SU privilege or no if not.
SU_node *	The node in "dot" notation who currently has SU privilege.
SU_TTL *	The time to live in seconds of the current SU. If value is negative, SU privilege has timed out and may be claimed by someone else.
SU_failures	The current count of the number of password failures.
SU_Log	This line is repeated for each SU password failure. The failure log is around 100 entries. The two returned values are number (decimal) and IP_Address (in "dot" notation).
Current_connections	The number of current connections.
Site	The name of the site that the Clock is at.
GMST_coeff_A	The GMST "A" coefficient used in the GMST calculations.

.STAT

GMST_coeff_B	The GMST “B” coefficient used in the GMST calculations.
GMST_coeff_C	The GMST “C” coefficient used in the GMST calculations.
Longitude	The longitude in milliseconds of the Clock’s site. This value is used by the various calculations.
Your_node	The IP address in “dot” notation that the Clock is connected to.

*These entries only appear if SU returns ‘yes’.

Example:

```
.stat<ret>
```

Returns the Clock’s current status.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7029	ER_DifficultyAccessingATDC.

See also: .LO .STAT.

.TLH

.TLH

Set/get the Tick Phase network log host information. Set operation requires SU privilege.

Sets or gets the IP address, the network port number, the integration period and the stream number for the network logging process.

Format: .TLH • IP • Port • Period • Stream [• SU password]<ret>

Returns:

```
[% <ret>
```

```
IP • Port • Period • Stream <ret>
```

```
~] <ret>
```

```
ErrorCode<ret>
```

The .TLH command sets or gets the information required by the Tick Phase network logging process. This information is the IP address of the logging host, the IP port number on that host, the integration period over which to average, and the stream number to use.

If there are no parameters supplied the commands returns a standard data block with the current entries.

The IP address is in ‘dot’ notation, while the remaining 3 entries are decimal integers; port is a number in the range 1-65535, period is in seconds and stream is a number in the range 1-999. An entry of ‘*’ in any of these fields, leaves the current setting of that entry to whatever it is. For example the default setting for port is 514, so issuing this command with port set to * will leave the port value set to 514.

If the IP address is set to 0.0.0.0 all transmissions are stopped. The startup state of the logging transmissions is ‘stopped’.

The value of ‘stream’ is dependent on the network logging hosts logging daemon.

This command requires SU privilege. It may be achieved either by explicitly setting

SU access before attempting the command, or by including the SU password with the command. If SU access has explicitly been set, the SU password may be omitted. If SU access has already been granted to someone else (and the timeout limit has not expired), an error will be issued and no operation will take place.

Tick Phase logging will only take place if the ATDC is both locked to the 5Mhz reference signal and there is a 1 second tick. Logging is suspended whenever these 2 conditions are not met. It is also necessary to configure the network syslog host.

Example:

```
.tlh 130.155.196.197 0 0 0<ret>
```

Sets the ATDC's network logging host to 130.155.196.197, port unchanged, integration period unchanged, and the stream number unchanged.

The issuer of the command would have needed to log on as SU previously.

Likely ErrorCodes:

0	ER_OK.
0x7022	ER_NoClock.
0x7026	ER_IncorrectPassword.
0x7027	ER_SuperUserAlreadyActive.
0x7028	ER_NotSU.

See also .SU, .STAT.

4.0 Native Display.

4.1 General.

The Native Display is designed to connect to any VT100 compatible terminal. RS-232 communication settings are: 9600 baud, 7 bits, no parity. A keyboard is optional. Information is updated every second with only those fields that have changed since the last second being re-written. If a keyboard is fitted, the screen can be completely re-written by pressing the <RET> key at any time. In any case, the entire screen is re-written automatically every few minutes.

If a keyboard is fitted, several additional features are available. These include:

1. Enabling/Disabling a 1 second Bell,
2. A simple help screen.
3. Accessing a Command Shell.

4.2 Options.

To activate any of the options, type the appropriate command while the regular time display is running.

4.2.1 Enabling/Disabling a 1 second Bell.

To Enable or disable the 1 second bell type:

```
b <RET>
```

This will toggle the bell flag. This feature can be used as an aid to monitor the ATDC's time with some reference without the need to look at the ATDC's display.

4.2.2 A simple help screen.

To print the current list of options type:

```
h <RET>
```

The regular time display will be cleared and a list of current options will be printed. This display will persist for about 15 seconds before returning to the regular display.

4.2.3 Accessing a Command Shell.

To access a Command Shell type:

```
c <RET>
```

The regular time display will be cleared, and the user can issue commands to the ATDC. For a list of commands see section 2 above. **To quit the Command Shell issue the “.quit” command. This is the only way to return to the regular time display.**

When the activated, the Command Shell is automatically invoked with SU privilege. This allows the user to be able to issue commands without the need to supply the SU password. The time-to-live for SU privilege is approximately 300 seconds from the last command entered requiring SU privilege. If SU privilege is not required, use the command ‘.lo’ to return to normal privilege. This is important, as to remain with SU privilege will block other users such as the automatic IERSA table loader from performing their tasks.

5.0 Appendix.

5.1 Appendix A.

Return Error Codes

The following is a list of all the error codes returned from the various embedded Correlator Control computers including BCC, DUCC, PRCC and ATDC.

```
/* A line starting with a period (.) was received but the next characters  
   were not recognized as a legal command. */
```

```
ER_IllegalCommand          0x7001
```

```
/* A command line argument which is required by the given command was not  
   present. */
```

```
ER_MissingArgument        0x7002
```

```
/* A command line argument contained an illegal character and could not be  
   converted, or contained an illegal value. */
```

```
ER_IllegalArgument        0x7003
```

```
/* The command line contained an illegal mode. */
```

```
ER_IllegalMode            0x7004
```

```
/* An error occurred when the system attempted to allocate a memory block */
```

```
ER_MemoryAllocError       0x7005
```

```
/* An input data block element either contained illegal characters and  
   could not be converted, or contained an illegal value. */
```

```

ER_DataBlockValueError          0x7006

/* There were not enough lines in the input data block following the command. */
ER_MissingDataBlockElement      0x7007

/* There were too many lines in the input data block following the command. */
ER_TooManyDataBlockElement      0x7008

/* Calls to the system shell were nested too deeply. This can only occur when
   using the .EX command. */
ER_ExceededRecursiveLimit       0x7009

/* The given disk file name was not found. This can only occur when using the
   .EX command. */
ER_FileNotFound                 0x700a

/* The given memory file name was not found. */
ER_ProgFileNotFound             0x700b

/* A CRC error occurred when reading the given memory file. */
ER_ProgFileCRCError            0x700c

/* The interface status register indicated an attempt was made to access a
   memory location which does not exist. */
ER_NonexistentMemory           0x700d

/* The interface status register indicated that the address register overflowed
   while accessing a memory location. */
ER_MemoryAddressOverflow        0x700e

/* The Event Timing Description for the given index has not been defined with
   the .LT command. */
ER_UnknownETD                  0x700f

/* The event generator indicates the BAT clock signal is not present or is
   broken. */
ER_BATOffLine                  0x7010

/* An event generator FIFO memory fault occurred. */
ER_EGFIFOError                 0x7011

/* The system failed to find the preamble to the event generator version/serial
   number string. */
ER_EGPreambleError             0x7012

/* The event generator version/serial number string was longer than expected. */
ER_EGSerNumTooLong             0x7013

/* The given Event Timing Description was too long. */

```

ER_ETDTooLong 0x7014

/* A error occurred while the .LT command was parsing an Event Timing
Description description. */

ER_BadETDDesc 0x7015

/* No event generator is present in the system. */

ER_NoEventGen 0x7016

/* A communication failure has occurred */

ER_CommunicationFailure 0x7017

/* The addressed correlator module is not present. */

ER_NonexistentModule 0x7018

/* Only one correlator module can be selected for the command. */

ER_IllegalModuleCombination 0x7019

/* A delay unit in the given delay unit block has already been assigned. This
can only occur when using the .DB command. */

ER_DelayUnitOwned 0x701a

/* The given delay unit block index has not been defined with the .DB
command. */

ER_UnknownDelayTable 0x701b

/* All available delay unit blocks have been used. This can only occur when
using the .DB command. */

ER_OutOfDelayBulkTables 0x701c

/* The message queue where ETD process requests are placed is full. This
usually indicates previous ETD processing has not been completed. This can
only occur when using the .EE command. */

ER_ETDQueueOverflow 0x701d

/* An error occured sending correlation data over ethernet */

ER_CorrDataNoSend 0x701e

/* The done pin did not go high on reprogramming a Xilinx chip
on the Multibeam correlator */

ER_DoneNotHigh 0x701f

/* An error occured reading the Xilinx configuration data over the
socket */

ER_XilinxCFG 0x7020

/* The done pin did not go low on resetting a Xilinx chip on
the Multibeam correlator */

ER_DoneNotLow 0x7021

/* The Clock was not present at expected address - AT Distributed Clock*/
ER_NoClock 0x7022

/* The clock could not successfully retrieve the frame data from the commom */
/* area */
ER_TimeFrameUnstable 0x7023

/* The clock would not stop after 1 second */
ER_UnableToStopClock 0x7024

/* The Clock did not restart when requested */
ER_UnableToStartClock 0x7025

/* Password was incorrect */
ER_IncorrectPassword 0x7026

/* Super User already Active */
ER_SuperUserAlreadyActive 0x7027

/* Not Super User */
ER_NotSU 0x7028

/* Difficulty Accessing ATDC */
ER_DifficultyAccessingATDC 0x7029

/* ATDC Has not been set */
ER_ATDCNotSet 0x702a

/* ATDC new password not validated */
ER_ATDCPasswdNotValidated 0x702b

/* ATDC IERSA table empty */
ER_ATDCEmptyEIRSATable 0x702c

/* ATDC IERSA table no longer valid */
ER_ATDCOutOfDateEIRSATable 0x702d

/* NIC already in use */
ER_NICInUse 0x702e

/* Error when doing a socket() call */
ER_UnableToCreateNetworkSocket 0x702f