

MSS-310

IP-Enabled Satellite QPSK Modulator 10Kbps – 2 Mbps, 70 MHz IF.

Key Features

- Selectable BPSK / QPSK / OQPSK modulation.
- Variable data rate: 10 Kbps – 2 Mbps.
- 52 - 88 MHz center frequency, tunable.
- Output level: -10 to -30 dBm.
- Transmit AGC keeps output level within +/- 0.3 dB of specified power level.
- Internal / External 10 MHz frequency reference.
- Turbo product code for error correction: 7.3 dB coding gain @ 10^{-6} BER (rate 0.793).
- TCP-IP baseband interface over standard 10baseT LAN, 10 Mbps, RJ-45 connector.
- Support for over-the-air signaling channel. Data and signaling streams are multiplexed using HDLC.
- Elastic buffering and flow-control.
- 19" rack mount, 1.75" height.
- Universal AC power supply: 90 – 264VAC.

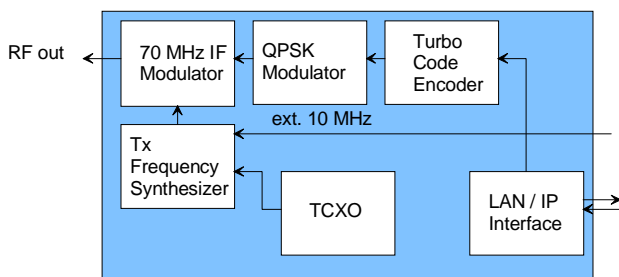


Modem Inputs / Outputs

Modem	Definition
RF OUT	SMA female. 50 Ohm impedance. Center frequency: 52 – 88 MHz. Tunable by steps of 1 Hz. Output level: -10 to -30 dBm. Transmit level resolution: 0.2 dB steps. Transmit gain stability over frequency and temperature (after calibration) +/- 0.3 dB. On/Off isolation: < -50 dBc. Out-of-band spectral spurious lines: < -60 dBc at maximum power settings. Transmit spectral mask in any 3 KHz band: @ 0.7 * modulation rate: < - 30 dBc @ 1.5 * modulation rate: < - 35 dBc @ 10 * modulation rate: < - 60 dBc.
EXT_REF_CLK	External 10 MHz frequency reference for frequency synthesis. Sinewave, clipped sinewave or squarewave. Minimum level 0.5Vpp. Maximum level: 3.3Vpp.
M&C	Definition
LAN	10 baseT, RJ-45, 10 Mbit/s.
Asynchronous serial	DB9 115.2 Kbps, 8 bit, no parity, one stop bit.

For the latest data sheet, please refer to the MSS web site:
www.mobile-sat.com/download/mss310.pdf.
These specifications are subject to change without notice.

Block Diagram



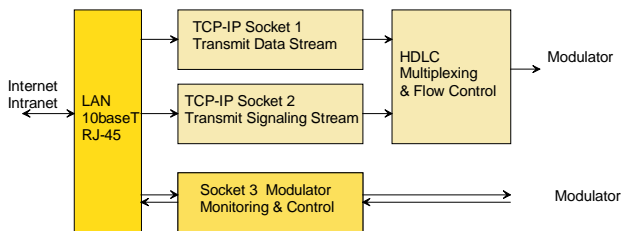
Baseband Interface

The primary baseband interface is the LAN, which is used for both data transfer and monitoring and control.

A single physical LAN connection supports three virtual channels:

- one transmit data stream
- one transmit signaling stream
- one monitoring & control channel.

The first two streams are handled as TCP-IP sockets. The modem is always listening for connections. The TCP-IP protocol between the satellite modem and a data server ensures proper flow control.



The modem opens the following sockets in listening mode:

- Port 1024: transmit data stream
- Port 1025: transmit signaling stream
- Port 1028: monitoring & control

The modem supports the following IP protocols:

- Ping
- ARP
- UDP
- TCP-IP

The modem responds to ping requests with size up to 500 bytes.

Initial Configuration (via Serial Link)

The IP address, IP mask, Gateway address and DNS addresses of the modem must first be configured over the serial link. These network settings are saved in non-volatile memory. Once the correct network settings are configured, the modem can communicate over the intranet or internet.

Configuration (via Serial Link / LAN)

Modems can be monitored and controlled remotely either over a serial link or over a LAN connection.

The modem configuration parameters are stored in non-volatile memory.

Parameters	Configuration
Reference clock	0 = Internal 1 = External clock
Modulator n-PSK	1 = BPSK 2 = QPSK 3 = OQPSK
Modulator output level	-10 to -30 dBm, steps of 0.2 dB
Modulator carrier center frequency	36 MHz, by steps of 1 Hz
Modulator symbol rate	Up to 2 Msymbols/s.
CRC insertions	0 = off 1 = 16-bit on 2 = 32-bit on
Scrambling	0 = off 1 = on
Transmitter spectral inversion	0 = off 1 = on
Test mode	0 = off 1 = 2047-bit pseudo-random data sequence. 2 = unmodulated carrier.

Monitoring (via Serial Link / LAN)

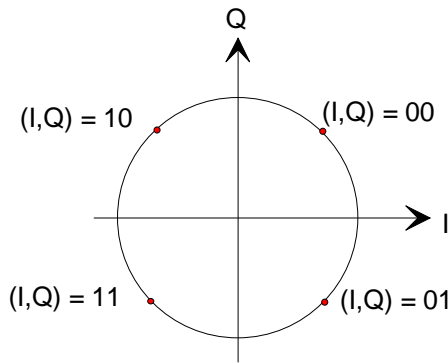
Parameters	Monitoring
Version	Returns version number "MSS310x"

Front-Panel LEDs

LEDs (3 total):	Status/Power Tx on LAN link / activity
dual seven segment display	configuration and error codes

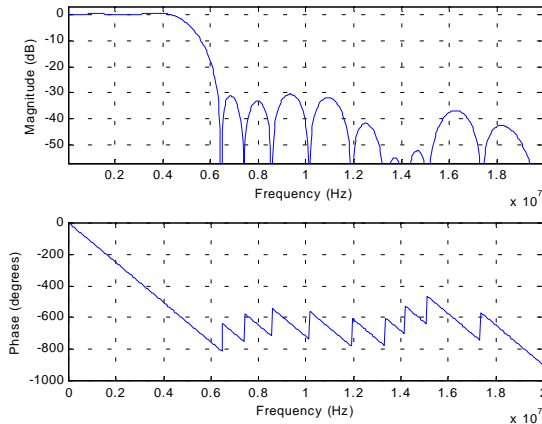
Implementation

Phase Map



Filter Response (20% rolloff)

A raised cosine square root filter is used to reduce the transmitted RF spectral mask.



The raised cosine square root filter with 20% rolloff is a 29-tap FIR filter with the following impulse response:

- Coeff(0) = -8/1024
- Coeff(1) = -16/1024
- Coeff(2) = -8/1024
- Coeff(3) = 8/1024
- Coeff(4) = 24/1024
- Coeff(5) = 24/1024
- Coeff(6) = 12/1024
- Coeff(7) = -16/1024

- Coeff(8) = -48/1024
- Coeff(9) = -52/1024
- Coeff(10) = -16/1024
- Coeff(11) = 64/1024
- Coeff(12) = 160/1024
- Coeff(13) = 240/1024
- Coeff(14) = 272/1024
- Coeff(j=15:28) = coeff(28-j);

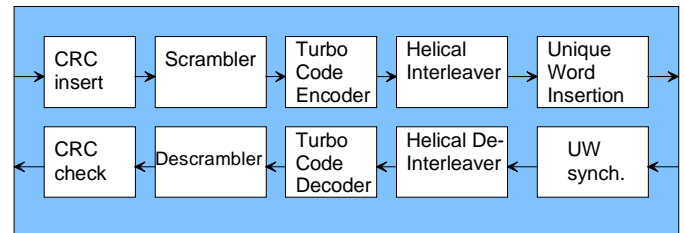
Phase Noise

The transmitter local oscillator phase noise performances are consistent with operations down to 10 Kbit/s.

Turbo Code

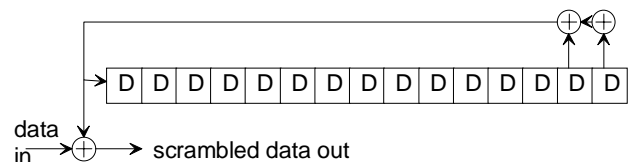
Turbo product codes (TPC) are used for error correction. A two-dimensional (64,57)x(64,57) TPC is used to provide 7.3 dB coding gain at 10⁻⁶ bit error rate. The block size is 4096 bits.

In order to keep the TPC encoder and TPC decoder synchronized, a 32-bit unique words is inserted before each 4096-bit block. The UW is
01011010 00001111 10111110 01100110 (binary)
0x 5A 0F BE 66 (hex)



Scrambling

A scrambler can be used to randomize the transmitted bit pattern. The scrambler is a 16-bit linear feedback shift register with generator polynomial $1 + x^{14} + x^{15}$.

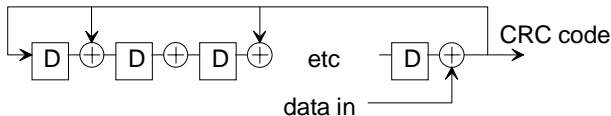


The scrambling and descrambling feature can be enabled or disabled by software command.

CRC check

The Cyclic Redundancy Code is used to detect blocks which contain uncorrected errors. A 16-bit or 32-bit CRC is appended to the data in each block. In applications where spectral efficiency is important, the CRC check can be disabled by software command.

The generic form of the CRC code generator is shown below:



Two standard CRC encoders are available: CCITT 16-bit CRC and 32-bit CRC. The feedback taps are 0x1 10 21 and 0x1 04 C1 1D B7 respectively. The MSB is the leftmost tap on the generic CRC code generator shown above.

Internal / External Frequency Reference

The modem includes a built-in internal 10 MHz reference clock with medium stability specifications (typically 2ppm over 0-40C, 8ppm over -40/85C). The frequency reference is selected by software among two possible sources: (a) the internal TCXO, (b) an external 10 MHz reference clock. The modem shall automatically revert to the internal TCXO if the currently selected source is no longer available. Total time for automatic fault detection and redundancy switchover shall be less than 1 second.

Power Supply

AC: Universal power supply.
90 – 264 VAC, 47-63 Hz single phase, automatic selection.
Power consumption: < 20W.

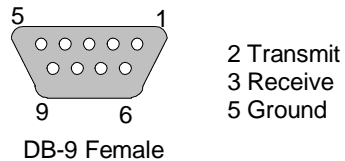
Mechanical

19" rack mount.
Width : 17.80"
Depth : 14"
Height: 1.74"
Color: black
Weight: 12 lbs.

Pinout

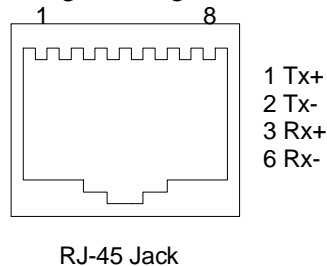
Serial Link

The DB-9 connector is wired as data circuit terminating equipment (DCE). Connection to a PC is over a straight-through cable. No null modem or gender changer is required.



LAN Connector

The RJ-45 Jack is wired as a standard PC network interface card. Connection to a LAN Hub is over a straight-through cable.



Ordering Information

MSS-310 70 MHz QPSK Modulator

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