

NegevSat – Programmer's Reference Manual (PRM)

**NegevSat satellite supports the following commands from the ground station
(can be found in data_protocol/CMDDictionary.hpp):**

#define MOVE_TO_SAFE	1
#define MOVE_TO_STANDBY	2
#define MOVE_TO_OP	3
#define FORMAT_ENERGY	4
#define FORMAT_TEMP	5
#define FORMAT_STATIC	6
#define FORMAT_MIXED	7
#define SBAND_ON	8
#define SBAND_ STANDBY	9
#define PAYLOAD_ON	10
#define PAYLOAD_ STANDBY	11
#define THERMAL_CRTL_ON	12
#define THERMAL_CRTL_ STANDBY	13

MOVE_TO_SAFE	Switches satellites state to SAFE_MODE.
MOVE_TO_STANDBY	Switches satellites state to STANDBY.
MOVE_TO_OP	Switches satellites state to OPERATIONAL.
FORMAT_ENERGY	Changes satellites sending format to Energy, now the satellite will send 10 Energy packets and 1 Static.
FORMAT_TEMP	Changes satellites sending format to Temperature, now the satellite will send 10 Temperature packets and 1 Static.
FORMAT_STATIC	Changes satellites sending format to Static, now the satellite will send only Static packets.

FORMAT_MIXED	Changes satellites sending format to Mixed, now the satellite will send Energy, Temperature and Static packets, one after another.
SBAND_ON	Satellite turns on the SBAND module.
SBAND_STANDBY	Satellite turns off the SBAND module.
PAYLOAD_ON	Satellite turns on the PAYLOAD (Camera) module.
PAYLOAD_STANDBY	Satellite turns off the PAYLOAD (Camera) module.
THERMAL_CTRL_ON	Satellite turns on the THERMAL_CTRL module.
THERMAL_CTRL_STANDBY	Satellite turns off the THERMAL_CTRL module.

NegevSat satellite has 6 modules:

- SBAND module
- TEMPERATURE module
- ENERGY module
- SOLAR PANELS module
- PAYLOAD module (Camera)
- THERMAL CTRL module

Each NegevSat module can be in the following state:

- **ON** – The module is in proper state and works as expected. **Green**
- **MALFUNCTION** – The module is operating but there is a possibility that there is a problem with the module, further actions should be taken. **Yellow**
- **STANDBY** – The module has turned off most of unnecessary parts, mostly will happened for Energy saving. **Orange**
- **NON_OPERATIONAL** – The module is turned off as a result of a failure. **Red**

There are three kinds of packets which the satellite can send:

Static Packet: contains satellite's state machine's current state, state of each Module and timestamps.

For example:

```

1  <?xml version="1.0"?>
2  <packet>
3    <downstreamPacket>
4      <type>Static</type>
5      <state>Operational</state>
6      <Module time="2002-05-30T09:00:00">
7        <Info name='X' status='OK' />
8      </Module>
9      <Module time="2002-05-30T09:00:00">
10       <Info name='Y' status='CRIT' />
11     </Module>
12    <Module time="2002-05-30T09:00:00">
13      <Info name='Z' status='OFF' />
14    </Module>
15    <Module time="2002-05-30T09:00:00">
16      <Info name='A' status='OK' />
17    </Module>
18    <Module time="2002-05-30T09:00:00">
19      <Info name='B' status='OFF' />
20    </Module>
21  </downstreamPacket>
22 </packet>

```

Energy Packet: contains satellite's Energy data: voltage and current of the batteries and timestamps.

For example:

```

1  <?xml version="1.0"?>
2  <packet>
3    <downstreamPacket>
4      <type>Energy</type>
5      <EnergySample time="2002-05-30T09:00:00">
6        <Battery1 voltage="12" current="1" />
7        <Battery2 voltage="12" current="1" />
8        <Battery3 voltage="12" current="1" />
9      </EnergySample>
10     <EnergySample time="2002-05-30T09:00:00">
11       <Battery1 voltage="12" current="1" />
12       <Battery2 voltage="12" current="1" />
13       <Battery3 voltage="12" current="1" />
14     </EnergySample>
15     <EnergySample time="2002-05-30T09:00:00">
16       <Battery1 voltage="12" current="1" />
17       <Battery2 voltage="12" current="1" />
18       <Battery3 voltage="12" current="1" />
19     </EnergySample>
20     <EnergySample time="2002-05-30T09:00:00">
21       <Battery1 voltage="12" current="1" />
22       <Battery2 voltage="12" current="1" />
23       <Battery3 voltage="12" current="1" />
24     </EnergySample>
25  </downstreamPacket>
26 </packet>

```

Temp Packet: contains satellite's sensors Temperature data and timestamps.

For example:

```

1  <?xml version="1.0"?>
2  <packet>
3    <downstreamPacket>
4      <type>Temperature</type>
5      <TemperatureSample time="2002-05-30T09:00:00">
6        <Sensor1 temp="1"/>
7        <Sensor2 temp="1"/>
8        <Sensor3 temp="1"/>
9      </TemperatureSample>
10     <TemperatureSample time="2002-05-30T09:00:00">
11       <Sensor1 temp="1"/>
12       <Sensor2 temp="1"/>
13       <Sensor3 temp="1"/>
14     </TemperatureSample>
15     <TemperatureSample time="2002-05-30T09:00:00">
16       <Sensor1 temp="1"/>
17       <Sensor2 temp="1"/>
18       <Sensor3 temp="1"/>
19     </TemperatureSample>
20     <TemperatureSample time="2002-05-30T09:00:00">
21       <Sensor1 temp="1"/>
22       <Sensor2 temp="1"/>
23       <Sensor3 temp="1"/>
24     </TemperatureSample>
25   </downstreamPacket>
26 </packet>

```

UpStream Packet: contains the commands that the ground station sent to the satellite.

For example:

```

1  <?xml version="1.0"?>
2  <packet>
3    <upstreamPacket time="12332">
4      <mission time="1223" opcode="5" priority="3"/>
5      <mission time="1222" opcode="4" priority="2"/>
6      <mission time="1256" opcode="2" priority="1"/>
7    </upstreamPacket>
8  </packet>

```

Timing:

RTEMS has no time and date unless the user sets it by using the `rtems_clock_set` command and then obtaining time and date by using the `rtems_clock_get` command. More detail can be found in `c_user` manual and in `rtems` example or in:

https://github.com/RTEMS/examples-v2/blob/master/classic_api/triple_period/tasks.c

Satellites comparing system:

For date and time stamp: 11/05/2014 12:35:55

Satellite will produce the following unsigned long long number: **20140511123555**

