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| **Beam Steering Controller (BSC) Software**  **Interface Control Document (ICD)** | |
|  |  |
|  |  |
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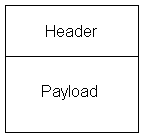
1. **Overview**

This document describes the interface message details of the software interface between the Beam Steering Controller (BSC) CSCI and the Control System.

1. **Message Description**

The System Controller will send state change commands, bit test requests, and status requests to the BSC. The BSC will send Status Results back to the System Controller.

Each message contains a Header and Payload, like this:



The header indicates the type of message this is along with the amount of data to expect in the payload.

There are two types of messages:

* Commands – messages from the system controller to the BSC
* Response – responses from commands from the BSC to the system controller

The BSC never sends unsolicited messages.

* 1. **Message Description Format**

For all messages, the 32 bit offset, mask, type, units and Description is defined. The Mask is listed MSB first (upper left hand corner) and LSB last (lower right hand corner). Each unique letter defines a bit or group of bits that have specific meaning.

For Example, the following **Mask**:

|  |
| --- |
| ABBB BBBB  CCCC CCCC  CCCC CCCC  DDDD EEEF |

A corresponds to bit 32 and is only 1 bit wide and represents the most significant bit

B corresponds to bits 25 to 31 and is 7 bits wide

C corresponds to bits 9 to 24 and is 16 bits wide

D corresponds to bits 5 to 8 and is 4 bits wide

E corresponds to bits 2 to 4 and is 3 bits wide

F corresponds to bit 1 and is only 1 bit wide and represents the least significant bit

The **Description** will contain a title and brief overview of the data for the 32 bits. It also defines the usage of each bit grouping. It can also contain possible valid values the bits can take on, if there is a limit. In this example the description could be as follows:

|  |
| --- |
| **Message Example**  This defines an example message register  A = MSB  0 = MSB Disbled  1 = MSB Enabled  B = Next value with  C = Middle bits  E = Small limited value  000 = lowest value  001 = small value  010 = bigger value  111 = biggest value  F = LSB |

Notice, when defining valid values the bits can have, the values are shown in binary

1. **Message Header**

Every message contains a common message header that gives basic information about the message payload.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Message Start Indicator  A = Sync Key  10010001101000101011001111000 = key |
| 1 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Message Identifier  Unique identifier for the message. This is typically the message count.  A = Message Id |
| 2 | XXXX XXXX  BBBB BBBB XXXX XXXX  XXXX AAAA | UINT | none | Message Information  A = Antenna Id  0000 = Antenna NA  0001 =  0010 =  0011 =  0100 =  1111 = All Antennas  B = Payload Type  00000000 = no message payload  00000001 = system state command  00000010 = beam command  00000011 = null beam command  00000100 = status request command  00000101 = site control command  00000110 = site status request command  00000111 = site simple status request command  00001000 = heartbeat command  00001001 = site summary request command  00001101 = read hardware command  00001110 = battle short command  00001111 = emcon command  00010000 = tod reset command  00010001 = bit detector command  00010010 = rf lru command  00010011 = fmm command  10000000 = general reply  10000001 = status reply  10000010 = site status reply  10000011 = site simple status reply  10000101 = read hardware status reply  10000110= beam status reply  10000111= bit detector reply  10001000= site summary reply |
| 3 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Payload Size  A = Num Bytes |
| 4 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | nSec | Time Stamp MSB  This indicates the timestamp of the message  A = Time Msb |
| 5 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | nSec | Time Stamp LSB  This indicates the timestamp of the message  A = Time Lsb |

1. **Operational Commands from System Control to BSC**
   1. **System State Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | system state |
| **Payload Value** | 00000001 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

The system mode command changes the mode of the antenna. It initializes hardware and enables and disables power for the antenna.

The table below describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX AAAA | UINT | none | Antenna System State  A = system state  0000 = system shutdown  0001 = system standby  0010 = system operate stage 1  0011 = system operate stage 2  0100 = test maintenance |

N = not available for the type of antenna, Y = available to the antenna

* 1. **Battle Short Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | battle short |
| **Payload Value** | 00001110 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

The Battle Short Command enables or disables Battle Short Operation. When Battle Short Operation is enabled, system faults are monitored but not acted upon. When Battle Short Operation is disabled, then system faults will activate recovery and safety actions to protect the system. The antenna defaults to Battle Short Operation being disabled.

The table below describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXA | UINT | none | Battle Short  A = Setting  0000 = battle short disabled  0001 = battle short enabled |

N = not available for the type of antenna, Y = available to the antenna

* 1. **EMCON Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | emcon |
| **Payload Value** | 00001111 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

The EMCON Command will enable or disable RF in the antenna.

The table below describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXA | UINT | none | EMCON  A = EMCON Setting  0000 = disable EMCON  0001 = enable EMCON |

N = not available for the type of antenna, Y = available to the antenna

* 1. **Beam Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | beam |
| **Payload Value** | 00000010 |
| **Reply Name** | beam status reply |
| **Reply Value** | 10000110 |

Upon receipt of this message, the BSC performs all hardware control to form a beam on the array and loads the controls into the hardware. This message contains the information needed to point the beam on the array or portion of array.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XBXA AAAA | UINT | none | Beam Control  A = Buffer Position  Minumum: 0  Maximum: 30  Note: The last buffer position, 31, is reserved for the null beam and cannot be populated with a computed beam.  B = RF Path Select  0 = one RF path  1 = two RF paths |
| 1 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | sines | Direction Cosines X Vector  A = DC X  Minimum: -1.0  Maximum: 1.0  Note the combination of DCX, DCY, and DCZ must be a unit circle |
| 2 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | sines | Direction Cosines Y Vector  A = DC Y  Minimum: -1.0  Maximum:1.0  Note the combination of DCX, DCY, and DCZ must be a unit circle |
| 3 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | sines | Direction Cosines Z Vector  A = DC Z  Minimum: -1.0  Maximum:1.0  Note the combination of DCX, DCY, and DCZ must be a unit circle |
| 4 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | GHz | Operating frequency  A = Ghz |
| 5 | AAAA AAAA AAXX XXXX XXXX XXXX XXXX XXXX | UINT | none | Beam Type  A = Taper Index  Minimum: 0  Maximum: 255 |
| 6 | XXXX XXXX XXXX XXXX XXXX XAAA  AAAA AAAA | UINT | none | ERP Backoff  A = Backoff index  Minumum: 0  Maximum: 255 |
| 7 | AAAA AAAA AAAA AAAA AAAA AAAA  AAAA AAAA | UINT | None | Instance ID  This is the instance ID for the beam that associates resource to setup the RF path  A = Instance ID |
| 8 | AAAA AAAA AAAA AAAA AAAA AAAA  AAAA AAAA | FLOAT | dB | AIM Cal Correction Value  Correction value to apply due to the AIM  A = AIM CCV |
| 9 | AAAA AAAA AAAA AAAA AAAA AAAA  AAAA AAAA | FLOAT | dB | Converter Cal Correction Value  Correction value to apply due to the Converter  A = CAL CCV |

N = not available for the type of antenna, Y = available to the antenna

* 1. **Null Beam Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | null beam |
| **Payload Value** | 00000011 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

This command assigns a beam location to be an innocuous null beam. This command effectively deletes a beam within the Array.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XBXA AAAA | UINT | none | Null Buffer Position  A = beam buffer  B = RF Path Select  0 = one RF path  1 = two RF paths |

N = not available for the type of antenna, Y = available to the antenna

* 1. **Status Request Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | status request |
| **Payload Value** | 00000100 |
| **Reply Name** | status reply |
| **Reply Value** | 10000001 |

This command invokes a status query of power supply and other information about the antenna This command does not use the destination ID from the message header.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | None | Future  A = Expansion |

* 1. **Heartbeat Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | heartbeat |
| **Payload Value** | 00001000 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

This command can be used as a heartbeat indicator. This command does not use the destination ID from the message header. It will reply with a command reply where success indicates there are no errors in the system and fail will indicate an error has occurred during normal operation.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXA | UINT | None | Future 1  A = future |

1. **Module Control Commands and Bit Support**

The following commands support BIT operations. These commands are used to further isolate and control sites on the array individually. These commands can facilitate Bit operations such as for the implementation of Mutual Coupling or simply for general tuning. This command uses the destination ID from the message header to determine the sub-aperture to talk to.

* 1. **Site Commands**
     1. **Site Control Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | site control |
| **Payload Value** | 00000101 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

These commands can be sent to any module in the destination antenna. The antenna shall be in Test Maintenance State prior to this operation.

This command will load a phase and attenuation to the specified site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX CCCC CCCC  BBBB BBBB AAAA AAAA | UINT | None | Site Command Selection  A = Slat  B = Module  C = Element |
| 1 | XXXX XXXF XXXD DDDD XXCB XXXX XXXX XXXA | UINT | none | Site Control  F = Ad Tdu Selection  0 = Primary Ad Tdu  1 = Secondary Ad Tdu  D = Beam Buffer  Values: 0-31  C = Command Type  0 = Phase Atten Lookup  This option will use the VM lookup table to get a vector modulator command. See offset 2 & 4.  1 = Force VM command  This option will directly apply the vector modulator command to the site. This option will only be valid during tuning. See offset 3 & 5.  B = Array Control  0 = Single Site Only  This setting will only enable the current site. It effectively sends a null to the rest of the array. This setting is used during normal tuning of the antenna.  1 = Multiple Sites Allowed  This will leave previously loaded sites to be unaffected. This field only applies to and  A = Site Enables  This will enable or disable the Site and any associated TDU/ADs. If the site is disabled, then the null (maximum attenuation) setting will be loaded.  0 = Load Null  Load a null beam and disable the site  1 = Load VM  Normal operation of setting enables, and loading the vector modulator for the site and any associated AD/TDUs |
| 2 | BBBB BBBB BBBB BBBB AAAA AAAA AAAA AAAA | UINT | none | Phase and Attenuation  This parameter is only used if Phase Atten Lookup is enabled. A lookup table will be used to get the tuned Vector Modulator command to achieve this phase and attenuation.  B = Attenuation  A = Phase |
| 3 | XXXX XXXX XXXX XXAA AAAA AAAA AAAA AAAA | UINT | none | Vector Modulator Command  This parameter is only used if Force VM command is enabled. The value in this parameter will be loaded directly into the module without modification.  A = VM Cmd |
| 4 | BBBB BBBB BBBB BBBB AAAA AAAA AAAA AAAA | UINT | none | AD/TDU Phase and Attenuation  This parameter is only used if Phase Atten Lookup is enabled. A lookup table will be used to get the tuned Vector Modulator command to achieve this phase and attenuation.  B = AD/TDU Attenuation  A = AD/TDU Phase |
| 5 | XXXX XXXX XXXX XXAA AAAA AAAA AAAA AAAA | UINT | none | AD/TDU Vector Modulator Command  This parameter is only used if Force VM command is enabled. The value in this parameter will be loaded directly into the module without modification.  A = AD/TDU VM Cmd |
| 6 | XXXX XXXX XXXX XXXX  XXXX XXXX XDDD DCBA | UINT | none | Control  A = TDU Control  0 = TDU Disable  1 = TDU Enable  B = AD/TDU Control  0 = AD/TDU Disable  1 = AD/TDU Enable  C = TDU Setting  LSB is 45 ps  D = AD/TDU Setting  LSB is 45 ps |
| 7 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX BBBA | UINT | none | Control  A = AD/TDU Control  0 = AD/TDU Disable  1 = AD/TDU Enable  B = AD/TDU Setting  LSB is 50 ps |
| 8 | XXXX XXXX XXXX XXXX XXXX XXCC XXXX XXBA | UINT | none | Control  A = Input Amp Regulator  0 = Regulator Disable  1 = Regulator Enable  B = Bypass Amp  0 = Amp Disable  1 = Amp Enable  C = Filter Select  00 = HPF1  01 = HPF2  10 = LPF  11 = No Filter |
| 9 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX XCBA | UINT | none | Control  A = Gain Compensation  0 = Gain Off  1 = 3dB Attenuation  B = CAGC 0  0 = CAGC 0 No Attenuation  1 = CAGC 0 10 dB Attenuation  C = CAGC 1  0 = CAGC 1 No Attenuation  1 = CAGC 1 10 dB Attenuation |
| 10 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | GHz | RF operational frequency  A = Ghz |

* + 1. **Site Status Request Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | site status request |
| **Payload Value** | 00000110 |
| **Reply Name** | site status reply |
| **Reply Value** | 10000010 |

This command will request status of a site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX CCCC CCCC  BBBB BBBB AAAA AAAA | UINT | None | Site Status Selection  A = Slat  B = Module  C = Element |

* + 1. **Site Simple Status Request Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | site simple status request |
| **Payload Value** | 00000111 |
| **Reply Name** | site simple status reply |
| **Reply Value** | 10000011 |

This command will request simple status of a site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XEXD DDDD CCCC CCCC  BBBB BBBB AAAA AAAA | UINT | None | Site Simple Status Selection  A = Slat  B = Module  C = Element  D = Beam Buffer  This is only used if the E bit is set to “selected beam buffer”  E = Buffer Selection  0 = selected beam buffer  1 = active buffer |

* + 1. **Site Summary Request Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | site summary request |
| **Payload Value** | 00001001 |
| **Reply Name** | site summary reply |
| **Reply Value** | 10001000 |

This command will request simple status of a site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX  XXXX XXXX XXXX XXXA | UINT | None | Summary Selection  A = selector  0 = return site summary  1 = return ad/tdu summary |

* + 1. **Failed Module Map (FMM) Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | fmm |
| **Payload Value** | 00010011 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

This command will request update the failed module map. Modules can be either enabled or disabled.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXD CCCC CCCC  BBBB BBBB AAAA AAAA | UINT | None | FMM Selection  A = Slat  B = Module  C = Element  D = FMM Control  0 = FMM Disable  1 = FMM Enable |

* + 1. **RF LRU Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | rf lru |
| **Payload Value** | 00010010 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

This command will update the RF LRU. This can only be exercised in the Test Maintenance state.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX  XXXX XXXB BBBB XXXA | UINT | none | RF LRU Control  A = Aim  0 = Aim No Update  1 = Aim Update  B = AIM Attenuation |
| 1 | XXXX XXXX XXXF FFFF XXXE EEEE XXDD XCBA | UINT | none | RF LRU Control  A = HBUC TDU  0 = HBUC TDU No Update  1 = HBUC TDU Update  B = Aim  0 = Aim No Update  1 = Aim Update  C = HBUC Attenuation  0 = HBUC No Update  1 = HBUC Update  D = HBUC TDU Settings  E = AIM Attenuation  F = Upconverter Attenuation |

* 1. **Time Of Day Commands**

The system synchronizes time via 1PPS. The following commands will coordinate synchronization of the system time.

* + 1. **Time Of Day (TOD) Reset Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | tod reset |
| **Payload Value** | 00010000 |
| **Reply Name** | general reply |
| **Reply Value** | 10000000 |

The time of day reset command will reset the time of day counter on the next 1PPS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX AAAA AAAA | UINT | None | TOD Control  Controls for the time of day reset  A = tod tweak  On the next 1PPS signal, the preloaded value is loaded into the time of day registers adjusted by this tweak setting. lsb is 6.25 ns |

* 1. **BIT Commands**

The following commands invoke bit tests.

* + 1. **BIT Detector Command**

The bit detector command will interrogate the RF LRU Bit detector and return the results from connected RF LRU hardware.

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | bit detector |
| **Payload Value** | 00010001 |
| **Reply Name** | bit detector reply |
| **Reply Value** | 10000111 |

The time of day reset command will reset the time of day counter on the next 1PPS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXA | UINT | None | RF LRU Selection  This will select which RF LRU to get BIT detector data from  A = RF LRU Select  0 = RF LRU 0  1 = RF LRU 1 |

* 1. **Debug Commands**

These commands can be sent to any module in the destination antenna. The user shall set the State prior to this operation to TEST\_MAINTENANCE.

* + 1. **Read Hardware Command**

|  |  |
| --- | --- |
| **Payload Type** | command |
| **Payload Name** | read hardware |
| **Payload Value** | 00001101 |
| **Reply Name** | read hardware status reply |
| **Reply Value** | 10000101 |

This command will request read of hardware. This command uses the destination ID from the message header to determine the sub-aperture to talk to. The following table describes the message fields. This command will always attempt to read the maximum (16 registers).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX BBBB AAAA AAAA AAAA AAAA | UINT | None | Hardware Select  A = Device ID  For sites this is the range id  For RF LRU, this is LRU interface (0 or 1)  For LVPS and HVPS this is the power train id  B = Hardware Type  0000 = BSCM  0001 = Site  0010 = RF LRU  0011 = LVPS  0100 = HVPS |
| 1 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | None | Hardware Address  A = Address |

1. **Messages from BSC to System Control**

The messages from the BSC to the System Control are all in response to message requests from the system control.

* 1. **General Status Messages**

These messages are responses to commands and are applicable to all antennas.

* + 1. **General Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | general |
| **Payload Value** | 10000000 |
| **Reply Name** | None |
| **Reply Value** | None |

This is the default response message from most commands. It indicates the pass or fail status of the command.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX  AAAA AAAA AAAA AAAA | UINT | None | Status Response  A = Status  00 = fail  01 = success |

* + 1. **Status Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | status |
| **Payload Value** | 10000001 |
| **Reply Name** | None |
| **Reply Value** | None |

This message provides overall status of the antenna operation.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XGFE DDDD CCCC CCCC BBBB BBBB AAAA AAAA | UINT | None | BSC Status  A = SBC Status  00000000 = sbc ok  00000001 = sbc internal error  00000010 = sbc memory error  00000011 = sbc comms error  00000100 = sbc hw interface error  00000101 = sbc data error  B = BSCM Status  00000000 = bscm ok  00000001 = bscm comms error  00000010 = bscm fpga error  00000011 = bscm mem error  00000100 = bscm internal error  00000101 = bscm missing  C = Current System State  0000 = power up state  0001 = standby state  0010 = operate stage 1 state  0011 = operate stage 2 state  0101 = shutdown state  0100 = test maintenance state  D = Thermal Status  0000 = thermal ok  0001 = thermal fault  E = Transmit Discrete  0 = transmit disabled  1 = transmit enabled  F = Battle Short Status  0 = Battle Short Inactive  1 = Battle Short Active  G = EMCON Status  0 = EMCON Disabled  1 = EMCON Enabled |
| 1 | XXXX XXXX XXXX XXXX XXFX XXXX | UINT | None | Power Supply Status  F = Summary Power Status  0 = ps ok  1 = ps fault |
| 2 | XXXX XXXX XXXX XXXX BBBB BBBB  AAAA AAAA | UINT | None | Site Status  A = Site Status  00000000 = site ok  00000001 = site internal error  00000010 = site mem error  00000011 = site comms error  00000100 = site interface error  00000101 = site data error  00000110 = site bit error  B = Site Error ID  Indicates the first id of a site with an error |
| 3 | MMMM MMMM DDDD DDDD YYYY YYYY  YYYY YYYY | UINT | None | Software Build  Y = sw year  D = sw day  M = sw month |
| 4 | MMMM MMMM DDDD DDDD YYYY YYYY  YYYY YYYY | UINT | None | FPGA Build  Y = fpga year  D = fpga day  M = fpga month |

* 1. **Status Messages**

These messages are specific to the antenna and are responses to status request commands.

* + 1. **Site Status Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | site status |
| **Payload Value** | 10000010 |
| **Reply Name** | None |
| **Reply Value** | None |

This message provides the status of the site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX CCCC CCCC  BBBB BBBB AAAA AAAA | UINT | None | Site Identification  A = Slat  B = Module  C = Element |
| 1 | ZZZZ XXXX XXXX XXXX XXXX XXXI HGFE DCBA | UINT | none | Site Status Information  This sections contains general settings for the site.  Z = Health  0000 = Site Missing  0001 = Site Healthy  0010 = Site Disabled  I = Pinch B  H = Pinch A  G = Tx Enable B HD  F = Tx Enable B  E = Tx Enable A HD  D = Tx Enable A  C = TDU Status  0 = TDU Disabled  1 = TDU Enabled  B = Global Regulator Status  0 = Global Disabled  1 = Global Enabled  A = Regulator Status  0 = Regulator Disabled  1 = Regulator Enabled |
| 2 | AAAA AAAA AAAA AAAA BBBB BBBB BBBB BBBB | UINT | none | Hardware Identifiers  Provides hardware location  A = Slat  B = Module Id |
| 3 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | Inch | X Position  The X Position of the Site within the Array Map  A = X Axis |
| 4 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | Inch | Y Position  The Y Position of the Site within the Array Map  A = Y Axis |
| 5 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | DegC | Site Temperature  The temperature of the site.  A = DegC |
| 6-69 | BBBB BBBB BBBB BBBB AAAA AAAA AAAA AAAA | UINT | none | Phase and Attenuation Status  B = Attenuation  A = Phase |
| 70-133 | XXXX CCCC BBBB BBAA AAAA AAAA AAAA AAAA | UINT | none | Vector Modulator Status  C = TDU Delay  B = TDU Attenuation  A = VM Command |
|  |  |  |  |  |

* + 1. **Site Simple Status Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | site simple status |
| **Payload Value** | 10000011 |
| **Reply Name** | None |
| **Reply Value** | None |

This message provides the simple status of the site.

The following table describes the message fields.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |  |  |  |  |
| 0 | AAAA AAAA  BBBB BBBB  CCCC CCCC  IIHH GFED | UINT | None | Simple Site Identification  A = Slat  B = Module  C = Element  D = Site Present Status  0 = site not present  1 = site present  E = TDU/AD Primary Status  0 = tdu/ad primary not present  1 = tdu/ad primary present  E = TDU/AD Secondary Status  0 = tdu/ad secondary not present  1 = tdu/ad secondary present  F = TDU/AD Active  0 = primary active  1 = secondary active  H = site temperature status  00 = site temperature invalid  01 = site temperature overflow  10 = site temperature underflow  11 = site temperature valid  I = tdu/ad temperature status  00 = tdu/ad temperature invalid  01 = tdu/ad temperature overflow  10 = tdu/ad temperature underflow  11 = tdu/ad temperature valid | Y | Y | Y | Y |
| 1 | XWVU TSRQ XXXP MLKK JJJJ XXHH XXFE XXBA | UINT | none | Simple Site Status  A = Global Regulator  0 = global regulator off  1 = global regulator on  B = Beam regulator  0 = Beam Regulator Disabled  1 = Beam Regulator Enabled | Y | Y | Y | Y |
| 2 | XXXX XXXN MMMM LLKK XXJI XXHG FEDC XXBA | UINT | none | **TDU/AD Status**  A = TduAd Global Regulator  0 = TduAd regulator off  1 = TduAd regulator pulser on  B = Beam Control  0 = Beam Disabled  1 = Beam Enabled  C = Transmit Enable A  D = Transmit A Max Duty  E= Transmit Enable B  F = Transmit B Max Duty  G = Tdu/Ad Pinch A  0 = Tdu/Ad A pinched  1 = Tdu/Ad A unpinched  H = Tdu/Ad Pinch B  0 = Tdu/Ad B pinched  1 = Tdu/Ad B unpinched | Y | N | Y | N |
| 3 | DDDD DDDD  CCCC CCCC BBBB BBBB AAAA AAAA |  |  | Parity Check  A = Command Line Error Count  B = Next Address Error Count  C = AD-TDU Command Line Error Count  D = AD-TDU Next Address Error Count | Y | Y | Y | Y |
| 4 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | Float | degC | Temperature  A = Data | Y | Y | Y | Y |
| 5 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Vector Modulator  A = Data | Y | Y | Y | Y |
| 6 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | TDU/AD Vector Modulator  A = Data | Y | N | Y | N |

* + 1. **Site Summary Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | site summary |
| **Payload Value** | 10001000 |
| **Reply Name** | None |
| **Reply Value** | None |

This message provides the summary status of the site.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0-607 | AAAA AAAA  BBBB BBBB  CCCC CCCC  DDDD DDDD | UINT | None | Summary Site Identification  A = Slat  B = Module  C = Element  D = Temperature |

* + 1. **Read Hardware Status Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | read hardware status |
| **Payload Value** | 10000101 |
| **Reply Name** | None |
| **Reply Value** | None |

This message provides the register read from the hardware. The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0-15 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Register Read Address  A = hw address |
| 16-31 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | UINT | none | Register Read Data  A = hw data |

* + 1. **Beam Status Reply**

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | beam status |
| **Payload Value** | 10000110 |
| **Reply Name** | None |
| **Reply Value** | None |

This is the response message from an beam command.

The following table describes the message fields.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX  AAAA AAAA AAAA AAAA | UINT | None | Beam Status Response  A = Pointing Status  0000 = BEAM\_SUCCESS  0001 = BEAM\_DATA\_ERROR  0010 = INVALID\_BEAM\_PARAMETERS  0011 = INVALID\_BEAM\_BUFFER  0100 = CANNOT\_LOAD\_BEAM  0101 = INCORRECT\_SYSTEM\_STATE |

* + 1. **BIT Detector Reply**

The bit detector reply returns the results of the bit detector interrogation of the selected RF LRU.

|  |  |
| --- | --- |
| **Payload Type** | reply |
| **Payload Name** | bit detector |
| **Payload Value** | 10000111 |
| **Reply Name** | None |
| **Reply Value** | None |

The time of day reset command will reset the time of day counter on the next 1PPS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Offset** | **Mask** | **Type** | **Units** | **Description** |
| 0 | XXXX XXXX XXXX XXXX XXXX XXXX XXXX AAAA | UINT | None | A = LRU Type  0000 = LRU None  0001 = LRU BitCal  0010 = LRU Down Converter  0011 = LRU AIM  0100 = LRU Upconverter  0101 = LRU 4x8 switch |
| 1-8 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | dBm | **Current Path Power**  BIT analog detection measures and reports the current power level in a path. For LRUs that perform BIT analog detection, the path 1 power is reported here.  A = Path Power |
| 9-16 | AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA | FLOAT | dBm | **Max Hold Path Power**  Max hold BIT analog detection measured the max (peak) power level in a path since the last time the register was read. For LRUs that perform BIT analog detection, the path 1 power is reported here.  A = Max Power |
| 17 | ZXXX XXXX XXXX XXXX XXXX XXXX HGFE DCBA | UINT | None | **BIT Binary Detection**  Binary detection compares a path power to a threshold power level and reports whether the detector detects the signal greater than or equal to the threshold or below the threshold. For LRUs that perform BIT binary detection, the path BIT binary detection status is reported via this register.  A = BIT Path 1  0 = Path 1 below threshold  1 = Path 1 exceeds threshold  B = BIT Path 2  0 = Path 2 below threshold  1 = Path 2 exceeds threshold  C = BIT Path 3  0 = Path 3 below threshold  1 = Path 3 exceeds threshold  D = BIT Path 4  0 = Path 4 below threshold  1 = Path 4 exceeds threshold  E = BIT Path 5  0 = Path 5 below threshold  1 = Path 5 exceeds threshold  F = BIT Path 6  0 = Path 6 below threshold  1 = Path 6 exceeds threshold  G = BIT Path 7  0 = Path 7 below threshold  1 = Path 7 exceeds threshold  H = BIT Path 8  0 = Path 8 below threshold  1 = Path 8 exceeds threshold  Z = BIT Detector Status  This field will indicate whether or not to ignore the data collected for this entire reply.  0 = BIT Data Invalid  All data is invalid and should be ignored  1 = BIT Data Valid  All data is valid and can be processed |

1. **Telnet command prompt functions**
2. **INI File Settings**

The BSC application requires some predefined settings that define its operation. The settings are defined in an INI file. The BSC reads the file during initialization.

There are several categories of information. They are shown below.

|  |  |
| --- | --- |
| **Topic** | GENERAL |
| **Description** | General Settings for the BSC |

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Type** | **Default** | **Description** |
| ServerIp | String | 127.0.0.1 | IP Address of system controller |
| ServerPort | Int | 42020 | Port of system controller |
| ServerBitPort | Int | 42022 | Port to send BIT status to on the system controller |
| MyPort | Int | 42020 | Port of BSC command socket |

|  |  |
| --- | --- |
| **Topic** | BIT |
| **Description** | BIT Check Parameters |

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **Type** | **Default** | **Description** |
| Timeout | Int | 10 | Timeout for checking BIT |
| General | Int | 1000 | Frequency of general BIT check |
| RfLru | Int | 100 | Frequency of RF LRU BIT check |
| LVPS | Int | 101 | Frequency of LVPS BIT check |
| HVPS | Int | 102 | Frequency of HVPS BIT check |
| Site | Int | 1 | Frequency of Site BIT check |