White Paper

Retrofit of ACU 7200
with
sat-nms ACU2-19V2

Summary: The SatService Antenna Control Unit *sat-nms* ACU2-19V2 provides an excellent field replacement for the discontinued ACU 7200 from GD Satcom. Compatible with the SatService *sat-nms* MNC and the Calian Mon-A-Co monitor and control systems, the *sat-nms* ACU2-19V2 has a web-based user interface along with other standardized interfaces making it simple to integrate into existing SATCOM antenna monitor and control infrastructure. With improved SatService specific firmware capabilities and its effective user interface the *sat-nms* ACU21-19V provides an excellent means of cost-effectively upgrading antenna systems.

SatService has in the meantime delivered 400 *sat-nms* ACUs in different configurations, both for new installations or as upgrades of existing satcom antennas. The antenna diameter of these antennas ranges from 1,8m to 32m. The track record of ACU upgrades covers almost all worldwide antenna manufacturers like for example ASC, Andrew, Vertex, GD Satcom, Scientific Atlanta, ViaSat, NEC, Siemens, TIW and Patriot. Ask SatService if you have another type and we do it for you.

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The requirement:

SatService was approached by customers who asked for an alternative when the production of the Vertex 7200 ACU was discontinued. A typical system installed at the customer site is a 7150-drive cabinet located outside close to the antenna mount, several cables routed from this drive cabinet to the 7200 ACU which is installed indoors in a 19" rack. If an ACU 7200 fails and no spare parts are available but the complete outdoor system is still in good working condition, the teleport operator may not want to spend the money for a complete exchange of all the indoor and outdoor equipment.

The idea:

SatService has a proven antenna tracking design which is very well established and accepted in the market for more than 10 years. Until now SatService concentrated more on complete outdoor solutions (*sat-nms* ACU2-ODU-AC) which are directly installed at the satellite ground station antennas and required, beside the mains voltage, only a LAN interconnection to the building. But this is all only packaging around the *sat-nms* ACU2-ODM core module which includes all the intelligence and software algorithms.

Based on this experience the idea was born to develop a 19" 1RU drawer which is hardware compatible with the 7200 ACU. The goal is that the integrator will find all matching and compatible connectors, so that they can easily exchange units.

The solution:

The *sat-nms* ACU2-19V2 19" 1RU rackmount unit presented on the next pages is the result of these development activities. It includes the complete functionality of an antenna tracking controller with all the hardware interfaces necessary to exchange it against a 7200 ACU drawer.

To be even more universal the *sat-nms* ACU2-19V2 provides three different angular encoder interfaces

- analogue resolver
- optical encoder with SSI interface
- analogue DC interface for potentiometer

this allows to adapt the SatService ACU to antennas from different manufacturers and model types easily.


The front panel design is typical of the *sat-nms* products which allow management of the controller from the front panel LED display as well as keyboard and display. Nevertheless, the most common method of access for standard operations would be through its browser-based user interface or via the established monitor and control system. Equivalent functionality can be obtained through any of the interfaces

selected above. Especially the set-up of the antenna controller and tracking system but also the daily operation is performed via the web browser GUI which is also presented on the next pages.

At the rear panel the **sat-nms** ACU2-19V2 provides a set of connectors which matches to the ones of the 7200 ACU.
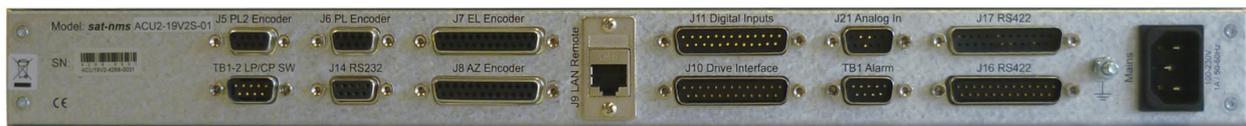
- J6 PL Encoder (interface to polarization angular encoder, either resolver or SSI interface)
- J7 EL Encoder (interface to elevation angular encoder)
- J8 AZ Encoder (interface to azimuth angular encoder)
- J9 LAN Remote (Ethernet interface for Web GUI and SNMP, and to **sat-nms** LBRX beacon RX)
- J10 Drive Interface
- J11 Digital Inputs
- J14 RS232 (not used)
- J16 RS422
- J17 RS422
- J21 Analog in (interface to other vendors beacon receiver)
- TB1 Alarm
- J5 PL2 Encoder (for 4th axis option)
- TB1-2 LP/CP SW (for 4th axis option)

Both analogue resolver and/or optical encoder with SSI interface can be connected to the **sat-nms** ACU2-19V2. This has to be defined at the time of order, as the necessary daughter cards will be installed accordingly.

The hardware

The key module within the 1RU 19" unit is the **sat-nms** ACU2-ODM module. This is the module which provides all the hardware interfaces to the drive system (frequency inverters are most common, but could be also servo or DC motor drivers), the antenna limit switches, and axis encoders, etc. In the case of this special **sat-nms** ACU2-19V2 19" drawer a printed circuit board (PCB) was designed which transfers all the interfaces at its rear panel in the right way to be compatible to the ACU 7200. In addition to that the unit also provides an ethernet interface via which the customer has full access to the integrated web server for operational purposes and remote interfaces like SNMP and http protocol for M&C.

Independent from the development of the **sat-nms** ACU2-19V2 version also the core **sat-nms** ACU-ODM module was upgraded with a new more powerful processor to cover the requirement for more CPU power and firmware capability. The result is the new core module **sat-nms** ACU2-ODM, in which the 2 expresses the next generation. This will also be delivered in future in all other SatService antenna controller configurations

The firmware

As already explained, the *sat-nms* ACU2-19V2 is from the interfaces point of view hardware compatible to the ACU 7200, whereas the firmware including tracking- and adaptive models-algorithm is SatService's complete own development and implementation.

The *sat-nms* ACU is implemented on a modern firmware architecture and has a proven track-record of performance in a variety of satellite networks over several years. The firmware design allows for continued product and algorithm improvements and will be constantly supported and also maintained. Just recently SatService performed a significant update of the firmware, and in case of the 4th axis interface also the hardware. This led to a significant expansion of functionality, like for example

- Orbit prediction based on TLE two-line elements data
- and Intelsat I11 data
- TLE and I11 editor and file manager
- polarization prediction, which is especially helpful for inclined orbit satellites
- NTP time synchronization
- jack screw protection mode
- *sat-nms* LBRX beacon receiver direct control
- space for 200 targets
- Tracking improved with "initial pointing mode" based on model, TLE or I11
- "4th axis" functionality can be covered as option

The matching beacon receivers

All *sat-nms* ACU tracking systems are designed to interface also to any other vendors beacon receiver via the universal 0 to 10V ADC interface. But the more sophisticated solution would be to use our *sat-nms* LBRX, which no longer makes a 0 to 10V calibration necessary. The beacon receiver *sat-nms* LBRX transfers via UDP packets the exact beacon level information (for example -67.23dBm) to the *sat-nms* ACU2-19V2 and its internal tracking algorithm via its ethernet interface.

Multiple configurations of the *sat-nms* LBRX beacon receiver are available; small DIN rail mounted version, the *sat-nms* LBRX19 with 4 L-band inputs, the *sat-nms* LBRX19-81 with 8 L-band inputs (which allows for example C/Ku multifeed operation) and the beacon receivers which provide inputs at the direct receive frequency in C-band, X, Ku and Ka-band, so for example *sat-nms* KuBRX19.

Interfacing an existing DTR beacon receiver

An RS232 interface with its serial protocol to the DTR beacon receiver is not implemented. But you certainly can continue to use the DTR if you switch to the analog (0…10 VDC) output. This is working fine and runs without any problems. But as already described you can avoid the DC output interface if you take a SatService beacon receiver, so then all devices communicate via the network.

The installation/integration workflow of the retrofit:

Our goal was to make the retrofit procedure from a 7200 ACU to a *sat-nms* ACU2-19V2 as easy as possible. Here is a short description of the tasks involved.

1. Stop step track at the 7200
2. Readout and write down azimuth, elevation and polarization values presented at the 7200 ACU
3. Switch off the circuit breakers in the 7150-drive cabinet, so that the antenna cannot move
4. Disconnect the cables from the ACU 7200
5. Remove ACU 7200 from the 19" rack
6. Slide in the *sat-nms* ACU2-19V2

7. Connect the three resolver cables to the *sat-nms* ACU2-19V2
8. Connect Ethernet to your local LAN
9. Connect mains voltage cable to *sat-nms* ACU2-19V2
10. Switch on the *sat-nms* ACU2-19V2
11. Configure the IP address so that it matches to your IP sub-net with @CHIPTOOL Software installed on a PC
12. Navigate with your web browser to this IP address and you will see the web interface of our *sat-nms* ACU2-19V2 (some examples we present as screen shots on the next pages of this paper)
13. In the "setup" page you calibrate azimuth, elevation and polarization to the values which you wrote down from the old ACU 7200 under point 2
14. Then switch on each axis circuit breaker step by step at the 7150-drive cabinet and test motorization in each axis via the *sat-nms* ACU2-19V2 main "pointing" page.
15. Check the drive direction of each axis and if necessary, change it in the set-up page. We recommend not to move all three axes at the same time, do it step-by-step
16. Test limit switches in each axis, so that you are sure these are operational and working
17. Now the new antenna controller is operational and you can move all three axes
18. You can make yourself familiar with the operation of the *sat-nms* ACU2-19V2 and its tracking modes by using the handbook either in electronic or printed form.
19. SatService is always available to provide assistance, see also the chapter below. SatService can also provide training to the operator, or system integrator.

In summary, these are very easy steps to be performed and can be completed in 2 hours, easily.

The alternative:

If the station owner needs to retrofit the ACU 7200 indoor unit and also the 7150-drive cabinet, there are two choices:

- keep the indoor/outdoor approach
- select a complete outdoor version *sat-nms* ACU2-ODU-AC

In case (1) continue to go with a *sat-nms* ACU2-19V2 as described above and in addition order a retrofit plate *sat-nms* MCU-V-AC into the 7150-drive cabinet. In that case, simply use the existing cables between indoors and outdoors if they are in good condition.

A more common approach is to change to the *sat-nms* ACU2-ODU-AC complete outdoor solution. In this case (2), there is no indoor unit necessary at all. The *sat-nms* ACU2-ODU-AC easily interfaces to an antenna which up to now is connected to a 7150 drive cabinet and 7200 ACU indoor unit, entirely. The replacement system must be sized properly, this information can be generated from specifications of the inverters and motors on the antenna. Finally, to complete the interface of the new *sat-nms* ACU system, the type of resolver/encoder technology and specifications must be provided – *sat-nms* ACU accommodates a wide variety of types, including optical (with SSI interfaces) as well as the more common resolver-type encoders. Please specify at the time of order.

The RS232 Implementations:

As always in real world applications there are some limitations or restrictions which we are open to discuss. If the central monitoring & control system to which the Vertex 7200 ACUs are connected and you now want to install a *sat-nms* ACU2-19V2 instead, then the M&C protocol on its RS232 interface is no longer compatible with the protocol provided by the 7200 ACU. Certainly, SatService can provide an M&C command set via its RS232 interface but this is a different command set then provided by the 7200 ACU. In the existing customer installations that do not use the RS232 interface and have converted their M&C

systems to a driver which interfaces to the **sat-nms** ACU2-19V2 via the existing SNMP MIB or http PUT/GET protocol. This is a much more common implementation than the RS232 interface.

However, SatService could also implement a sub-set of the 7200 RS232 protocol and command set if a customer does have a higher demand in terms of quantities to be replaced. Please consult the factory for further discussion.

The support:

After-sales support is a priority at SatService GmbH. SatService take pride in its reputation for responsive and strong technical support. For this we provide you as a customer the following options:

Training	SatService quotes dedicated training to its customers. These are trainings specifically designed and performed to your specific requirements and also experiences.
Website	SatService provides all manuals and any other relevant information online on its web page: www.satservicegmbh.de/en/documentation.html
E-mail	Support can be reached by E-Mail under support-satnms@satservicegmbh.de
Sales	Sales team can be reached by E-Mail under sales@satservicegmbh.de and via telephone +49 7738 99791 20

Web based GUI of sat-nms ACU2-19V2

On the following pages the user interface of the **sat-nms** ACU2-19V2 is presented. The user launches a web browser and navigates to the IP address of the equipment. The details of how to use the GUI and the definition and explanation of each parameter is explained in the handbook. This is available on the unit itself under the help button and also available on our web site, please navigate to https://satservicegmbh.de/en/documentation/manuals.html .

The **main page** (labelled "Pointing" in the navigation menu) includes the status of the antenna controller, the actual pointing values of each antenna axis some additional status and alarm information and the target name actually selected. The target values of all three axis can be set if using the manual pointing mode. In the left frame are the navigation buttons, where the user can select the other pages, like target, tracking, test, setup, info and help. The following pages of this document show screenshots of these GUI web pages. In the bottom of the left frame are the tools to drive the antenna in predefined steps for easy manual pointing and peaking.

3.7m Antenna

Azimuth	Elevation	Polarization
178.536°	**35.141°**	**0.330°**
Target value 178.548 °	Target value 35.148 °	Target value 0.000 °

Target name	W10 10 °E (#108)
Pointing state	target position reached.
Tracking mode	ADAPTIVE (SLEEPING) (sleep=99s fill=125.7h age=0.0h)
Beacon level	rel. 5.33 dB / abs. -68.26 dBm (var 0.01 dB)

Temperature	37.6 °C
ACU Faults	
Tracking Faults	
AZ Tracking State	M=SMALL A=30% J=2% B=0.485° S=0.059°
EL Tracking State	M=SMALL A=25% J=3% B=0.485° S=0.049°
Pol Prediction State	OFF
Time	2021-02-17 13:50:40 (last synced 2021-02-17 13:50:39 from NTP1)
GPS State	DISABLED

Target page: The operator can store and select up to 200 targets. The target name used to store it in the database is the name defined on the pointing main page under target name. This target saves not only all antenna controller and tracking parameters but also these of the associated *sat-nms* LBRX19 beacon receiver. Due to this fact the operator can select by writing and reading targets the complete configuration of the whole tracking system. If the configuration is saved with tracking mode on, then it will also start in tracking mode when the target is selected. If the target was saved with tracking parameter in stop mode then the antenna will be driving to the new target's azimuth, elevation and polarization position, but then stop.

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ACU Outdoor Module

Targets

Sort by **Number** Name Azimuth -- 1 2 3 4 5 **6** 7 8 9 10

≠	Target	Go	Save	Edit	Delete
100	EU12WA_11400.0_H (208.286/32.406/21.747)	▶	💾	🗐	✎
101	ASTRA2C 10951M5 (160.677/32.125/-10.328)	▶	💾	🗐	✎
102			💾	🗐	
103			💾	🗐	
104			💾	🗐	
105	ASTRA2C-10951M5 (160.750/31.754/-10.911)	▶	💾	🗐	✎
106			💾	🗐	
107			💾	🗐	
108	**W10 10 °E (178.649/35.273/0.000)**	▶	💾	🗐	✎
109	Astra2B TLE (165.609/34.540/0.000)	▶	💾	🗐	✎
110	W10 auf Stop (178.526/35.195/0.000)	▶	💾	🗐	✎
111	EU8W_12501_Y (202.470/32.819/14.705)	▶	💾	🗐	✎
112	NSS7_TLE (215.504/25.644/14.705)	▶	💾	🗐	✎
113			💾	🗐	
114			💾	🗐	
115			💾	🗐	
116			💾	🗐	
117			💾	🗐	
118			💾	🗐	
119			💾	🗐	
	Numeric orbit position	▶			

Pointing
Target
Tracking
Orbital Data
Test
Setup
Event Log
Info
Help

Step Move
◀◀ x10 ◀ ▶ ▶▶ x10
x10 ▼ ▼ ▲ x10 ▲
↰ ↱

STOP **RESET**
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Actually selected:	Initial pointing mode:	Save mode:
Satellite: W10 10 °E (#108)	⦿ use initial pointing mode as stored with target	⦿ save all
Tracking mode: ADAPTIVE	○ use pointing angles stored with target	○ exclude pointing angles
STOP TRACKING	○ calculate initial position from nominal orbit	
	○ calculate initial position from TLE	
	○ calculate initial position from I11	
	○ calculate initial position from adaptive model	

Tracking page: On this page you will configure the tracking parameter for this specific satellite selected in the target name. In any case it is the configuration of the antenna tracking to the actual satellite. Via the parameter "tracking mode" you select the different operational states of the tracking system. On this screenshot for example it is in adaptive mode. The second-generation software of the *sat-nms* ACU2-ODM module includes now also the TLE two-line elements Kepler data and Intelsat 11 prediction parameters and polarization prediction especially for inclined orbit tracking.

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ACU Outdoor Module

- Pointing
- Target
- Tracking
- Orbital Data
- Test
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- Help

Step Move

STOP RESET
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Tracking Parameters

General Settings

Tracking mode	ADAPTIVE		Initial pointing mode	STORED-POSITION
Tracking cycle time	900 sec		Polarization prediction	OFF
Target orbit position	0.000 °E		Inclination	0.000 °
Satellite pol offset	0.000 °		Max. prediction age	999.0 h

Steptrack Parameters

Tracking step size	20 %		Beacon RX frequency	11699.823 MHz
Level offset	-73.58 dB	calc.	Level threshold (rel.)	-7.00 dBm
AZ Maximum model type	SMALL		EL Maximum model type	SMALL
Measurement delay	3000 msec		Recovery delay	6000 msec
Level averaging	5 samples		Retry after motor fault	FOREVER
Smoothing interval	6 h		Peak jitter threshold	20 %
Spindle save mode	OFF		Spindle save threshold	100 %

Prediction Parameters

I11 Epheremides	00: NONE		TLE Epheremides	00: NONE
Target azimuth offset	0.000 °		Target elevation offset	0.000 °

Beacon Receiver Parameters

RF receive frequency	11699.823 MHz		Polarization	H-X
Attenuation (dB)	10		Measurement bandwidth (kHz)	30
Post detector filter (Hz)	0.5		Alarm threshold	-77.00 dBm
C/N measurement mode	OFF		Frequency tracking	ON
Noise measurement frequency	11450.360 MHz		Frequency tracking interval	600 sec
Noise measurement interval	5 sec		Frequency tracking width	100 kHz
Signal search enable	OFF		Analog output offset	-80.00 dB
Signal search delay	15 sec		Analog output scale	0.2100 V/dB
Spectrum compensation	OFF			

CLEAR TRACKING MEMORY

Orbital Data page: On this web page you can manage the orbital data either as Intelsat 11 (I11) or as two line elment (TLE) kepler data. This is a new functionality of the *sat-nms* ACU2-ODM module which was before only available within the *sat-nms* ACU-IDU indoor unit.

Orbital Elements

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ACU Outdoor Module

- ⚓ Pointing
- ⭐ Target
- 🎯 Tracking
- 📖 Orbital Data
- 🔍 Test
- 🔧 Setup
- 📋 Event Log
- ℹ️ Info
- ❓ Help

Step Move

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STOP | RESET
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Two Line Elements   **I11 Elements**

00: NONE	25:	50:	75:
01: EUTELSAT 80A	26:	51:	76:
02: ASTRA 2B	27:	52:	77:
03: INTELSAT 12 (IS-12)	28:	53:	78:
04: INTELSAT 10 (IS-10)	29:	54:	79:
05: ASTRA 2C	30:	55:	80:
06: INTELSAT 904 (IS-904)	31:	56:	81:
07: NSS-7	32:	57:	82:
08: INTELSAT 905 (IS-905)	33:	58:	83:
09: EUTELSAT 7A	34:	59:	84:
10: EUTELSAT HOT BIRD 13E	35:	60:	85:
11: EUTELSAT 33E	36:	61:	86:
12: EUTELSAT 10A	37:	62:	87:
13: EUTELSAT 16A	38:	63:	88:
14: INTELSAT 23 (IS-23)	39:	64:	89:
15: EUTELSAT 7B	40:	65:	90:
16: ECHOSTAR 7	41:	66:	91:
17: ALPHASAT	42:	67:	92:
18: Leer2	43:	68:	93:
19: EUTELSAT 8 WEST B	44:	69:	94:
20:	45:	70:	95:
21:	46:	71:	96:
22:	47:	72:	97:
23:	48:	73:	98:
24:	49:	74:	99:

re-read the TLE.TXT file

Test page: This web page is used only for testing the hardware interfaces, so you make use of this page during set-up and integration of the antenna tracking system and in case of a failure. It makes things easier to understand and search for faults. This page will not be used in normal operations.

Hardware Test

Outputs:		Outputs:		Inputs:	
AZ motor forward	LO	POL motor forward	LO	POL limit switch H	HI
AZ motor reverse	LO	POL motor reverse	LO	POL limit switch L	HI
AZ motor speed 1	HI	POL motor speed 1	HI	POL motor fault	HI
AZ motor speed 2	LO	POL motor speed 2	LO	Antenna hub fault	HI
AZ motor reset	LO	POL motor reset	LO	Auxiliary input 1	LO
AZ motor reserve	HI	POL motor reserve	HI	Auxiliary input 2	LO
Auxiliary output 1	LO	Auxiliary output 5	LO	Auxiliary input 3	LO
Auxiliary output 2	LO	Auxiliary output 6	LO	Auxiliary input 4	LO
EL motor forward	LO	Summary OK	HI	AZ limit switch H	HI
EL motor reverse	LO	Tracking OK	HI	AZ limit switch L	HI
EL motor speed 1	HI	Beacon RX preset 1	LO	AZ motor fault	HI
EL motor speed 2	LO	Beacon RX preset 2	LO	Emergency stop	HI
EL motor reset	LO	Beacon RX preset 3	LO	EL limit switch H	HI
EL motor reserve	HI	Beacon RX preset 4	LO	EL limit switch L	HI
Auxiliary output 3	LO	Auxiliary output 7	LO	EL motor fault	HI
Auxiliary output 4	LO	Auxiliary output 8	LO	Cabinet door open	HI

Flags:		Analog:	
AZ moving	LO	Temperature	37.7 °C
EL moving	LO	Beacon level	5.31 dBm
POL moving	LO	Nick	-90.0 °
		Roll	-90.0 °
AZ motor timeout	LO	AZ raw pointing	F778C000
EL motor timeout	LO	EL raw pointing	FD626000
POL motor timeout	LO	POL raw pointing	5A240000

AZ coefficients	1.78595E+02,-4.43357E-02,-6.81387E-02
EL coefficients	3.51780E+01,-4.38884E-02,6.52553E-02
Model epoch	2021-02-17 13:52:56

Setup page: As the name explains in this page the user configures the baseline antenna controller during the installation and integration phase.

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ACU Outdoor Module

- Pointing
- Target
- Tracking
- Orbital Data
- Test
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- Info
- Help

Step Move

STOP RESET

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Step Move

STOP RESET

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Antenna Setup Parameters

General

Note	3.7m Antenna		Date / time	2021-02-17 13:53:42
Display refresh	1 sec		Watchdog pulse on AUX8	OFF
Axes control mode	PARALLEL		Antenna mount type	AZ-OVER-EL
RS232 address	NONE		RS232 bauddate	9600
RS485 address	A		RS485 bauddate	9600
Use cab-open as handheld active	OFF		Use hub-fault as summary limit	OFF
Antenna mount declination	0.000 °		Show debug trace	GO

Azimuth

AZ Antenna diameter	3.7 m		AZ step delta	0.040 °
AZ Position sensor type	SSI-19B		AZ Motor driver type	DUAL-START
AZ Sense invert	NORMAL		AZ Motor timeout	8000 msec
AZ Pre scale offset	F3F1EEBD	calc.	AZ Post scale offset	207.500 °
AZ Calibration scale	0.000000		AZ Pointing hysteresis	0.025 °
			AZ Low speed threshold	3.0 °
AZ Lower limit	150.000 °		AZ Upper limit	265.000 °

Elevation

EL Antenna diameter	3.7 m		EL step delta	0.040 °
EL Position sensor type	SSI-19B		EL Motor driver type	DUAL-START
EL Sense invert	NORMAL		EL Motor timeout	8000 msec
EL Pre scale offset	FD658141	calc.	EL Post scale offset	42.500 °
EL Calibration scale	0.000000		EL Pointing hysteresis	0.025 °
			EL Low speed threshold	3.0 °
EL Lower limit	0.000 °		EL Upper limit	90.000 °

Polarization

Linear/Circular switch	DISABLED		PO step delta	0.20 °
PO Position sensor type	RESOLVER		PO Motor driver type	DUAL-START
PO Sense invert	NORMAL		PO Motor timeout	6000 msec
PO Pre scale offset	BD3471C8	calc.	PO Post scale offset	-32.500 °
PO Calibration scale	0.000000		PO Pointing hysteresis	0.500 °
			PO Low speed threshold	2.0 °
PO Lower limit	-90.000 °		PO Upper limit	92.000 °

Beacon Receiver

Beacon RX type	SATNMS		Beacon RX IP address	10.10.1.11
Beacon RX voltage scale	n/a		Beacon RX 0V level	n/a
Beacon RX frequency	11699.823 MHz		Beacon RX Pol. aliases (H,V)	H-X,V-Y

Location / Clock Sync

GPS receiver type	NONE		Antenna longitude	8.915 °E
Antenna course	0.000 °		Antenna latitude	47.782 °N
	[sync now]		Antenna abs. altitude	426 m
NTP server 1 address	192.53.103.108 [check]		NTP server 2 address	217.147.208.1 [check]

Orientation

Compass type	NONE		Inclinometer type	NONE
Nick offset	n/a		Roll offset	n/a

SNMP Control

SNMP read community	public		SNMP system name	ACU145
SNMP write community	private		SNMP system location	Default
SNMP trap community	public		SNMP system contact	SatService GmbH
SNMP traps	ENABLED		MIB File	ACU2.MIB
SNMP trap IP 1	192.168.2.32		SNMP trap IP 2	0.0.0.0
SNMP trap IP 3	0.0.0.0		SNMP trap IP 4	0.0.0.0

Access Control

User password	******		Admin password	******

Event Log page: The new event log shows you the status and error messages which where send by the *sat-nms* ACU2-19V2.

Info page: Presents the IP address information and the serial number of the *sat-nms* ACU2-ODM module within the *sat-nms* ACU2-19V2.

Help / documentation page: The documentation is in html form already on the antenna controller, enabling the operator to easily navigate the documentation on the same web browser used during operation.

------------------------End of GUI information for *sat-nms* ACU2-19V2 ---

Web based GUI of *sat-nms* LBRX19 L-band beacon receiver

Reading is the main page of the beacon receiver, presenting all measurement parameters and information.

sat-nms Beacon Receiver	**3.7m Antenna SatService Ku**	
State		
Settings	Input level	**-68.70 dBm**
Setup		
Event Log	RF receive frequency	11699.823 MHz
Info	L-Band receive frequency	1949.823 MHz (LO=9750.000 MHz)
Help	Polarization	Hor
	Frequency tracking offset	4 kHz
Fine Tune	Frequency tracking	ON (inhibited)
◀◀ ◀ ▶ ▶▶	Attenuation	10 dB
	Measurement bandwidth	30 kHz
	Post detector filter	0.5 Hz
	Noise level	n/a
	Analog output voltage	2.37 V
	Temperature	49.5 C
	Time	2021-02-17 14:24:01
© 2003-2020 SatService GmbH	Last time synchronization	2021-02-17 14:24:00 from NTP1
	Receive level alarm	OK
	Frequency tracking alarm	OK
	Synthesizer lock alarm	OK
	D/C supply alarm	OK
	NTP time sync alarm	OK

Settings page: Here the user configures the beacon receiver's operational measurement parameters and modes of operation

Operational Settings

RF receive frequency	11699.823 MHz
Polarization	Hor
Attenuation	10 dB
Measurement bandwidth	30 kHz
Post detector filter	0.5 Hz
Spectrum compensation	OFF
Alarm threshold	-77.00 dBm

Signal search enable	OFF [SEARCH NOW]
Signal search delay	15 sec

Frequency tracking	ON
Frequency tracking interval	600 sec
Frequency tracking width	100 kHz

C/N measurement mode	OFF
Noise measurement frequency	11450.360 MHz
Noise measurement interval	5 sec

Setup page: Here are the baseline settings of the beacon receiver configured, mainly during time of installation. The beacon receiver is very flexible in multi-feed applications; each input port can have a unique LO frequency.

sat-nms
Beacon Receiver

Installation Settings

LO selection mode	LEGACY
LNB voltage	AUTO
22kHz Tone	AUTO

LO frequency 4	n/a
Band edge 3/4	n/a
LO frequency 3	n/a
Band edge 2/3	n/a
LO frequency 2	10600.000 MHz
Band edge 1/2	11800.000 MHz
LO frequency 1	9750.000 MHz

LO 4 high frequency limit	n/a
LO 4 low frequency limit	n/a
LO 3 high frequency limit	n/a
LO 3 low frequency limit	n/a
LO 2 high frequency limit	13100.000 MHz
LO 2 low frequency limit	11550.000 MHz
LO 1 high frequency limit	12250.000 MHz
LO 1 low frequency limit	10700.000 MHz

Analog output scale	0.2100 V/dB
Analog output offset	-80.00 dB

UDP destination address	10.10.1.10
Communication address	A
Novella emulation	OFF
Relay 2 function	LEVEL

Note	3.7m Antenna SatService Ku
Display refresh rate	1 sec
User password	******
Admin password	******
Polarization aliases	Hor,Vert

SNMP system contact	SatService GmbH
SNMP system name	BCRX24
SNMP system location	Default
MIB File	BCRX.MIB
SNMP read community	public
SNMP write community	private
SNMP trap community	public
SNMP traps	DISABLED
SNMP trap IP 1	0.0.0.0
SNMP trap IP 2	0.0.0.0
SNMP trap IP 3	0.0.0.0
SNMP trap IP 4	0.0.0.0

Time	2021-02-17 14:25:31
NTP server 1 address [check] [sync]	192.53.103.108
NTP server 2 address [check]	0.0.0.0

[REBOOT] the beacon receiver

State
Settings
Setup
Event Log
Info
Help

Fine Tune

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Event log page: The new version of the *sat-nms* LBRX module provides now also an event log functionality. This has the advantage that now also an operator which does not have a central monitoring & control system can verify the behavior of the antenna controller/tracking system via the web interface.

Info page: In the info page we present not only the software version and the IP parameters of the beacon receiver, but also all calibration data which was measured and installed during the calibration and verification measurements at time of production and testing.

Info

```
Type:               SatService Beacon Receiver
Serial No.:         0DFF1 (SC24)
Software Version:   2.5.041 2020-05-04
Frontpanel:         Not Available
Input Switch:       Not Available
IP Address:         10.10.1.11
Subnet Mask:        255.255.255.0
Gateway:            10.10.1.1
Calibration Date:   2007-11-05 14:29


Calibration Constants

a/d -> dB calibration:          0.00162 dB/bit + 2.390e-07 dB/bit/°C
offset for att=0 dB:            -125.64 dB + 1.117e-01 dB/°C
offset for att=10 dB:           -115.95 dB + 1.039e-01 dB/°C
offset for att=20 dB:           -106.14 dB + 1.126e-01 dB/°C
offset for att=30 dB:           -96.36 dB + 1.213e-01 dB/°C
compensation for 6kHz filter:   0.47 dB + 1.472e-02 dB/°C
compensation for 12kHz filter:  0.14 dB + 1.923e-02 dB/°C
compensation for 30kHz filter:  0.00 dB + 0.000e+00 dB/°C
compensation for 100kHz filter: -0.98 dB + 1.437e-02 dB/°C


Band / Polarization Level Offsets

Frequency Band 1, Horizontal: 0.00 dB
Frequency Band 1, Vertical:   0.00 dB
Frequency Band 2, Horizontal: 0.00 dB
Frequency Band 2, Vertical:   0.00 dB


Frequency Compensation Table (0 dB Attenuation)

MHz        dB

950.0    -0.350
1000.0   +0.000
1050.0   +0.270
1100.0   +0.280
1150.0   +0.330
1200.0   +0.390
1250.0   +0.590
1300.0   +0.720
```

Help / documentation page: The full documentation is in html form already on the beacon receiver, enabling the operator to easily navigate the documentation on the same web browser as used during operation.

sat-nms
Beacon Receiver

- State
- Settings
- Setup
- Event Log
- Info
- Help

Fine Tune

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1 Introduction

The **sat-nms** L-band beacon receiver manufactured by SatService GmbH is a measurement tool which measures the RF input level and provides this information as output signal for control systems. The main application of this receiver is in antenna tracking systems where the receiver provides the tracking signal level to the antenna step-track controller. Other applications can be pilot measurement and control loops like uplink power control.

The beacon RX receives a satellite beacon signal which is down-converted to L-Band by a PLL stabilized Low Noise Converter (LNC) at its L-band interface input. The beacon RX does not demodulate any satellite because the satellite signals are sometimes CW signals but also very often modulated in FM or BPSK form. Due to this fact the best implementation is a non-coherent receiver which measures the input level in a user selectable defined bandwidth and provides this as a dB-linear and calibrated analogue output voltage and digital information.

The level output is provided by three different and parallel available interface types: a HTTP Web Interface via an internal Web Server, a RS232 interface or the analog voltage output. The **sat-nms** beacon receiver is controlled remotely by a monitoring and control application through the TCP/IP interface. All communication with the power sensor is made with HTTP get requests. The beacon receiver implements the 'Hypertext Transfer Protocol' (HTTP, RFC-1945) both, for the user interface and for the M&C interface.

This document is the user manual provided with the **sat-nms** LBRX beacon receiver. It contains all necessary information how to install, setup and operate the receiver. The user manual is available as a printed document and for on-line reading on the beacon receiver itself as well.

Version 2.3 / 2016-05-04

The paragraphs below give a short overview to the contents of the documentation. A subset of this documentation is stored on the device itself, the complete documentation is available on the **sat-nms** documentation CD and at www.satnms.com.

- Installation: The installation chapter guides through the installation and setup of the LBRX beacon receiver. It describes the mechanical concept of the receiver box and the assignment of the receiver's connectors. Finally you learn in this chapter how to set the receiver's IP address, which is a essential precondition to operate the receiver by means of a web browser. This section is available in the printed version only.

------------------------End of GUI information for **sat-nms** LBRX ---