

THE SATEL CATALOGUE



ON THE COVER
SATELLINE®-3ASd NMS
PAGE 7

TAKING STEPS IN A NEW DIRECTION

Amid the global economic downturn, our own activity is stimulating the company's operations. We at SATEL have been actively focusing our resources both on occupying new application areas and on developing new products, while not forgetting, however, the most important thing of all, namely you, our valued customer. We have listened to messages from our customers and based on these we have expanded our product range further.

We have launched the SATELLINE-3ASd Epic Pro 35 W device, which features high transmission power. This new IP67-classified modem is particularly well suited for land surveyors and others who work outdoors over long distances and in difficult conditions. Also new to our product range are the SATELLINE-M3-T1 and M3-R1 products, which are suitable for one-way data transmission. The strength of these products is a wide tuning range as well as their easy integration into devices due to a wide selection of connectors and housings.

We also want to offer our customers more freedom of choice; versions of our radio modems compatible with other manufacturers' equipment are available.



SATELLAR DIGITAL SYSTEM MORE THAN A RADIO MODEM – A COMPLETE SOLUTION

The most significant of the new products, however, is the new-generation digital radio modem system SATELLAR, which will be available in the near future. The SATELLAR product family consists of radio, central and expansion units that allow customers to assemble an equipment package that corresponds in terms of features to the needs of any particular system. SATELLAR's modular structure as well as wireless

TCP/IP and the Linux operating system will enable you to build a wireless data transfer network that suits you precisely.

We will gladly tell you more about our new products. Please contact us or your local distributor. You can also obtain detailed information about the new products from the new SATEL product catalogue that is now in your hands.

—Tuomas Pitkänen
Managing Director

DID YOU KNOW?

WHAT DO SATEL RADIOS DO?

SATEL radios are used in place of a data cable and can reach distances of up to tens of kilometers, depending on the terrain and output power. If this isn't long enough, the radios can be set to act as repeaters to extend the range over any distance. SATEL radio modems are used for a multitude of applications in numerous sectors of our everyday life. For example at airports for different monitoring and control applications, in industrial plants to set up internal data transfer networks and in cities for monitoring and traffic control. SATELLINE radio modems have been used, for example, to set up city wide alarm transfer networks and location data based traffic monitoring systems to enable smoother running of public transport and accurate timetable information at bus stops.



I WANT TO USE SATEL IN A UNIQUE WAY, CAN YOU HELP?

Most of our customers use SATEL for very specialized applications. We can meet almost all specifications. Because there are unlimited applications, SATEL has adapted the policy of providing every product with a reasonable number of parallel versions. Our mission is to help our customers solve their local area data communication problems. We are always open to the response and wishes from our customers. Send your specs and we'll be happy to assist you!

WHO USES SATEL?

Public and private enterprises worldwide use SATEL. Anywhere a wireless data link is needed, SATEL has a solution. Industries use SATEL in their manufacturing process; utilities use SATEL for energy and water systems, and dispatchers use SATEL to track fleets of vehicles with GPS linking. We are one of the leading suppliers in the world, operating worldwide through our wide distribution network.

WHAT IS SATEL'S HISTORY?

SATEL Oy, established in 1986, is a Finnish electronics and telecommunications company that specialises in the design, manufacturing, and international marketing of radio modems for data communication and alarm systems. One of the cornerstones of SATEL's success is the experienced personnel—many of whom have devoted a major part of their working lives to wireless data communications technology.



SATEL's Headquarters is located in Salo, Finland

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IMPORTANT

SATEL PRODUCTS HAVE NOT BEEN DESIGNED, INTENDED NOR INSPECTED TO BE USED IN ANY LIFE SUPPORT RELATED DEVICE OR SYSTEM RELATED FUNCTION NOR AS A PART OF ANY OTHER CRITICAL SYSTEM AND ARE GRANTED NO FUNCTIONAL WARRANTY IF THEY ARE USED IN ANY OF THE APPLICATIONS MENTIONED.

SATELLINE®-3ASd NMS
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HOW TO USE SATEL

APPLICATIONS

The usual applications include telemetry as well as remote control and surveillance. The radio modems are typically placed at locations to which cable connection is impossible or too costly to build. A wireless connection is flexible and easy to install. The distance between the stations included in a wireless communications network is scaleable in both point-to-point and point-to-multipoint applications. Ordinary range of direct contact is several kilometres. Longer distances can be handled by routing the message through radio modems acting as repeaters.



TRAFFIC

As traffic situations constantly change, static traffic signs are sometimes inadequate at serving road users in the best possible way. SATEL has addressed this by producing radio modem solutions that enable traffic control solutions, interactive traffic signs and vehicle tracking and positioning solutions.

LOGISTICS

In logistics it's important that everything is in its appointed place and that the location data is accurate, reliable and up-to-date. With SATELLINE radio modems it is easy to set up various location data applications.

SECURITY

Even the best alarm system can be next to useless if the reception of alarm status information is unreliable. SATEL radio modems, equipped with an auxiliary power source, are used worldwide in different alarm and control applications by both official authorities and private citizens.

MEASURING; DGPS AND ENVIRONMENT

In an age when having up-to-date, reliable information is vital, SATELLINE modems provide an easily installed solution. Used world wide in a variety of DGPS, remote measurement, control and interrogation applications, many companies have come to depend on SATEL products.

ENERGY

Within the energy industry SATELLINE radio modems are frequently used in monitoring and diagnostics applications, for example in SCADA systems. Independent radio modems with an auxiliary power supply can ensure communication under any circumstances, even if energy and data networks fail.

INDUSTRY

With a radio modem network, machines and workstations can be made independent from cabling. This enables flexible workspaces and easy layout changes. On vehicles, radio modem networks make real-time data transfer and various remote control applications a simple, cost effective reality.

WATER TREATMENT

Radio modems are used widely for the remote control and monitoring of waterworks and sewage processing plants. Since these installations are often in remote places or cover a large area, the data network needs to be flexible, easy to extend and above all reliable.

COUNTRY	SATELLINE-2ASc	SATELLINE-2ASxE	SATELLINE-3AS (d)	SATELLINE-3AS (d) Epic	SATELLINE-3AS (d) 869	SATELLINE-1870	SATELLINE-1870E	SATELLINE-3AS(d) VHF	SATELLINE-1915
Australia									
Austria									
Belgium									
Brazil									
Bulgaria									
Canada									
China									
Croatia									
Cyprus									
Czech									
Denmark									
Estonia									
Finland									
France									
Germany									
Greece									
Hong Kong									
Hungary									
Iceland									
India*									
Indonesia									
Ireland									

COUNTRY	SATELLINE-2ASc	SATELLINE-2ASxE	SATELLINE-3AS (d)	SATELLINE-3AS (d) Epic	SATELLINE-3AS (d) 869	SATELLINE-1870	SATELLINE-1870E	SATELLINE-3AS(d) VHF	SATELLINE-1915
Israel									
Italy									
Kazakhstan*									
Korea**									
Latvia									
Lithuania									
Malaysia									
Mexico									
Netherlands									
Norway									
Oman									
Poland									
Portugal									
Romania									
Russia									
Singapore									
Slovak Republic									
Slovenia									
South Africa									
Spain									
Sweden									
Switzerland									

TYPE APPROVALS

SATELLINE radio modems are type approved globally. Type approvals ensure frequency compatibility with other uses of the radio spectrum in a given country. The table on this page shows where SATELLINE modems are currently type-approved. If you would like to use a product that is not currently type-approved with your national government, contact your local distributor. Your distributor may already be in the process of securing approval.

RoHS COMPLIANCE

SATEL products meets the EU directive 2002/95/EC on the Restriction of Hazardous Substances (RoHS) and directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE). If you require further information regarding type approvals or RoHS, please contact your local distributor.

COUNTRY	SATELLINE-2ASc	SATELLINE-2ASxE	SATELLINE-3AS (d)	SATELLINE-3AS (d) Epic	SATELLINE-3AS (d) 869	SATELLINE-1870	SATELLINE-1870E	SATELLINE-3AS(d) VHF	SATELLINE-1915
Thailand									
Taiwan*									
Turkey									
UK									
Ukraine									
United Arab Emirates									
USA									
Vietnam									

*Project approval to be applied case-by-case.
 **Special versions only for Korea available.

NEW! More than just a radio modem
- a complete solution

SATELLAR is a new generation digital radio modem system that consists of several different units:

- Central unit (CU)
- Radio unit (RU)
- Expansion units (XU)

SATELLAR enables the building of an independent, reliable, real-time radio data communication system that meets the specific needs of the customer.

Typically, a central unit together with a radio unit are used in a network as a master station or in locations where an Ethernet connection is needed. For radio router stations, the central unit is not necessarily required. In these cases, the radio unit can be used alone. This is possible because of the modular structure of the product.

SATELLAR units are available as separate entities or as combined product packages:

- the SATELLAR-2DS includes a radio unit and a central unit, which enables full TCP/IP connectivity.
- the SATELLAR-2DSd provides the same functionality as the SATELLAR-2DS, but it is equipped with a colour display and a keypad.
- the SATELLAR-1DS is a radio unit that can be used in stations where a standard RS-connection is sufficient.

More information from www.satel.com or by contacting us.

Check the delivery time from your local distributor.



Radio unit

Expansion unit

Central unit

SATELLAR TECHNICAL SPECIFICATIONS, RADIO UNIT

RADIO-SPECIFICATIONS

Frequency Range	380 ... 520 MHz *
Tuning Range	< 20 MHz
Channel Spacing	12.5 ja 25 kHz, selectable

TRANSMITTER

Carrier Power	100 mW ... 1 W, SW adjustable with 10 mW steps
Radio interface speed	38400 bps @ 25 kHz channel 19200 bps @ 12.5 kHz channel

RECEIVER

Sensitivity (dBm)	
Channel spacing / air speed BER	BER
	10E-3 10E-3 (50 % FEC) 10E-6 10E-6 (50 % FEC)
25 kHz / 19200 bps	-114 -116 -110 -115
12.5 kHz / 9600 bps	-117 -119 -113 -118

GENERAL

Power consumption	10 W @ 100 mW
Interface - power	Detachable / lockable screw terminal
Interface - DTE	RS-232 interface, D9 female
Interface - RF	TNC female
Size K x L x P	130 x 24.3 x 76.5 mm
Weight	300 g

SATELLAR TECHNICAL SPECIFICATIONS, CENTRAL UNIT

Size	130 x 21.7 x 76.5 mm
Wight	260 g
CPU	ARM 9 @ ~ 200 MHz
RAM	64 MB RAM
ROM	128 MB flash
Display	2.4 ", 320 x 240 pixel resolution, 65 k colours
Keypad	up, down, left, right, OK (select) and two SW defined keys
Power consumption	2.0 W with UI
(no USB device connected)	1.4 W without UI
USB interfaces	USB-host & USB-device USB2.0 full speed
Ethernet interface	10/100 Mbit Ethernet RJ-45 with AUTOMDX

GENERAL

Standard compliance **	
Radio requirements	EN 300 113 MS, FCC Part 90
Emissions, immunity, ESD central unit	EN 61000-6-2, 61000-6-4
RoHS	2002/95/EC
Temperature ranges	-25 - +55 °C (complies with radio standards) -30 - +75 °C (functional) -40 - +85 °C (storage)
Humidity	< 95 % @ 25 °C, non-condensing
Mounting	DIN rail (side or back), Direct on flat surface
Vibration	at least 10 - 500 Hz / 5 g without degradation in data transfer capability
Shock resistance	dropping height 1 m / all directions
IP rating	IP52
DC input range	+9 Vdc ... +30 Vdc

Values are subject to change without notice.

* Check the available versions from local SATEL distributor.

** Check the local standard compliances from local SATEL distributor.



VHF RADIO MODEMS WITH NMS

VHF with NMS

UHF with NMS

UHF

Licence Free

IP67

OEM

KEY FEATURES

- With advanced NMS functions
- Wide frequency ranges
- Compatible with RS-232, RS-485 and RS-422 interfaces
- Wide coverage

SATELLINE-3AS(d) VHF

A SATELLINE-3AS(d) VHF network consists of remotely adjustable radio modems operated in a polling mode. It is controlled through the Master Station by dedicated SATEL NMS PC software. The Network Management System is compatible with most user protocols, making the NMS network suitable for numerous applications. Please note that SATELLINE-3AS(d) VHF modems can be used by taking advantage of the NMS features or in transparent mode.

SATELLINE-3AS(d) VHF is a half-duplex, high speed radio modem, with up-to-date hardware features and completely renovated software architecture. It operates in the 135...174 and 218...238 MHz frequency bands. Channel spacing 12.5 kHz or 25 kHz is available, with over-the-air data rates 9600 bps and 19200 bps, respectively. The SATEL NMS software provides a powerful graphical tool for designing a radio network, which ensures that NMS radio modems receive and transfer only desired messages.

The radio modem is compatible with the most widely used serial interfaces: RS-232, RS-485, and RS-422. Terminal data rates are selectable between 1200 bps and 38400 bps. The carrier power level of the transmitter can be set between the limits 100 mW...5 W. SATELLINE-3AS(d) VHF with heat sink is the appropriate choice when continuous transmission with 5 W output power is required. A connection range of up to tens of kilometers can be reached, depending on topography.

A special advantage of the SATELLINE-3AS VHF is the wider coverage. With the same carrier power and antenna gain, the connection ranges are 30 to 50 percent larger than those reached with the UHF radio modem.

SATELLINE-3AS VHF	YM5000
SATELLINE-3ASd VHF with Display	YM5010
SATELLINE-3AS VHF with Heat Sink	YM5020
SATELLINE-3ASd VHF with Display and Heat Sink	YM5030

TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	135 ... 174 MHz (135 ... 155, 138 ... 160 and 155... 174 MHz variants) 218...238 MHz
Channel Spacing	12.5 kHz / 25 kHz
No. Of Channels	1760 max.
Communication Mode	Half-duplex

TRANSMITTER

Carrier Power	100 mW, 500 mW, 1 W, 5 W / 50 ohm
---------------	-----------------------------------

RECEIVER

Sensitivity	< -115 dBm (BER < 10E-3)
Co-Channel Rejection	> - 12 dB

DATA MODEM

Interface	RS-232, RS-485, or RS-422
Interface connector	D15, female
Data speed of RS Interface	1200 - 38400 bps
Data speed of radio interface	9600 / 19200 bps
Data Formats	Asynchronous data

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating Voltage	+ 9 ... +30 Vdc
Power Consumption	1.7 VA max (Receive) 6.6 VA typical (1W Transmit) 22 VA max (5W Transmit) 0.07 VA (When DTR is "0")
Size H x W x D	137 x 67 x 29 mm (without a heat sink) 137 x 80 x 56 mm (with heat sink)
Weight	265 g (without a heat sink) 550 g (with heat sink)
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C



UHF RADIO MODEMS WITH NMS

KEY FEATURES

- With advanced NMS functions
- Compatible with RS-232, RS-485 and RS-422 interfaces
- Compatible with Epic NMS modems

SATELLINE-3AS(d) NMS

SATELLINE-3AS NMS introduces SATEL's concept of remotely manageable radio modems. In addition to ordinary communication functions, it allows remote configuration through the master radio, efficient diagnostics tools, and accumulation of operation statistics data.

The management and surveillance of SATELLINE-3AS(d) NMS radio modem network is affected through the Master Station connected by a serial interface to a PC with dedicated Network Management software.

The Network Management System provides easy configuration of the network and advance indication of faults for maximum reliability, labor-saving maintenance work, and efficient system management.

The NMS radio modems monitor the quality of the radio connection, received signal strength (RSSI), and the voltage level of the power source, as well as the inner temperature of the modem, on a continuous basis. The information is transmitted to the SATEL NMS PC software, where the long-term logs of the operational data are stored. The software allows the follow-up of the trends and regularly occurring events.

The Network Management System offers several significant benefits, including

- Enhanced reliability, through advance indication of anticipated faults and failures
- Reduced configuration and maintenance costs, through remote configuration
- Efficient network development tool
- Flexibility in adapting to customer protocols and applications

A SATELLINE-3AS NMS network provides a solution to a variety of wireless data communications applications. It is especially suited for frequently changing networks and applications requiring utmost reliability, thanks to efficient monitoring of the signal quality and flexible use of alternative routing.

Remote, continuous monitoring of the voltage level of the power source as well as the temperature of the radio modem provides early indication and the possibility of avoiding anticipated problems. Please note that SATELLINE-3AS(d) NMS modems can be used either by taking advantage of the NMS features or in transparent mode.

SATELLINE-3ASd NMS	YM1075
SATELLINE-3AS NMS	YM1070

VHF with NMS

UHF with NMS

UHF

Licence Free

IP67

OEM



TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	360...470 MHz
Channel Spacing	12.5 / 20 / 25 kHz
No. Of Channels	160 / 100 / 80
Communication Mode	Half-duplex

TRANSMITTER

Carrier Power	10mW...1W
---------------	-----------

RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
Co-Channel Rejection	> - 12 dB

DATA MODEM

Interface	RS-232, RS-485, or RS-422
Interface connector	D15, female
Data speed of RS Interface	1200 - 38400 bps
Data speed of radio interface	19200 bps (25 kHz channel) 9600 bps (12.5 and 20 kHz channel)
Data Formats	Asynchronous data

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating Voltage	+7.2 ... +30 Vdc
Power Consumption	1.4 VA typical (Receive) 6.0 VA typical (Transmit) 0.05 VA (When DTR is "0")
Size H x W x D	137 x 67 x 29 mm
Weight	260 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C

UHF RADIO MODEMS WITH NMS

VHF with NMS

UHF with NMS

UHF

Licence Free

IP67

OEM

TECHNICAL SPECIFICATIONS

TRANSCIVER

Frequency Range	360...470 MHz
Channel Spacing	12.5 kHz / 20 kHz / 25 kHz
Number of Channels	160 / 100 / 80 (or 2x 160 / 100 / 80)
Communication Mode	Half-Duplex

TRANSMITTER

Carrier Power	1, 2, 5 and 10 W / 50 ohm
---------------	---------------------------

RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
Co-channel Rejection	> -12 dB
Diversity	Space diversity

DATA MODEM

Interface level	RS-232, RS-485 or RS-422
Interface	One port for data and one for NMS
Interface Connector	D15, female
Data speed of RS interface	1200 - 38400 bps
Data speed of radio interface	19200 bps @ 25 kHz 9600 bps @ 12.5 / 20 kHz
Data format	Asynchronous

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating voltage	+ 11.8 ...+ 30 Vdc
Power consumption	3 VA typical (Receive) 33 VA typical (Transmit) 0.1 VA typical (in Standby mode)
Size H x W x D	154 x 123 x 29 mm without cooling part 154 x 151 x 77 mm with cooling part
Weight	580 g without cooling part 1480 g with cooling part
Operating Temperature	-25 °C...+55 °C (tests acc. to ETSI standards) -40 °C...+75 °C (absolute min/max)
Storage Temperature	-40 °C...+85 °C



Shown with optional heat sink.



SATELLINE-3AS(d) Epic NMS

The SATELLINE-3AS Epic NMS exhibits a high power (10 W) transmitter and two receivers operated in a Diversity Reception mode. The Diversity Reception improves the reliability of the connection where there is a lot of signal fading caused by reflections. The high-output power and the Diversity Reception make it possible to more than double the connection distances in comparison to ordinary SATELLINE-3AS NMS radio modems with 1 W output power.

The remotely manageable SATELLINE-3AS Epic NMS offers configuration through radio, efficient diagnostics tools and accumulation of operation statistics data, in addition to ordinary communication functions.

The management and surveillance of a network of 3AS Epic NMS radio modems is effected through the Master Station connected by a serial interface to a PC with dedicated Network Management software.

DIVERSITY RECEPTION

Fading of a radio signal occurs when a signal reflected from several objects is caught by the antenna of a radio modem and reaches the receiver at different times. The signals at the receiving antenna are in different phases so in the worst case two equally strong signals being in opposite phases cancel each other out causing signal fading. The SATELLINE-3AS Epic NMS is equipped with two separate receivers. Signal fading is reduced by tuning the two antennas properly apart from each other.

DEPENDABLE LONG-RANGE DATA TRANSFER

The 3AS Epic NMS radio modems monitor, on a continuous basis, the condition of the radio connection, in particular the strength of the signal (RSSI) and the voltage level of the power source as well as the inside temperature of the modem. The information is transmitted to the SATEL NMS PC, where it is stored and displayed as logs and trend data. In the SATELLINE-3AS Epic NMS the error rate is minimised by means of advance checking and correction of the data packets. In Forward Error Correction (FEC), the data packets are split in several blocks. The radio modem adds correction information inside the blocks during transmission.

A SATELLINE-3AS Epic NMS network consists of remotely adjustable radio modems operated in a polling mode, and controlled through the Master Station by dedicated SATEL NMS software. The Network Management System is compatible with most user protocols, making the NMS network suitable for a wide range of applications.

KEY FEATURES

- With NMS functions
- Compatible with RS-232, RS-485 and RS-422 interfaces
- Compatible with 3AS(d) NMS modems
- Diversity reception

SATELLINE-3AS(d) EPIC NMS *d* INDICATES DISPLAY

SATELLINE-3AS Epic NMS **YM3010**

SATELLINE-3ASd Epic NMS **YM3011**

WITH HEAT SINK

SATELLINE-3AS Epic NMS C **YM3012**

SATELLINE-3ASd Epic NMS C **YM3013**

NETWORK MANAGEMENT SYSTEM (NMS)

The SATEL NMS improves your network's reliability by allowing you to anticipate problems and even resolve them without needing to visit the site. Vital network statistics and modem settings are instantly accessible from your computer.

SATEL NMS PC is a software tool designed by SATEL for assisting when configuring, monitoring, and diagnosing radio modem networks constructed with new SATELLINE-3AS(d) NMS or VHF modems. The program is compatible with Windows® 2000 and Windows® XP operating systems.

MONITORING AND DIAGNOSTICS

SATEL NMS allows the modem network to be monitored constantly (online) while maintaining normal operations. SATEL NMS adds a small amount of diagnostics data to each packet sent by the network. A user's data is not affected by SATEL NMS traffic.

The system allows a real-time monitoring of several vital network diagnostics values, such as Received Signal Strength (RSSI) for each link direction, modem supply voltage, and operating temperature.

SATEL NMS maintains log files for the monitored values and includes a log viewer window to show the values as a graph.

RADIO MODEM CONFIGURATION

SATEL NMS also replaces the terminal software SATERM, made by SATEL, as the network configuration tool for the new SATELLINE-3AS(d) NMS or VHF modems. The network is drawn on a PC screen by using an easy-to-use graphical network designer, and the modem settings are automatically created. The modem settings are then initialized one-by-one using a serial cable between SATELLINE-3AS(d) NMS or VHF modem and PC before the final deployment to the field.

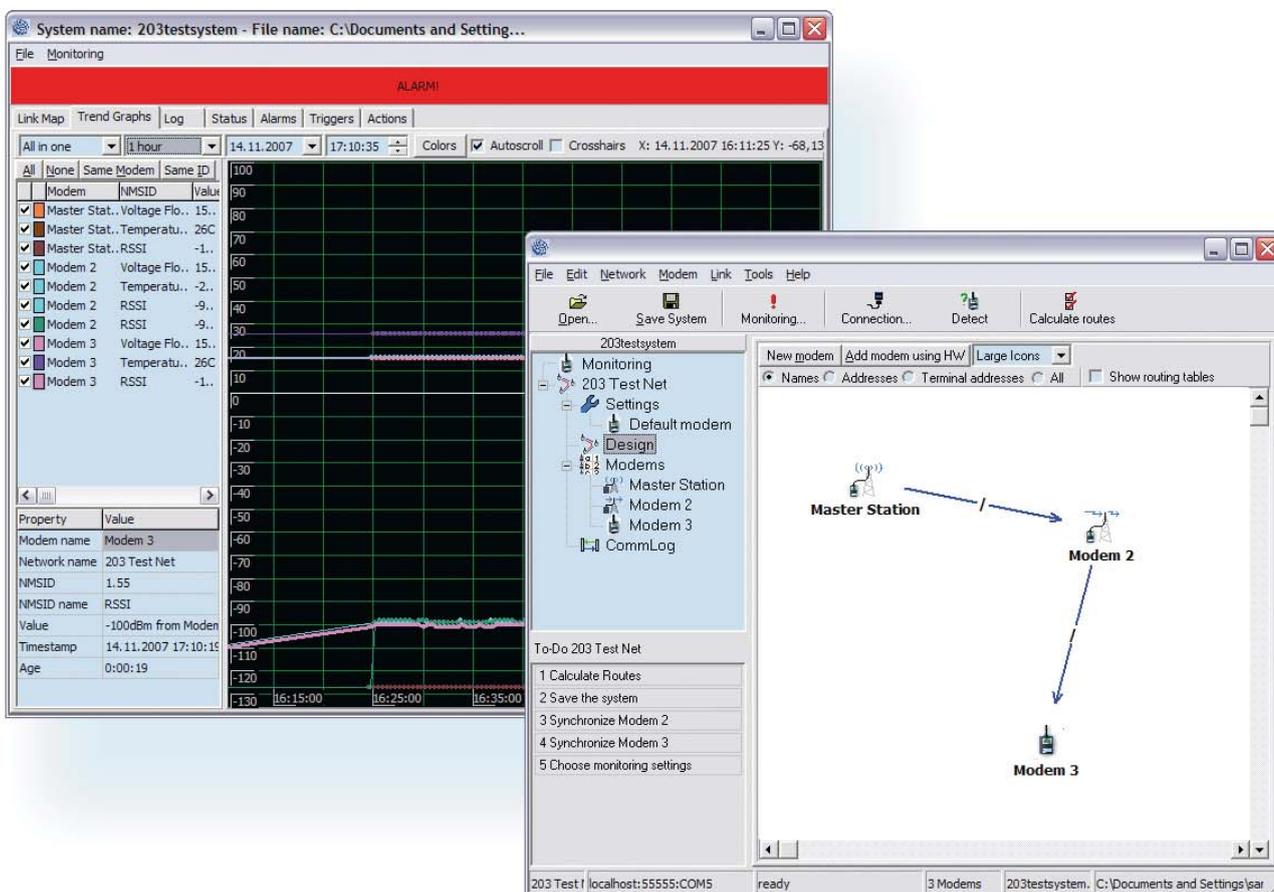
Using SATEL NMS, it is possible to configure settings of any modem in a deployed network remotely from a central location.

NETWORK DESIGN AND CONFIGURATION

With the graphical interface of the SATEL NMS PC, the user can conveniently configure, add or remove radio modems, as well as draw message routes and set repeater links.

All features of SATEL NMS may be activated while the user's system is operational (online) or the system may be temporarily disabled (offline) while the maintenance and measurements are performed.

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM



UHF RADIO MODEMS

VHF with NMS

UHF with NMS

UHF

Licence Free

IP67

OEM

SATELLINE-3AS & 3ASd

These half-duplex radio modems are suitable for a vast variety of critical data applications that demand speed and precision. The SATELLINE-3AS software features selectable error correction, which improves the functioning of the radio under interference. A complete line of accessories, including weatherproof battery packs, housings, and antennas complement the 3AS series.

MESSAGE ROUTING

Communication is fully transparent, which makes message routing directly compatible to most user protocols. Even though the network can cover large areas with multiple hops and repeater stations, only one radio channel is necessary. Any radio modem in the network can act as a repeater station, keeping infrastructure costs low.

RADIO NETWORK DESIGN

With the included free SaTerm PC software you can graphically design a radio modem network, troubleshoot, and make radio modem firmware updates. With SaTerm it is possible to simply draw the connections between radio modems, and the routing information is automatically generated. If access to a computer isn't convenient, manual setup of the radio network can be configured directly with the modem's LCD screen.

FREE CHANNEL SCAN

Free Channel Scan (FCS) is designed for one-way transmission between a transmitter and one or more receivers when there are multiple transmission frequencies available. The transmitter monitors the noise level of the channels between the transmissions and finds the best transmission channel. This feature is beneficial especially when Licence-free channels are used and there could be other transmitters using the same channels.

LOW VOLTAGE VERSION

The SATELLINE-3AS is also available in a low voltage version. The range is from 6.5 to 8.5 Vdc with the nominal voltage being 7.2 Volts. The average power consumption is 160 mA when receiving, 700 mA when transmitting, and 0.8 mA in standby mode. All the other technical specifications are the same as the standard version (+9...+30 Vdc).

DUAL BAND VERSION

SATELLINE-3AS(d) radio modem is also available as a special "Dual Band" version. The radio transceiver of the Dual Band version offers two times two MHz frequency bands and radio modem can be reprogrammed to operate at any channel within those two bands. Frequency bands are tuned at the factory and the maximum separation between the highest and the lowest frequency is 15 MHz. New special PCC compatible version available too. In order to get more information please contact your nearest SATEL distributor.

SATELLINE-3AS	YM1011
SATELLINE-3AS Dual Band	YM1012
SATELLINE-3AS 7V2 (Low Voltage)	YM1031
SATELLINE-3ASd	YM1016
SATELLINE-3ASd Dual Band	YM1017
SATELLINE-3ASd 7V2 (Low Voltage)	YM1033

KEY FEATURES

- Compatible with RS-232, RS-422 and RS-485
- Compatible with SATELLINE-3AS(d) Epic
- Each radio can be set to act as a repeater.
- 19200 bps maximum.
- PCC compatible version available

NEW!



TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	360...470 MHz
Channel Spacing	12.5 / 20 or 25 kHz
No. Of Channels	160 /100 or 80
Communication Mode	Half-duplex

TRANSMITTER

Carrier Power	10 mW ... 1 W / 50 ohm
---------------	------------------------

RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
Co-Channel Rejection	> - 12 dB

DATA MODEM

Interface	RS-232 or RS-485, RS-422
Interface connector	Connector D 15, female
Data speed of RS Interface	300 - 38400 bps
Data speed of radio interface	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channels)
Data Formats	Asynchronous data

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating Voltage	+ 9 ... +30 Vdc
Power Consumption	1.8 VA typical (Receive) 6.0 VA typical (Transmit) 0.05 VA (When DTR is "0")
Size H x W x D	137 x 67 x 29 mm
Weight	260 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C

SATELLINE®-3AS(d) Epic

SATELLINE-3AS Epic includes a high power 10 watt transmitter and two receivers. The powerful transmitter gives you better coverage and a potential 10 to 90 kilometer distance between stations. The modem automatically chooses the best signal from two independent receivers for greater signal reception. Compared to the regular SATELLINE-3AS radio modems, the Epic offers greater range and signal reliability; it more than doubles the distances between modems.

KEY FEATURES

- 10 Watt transmitter offers potential 90 km range.
- Diversity reception improves reception.
- Compatible with SATELLINE-3AS(d) modems
- NEW!** PCC compatible version available

DIVERSITY RECEPTION

You don't need to have a direct visual connection between the master station and the moving substation because the radio signal transmits by reflecting from buildings and geography, like hills. The transmission speed of the radio signals is the speed of light, so signals reflecting off of different objects get to the receiver at different times. The signals at the receiving antenna come in different phases, so even in the worst case, two "opposite but equal" signals cancel each other out, causing fading. The dips of the signal appear with half-wave intervals. In connections based only on reflections, the reliability of the receiving signal depends on the position of the receiving antenna, even when it's close to the base station. By setting the two antennas of the diversity receiver at least $\frac{3}{4}$ x wavelength apart from each other, the message can always be received by one of the receivers, if not both. This way they are rarely at the same time at the fading dips.

POWER SAVE VERSION

SATELLINE-3AS Epic is available also in a Power Save Version. The power consumption in this version is 1.7 VAMPS when receiving and when transmitting it is the same as the normal Epic. This feature is especially required, for instance, in applications where the power is generated by solar panels.

New special PCC compatible version available too. In order to get more information please contact your nearest SATEL distributor.

SATELLINE-3AS(d) EPIC *d* INDICATES DISPLAY

SATELLINE-3AS Epic	YM3000
SATELLINE-3ASd Epic	YM3001

POWER SAVE VERSION

SATELLINE-3AS Epic DB PWRS	YM3008
SATELLINE-3AS Epic C PWRS	YM3009

WITH HEAT SINK

SATELLINE-3AS Epic C	YM3002
SATELLINE-3ASd Epic C	YM3003

DUAL BAND

SATELLINE-3AS Epic DB	YM3004
SATELLINE-3ASd Epic DB	YM3005

DUAL BAND WITH HEAT SINK

SATELLINE-3AS Epic C DB	YM3006
SATELLINE-3ASd Epic C DB	YM3007



VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

3AS EPIC TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	360 ... 470 MHz
Channel Spacing	12.5 / 20 or 25 kHz
No. Of Channels	160 or 80

TRANSMITTER

Carrier Power	1 ... 10 W / 50 ohm
---------------	---------------------

RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
Co-Channel Rejection	> - 12 dB
Diversity Scheme	Space diversity, selection combining

DATA MODEM

Interface	RS-232 or RS-485, RS-422
Interface connector	D15, female
Data speed of RS Interface	300 - 38400 bps
Data speed of Radio Interface	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channels)
Data Formats	Asynchronous data

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating Voltage	+11.8 ... +30 Vdc
Power Consumption	3 VA typical (Receive) 25 VA typical (Transmit)
	154 x 123 x 29 mm without heat sink 154 x 151 x 77 mm with heat sink
Weight	580 g without heat sink 1520 g with heat sink
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C

UHF RADIO MODEMS

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

SATELLINE®-2ASc

Primarily, the purpose of the 2ASc is to ensure network compatibility with the discontinued SATELLINE-1AS and 2AS radio modems. The SATELLINE-2ASc radio modem used for diverse applications in half-duplex data message transfer, features a synthesized 80 or 100 -channel radio, operating in the 380-470 MHz frequency range. The accompanying RS-232 interface facilitates trouble-free connections to many data terminals and systems.

CHARACTERISTICS

There are two methods of initiating data relay with the SATELLINE-2ASc. Transmission can be activated with two methods—data coming from TD line activates the transmission,

or by using RTS/CTS handshaking. RTS/CTS handshaking is only needed to be used when replacing existing 1AS / 2AS modems or in systems where timing demands usage of handshaking.

SPECIAL FEATURES

In the reception mode, a data squelch circuit built into the modem board of the SATELLINE-2ASc easily prevents imitation characters (from e.g. radio interference) from entering the RD line. The output signals from the radio modem include an analog RSSI (Received Signal Strength Indicator). This feature is especially useful.

SATELLINE-2ASc **YM0246**

LOW VOLTAGE VERSION

The SATELLINE-2ASxE is also available in a low voltage version. The range is from 6.5 to 8.5 Vdc with the nominal voltage being 7.2 Volts. The average power consumption is 160 mA when receiving, 700 mA when transmitting, and 0.8 mA in standby mode. All the other technical specifications are the same as the standard version (+9...+30 Vdc).

SATELLINE-2ASxE **YM0236**

SATELLINE-2ASxE-7V2 (Low Voltage) **YM0256**

KEY FEATURES

- Compatible with 1AS & 2AS radio modems.
- Compatible with RS-232.
- 80 or 100 Channels.
- Received Signal Strength Indicator.

SATELLINE-2ASxE

SATELLINE-2ASxE is mostly used for local data communications in industrial and urban environments. Connection to customer's terminals and systems is easy with the RS-232 Interface. SATELLINE-2ASxE is fully compatible with the SATELLINE-2ASxm2 radio modem.

KEY FEATURES

- Each radio can act as a repeater.
- Compatible with RS-232.
- Tens of kilometres range.
- 9600 bps maximum.

2ASc AND 2ASxE TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	380 ... 470 MHz
Channel Spacing 2ASc	20 or 25 kHz
Channel Spacing 2ASxE	15.5 kHz, 20 kHz or 25 kHz
No. Of Channels	160, 100 or 80

TRANSMITTER

Carrier Power	10 mW ... 1 W / ohm (factory set)
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RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
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DATA MODEM

Interface	RS-232
Interface connector	D15, female
Data speed of RS Interface 2ASc	300-4800 bps (25 kHz) 300-2400 bps (20 kHz)
Data speed of RS Interface 2ASxE	1200-4800 bps (12.5/20 kHz) 1200-9600 bps (25 kHz)
Data Formats	Asynchronous data Character length: 10 or 11 bits

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating Voltage	+9 ... +30 Vdc
Size H x W x D	137 x 67 x 29 mm
Weight	250 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C



L I C E N S E F R E E R A D I O M O D E M S

SATELLINE®-1870

SATELLINE-1870 is the most economical and smallest member of the SATELLINE radio modem family. Thanks to its small size, as well as low power consumption, the SATELLINE-1870 is particularly well-suited for internal applications within factories.

LICENCE-FREE FREQUENCY

The SATELLINE-1870 uses the pan-European free 868 to 870 MHz frequency band with low output power, 5 to 100 mW. This band is divided into sub-bands according to the output power and duty cycle allowed for the transmitter. When changing the frequency the user need not worry about the output power limitation; the modem automatically sets the output power according to the regulations. Due to the limited output power, the radio's range is 5 kilometres, depending on surroundings. By using repeater stations and multiple addresses, the range of the radio modem network can be extended.

SPECIAL FEATURES

The modem can be connected to a terminal with a ribbon cable or by wiring a D9 connector. The radio can be mounted with with 2.5 mm screws, Velcro®, tape or the DIN-rail with a special installation kit. The settings of the SATELLINE-1870 radio modems can be modified by SL-commands in the normal communication mode or through an external terminal in programming mode. The software of the SATELLINE-1870 resides in a flash memory. The flash memory is easily re-programmable through a programming device.

SATELLINE-1870	YM4000
Antenna 1870	YA1869

1870 AND 1870E TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	868 ... 870 MHz (programmable)
Channel Spacing	25 kHz
Communication Mode	Half-duplex

TRANSMITTER

Carrier Power 1870	5, 10, 25, 50, 100 mW / 50 ohm
Carrier Power 1870E	5, 10, 25, 50, 100, 250, 500 mW / 50 ohm

RECEIVER

Sensitivity	<-108 dBm (BER < 10E-3)
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DATA MODEM

Interface	RS-232
Interface connector	DIN41651-16pin (male)
Data speed of RS Interface	300 – 19200 bps (programmable)
Data speed of radio interface	9600 bps
Data Formats	Asynchronous RS-232

GENERAL

Antenna Connector	SMA, 50 Ω, female
Operating Voltage	+ 8 ... + 30 Vdc
Size H x W x D	57 x 125 x 16 mm
Weight	125 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C

SATELLINE®-1870E

The SATELLINE-1870E radio modem forms a wireless transparent data link on the Licence free frequency band 868...870 MHz. It is designed for tight integration to user devices and is especially well suited for the transfer of data and control messages in medium distance range applications (1-10 km). Special care has been taken to allow for co-existence with other services adjacent to the 868...870 MHz band (DVB-T, TETRA, GSM). With its high output power (500 mW), good sensitivity (-108 dBm), small size and low power consumption, it meets both the technical and economical requirements for many applications. The settings of the radio modem can be changed from an external terminal in the programming mode or through SL-commands during normal operation.

EXTENDING THE RANGE

The communication range can be extended by using the repeater or subnet based routing function. Every SATELLINE 1870E device in a network can, while still providing data transfer service to the locally attached terminal device, be configured as a store-and forward repeater/router.

TRANSPARENT DATA TRANSFER

The SATELLINE-1870E, by default, operates in a protocol independent transparent transfer mode, which ensures compatibility with the vast majority of systems in the world. If desired, the modem can be programmed to benefit from the addressing functions of the used protocol, to provide routing / message filtering functions.

SATELLINE-1870E	YM4010
Antenna for 1870E	YA1869

KEY FEATURES

- Licence Free radio modem
- For short distances

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM



LICENSE FREE RADIO MODEMS

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

SATELLINE®-1915

The SATELLINE-1915 uses the ISM licence-free frequency band 902...928 MHz. The 1915 was designed with special attention on data integrity and transfer dependability. Good receiver sensitivity and selectivity as well as use of the Frequency Hopping Spread Spectrum (FHSS) technology, effectively minimise cross-talk radio interference.

The carrier power of the SATELLINE-1915 can be set in steps between 1 mW and 1000 mW, making the radio modem suitable for various indoors as well as medium-range applications. Connection ranges of up to about 900 meters are achieved in urban environment. In more open terrain, distances beyond 20 kilometres are not uncommon.

FOCUS ON VERSATILITY AND RELIABLE DATA TRANSFER

To ensure communication reliability, SATELLINE-1915 checks the correctness of a data transfer by repeating the transmission a given number of times until an acknowledgement from the receiving radio modem is received, or by sending every data packet multiple times in a row. Data encryption ensures message security.

Building a SATELLINE-1915 network is easy and straightforward. A pair of radio modems is all you need to set up a data link—no configuration is required. If more functionality is needed, the modem can be easily configured using standard AT and binary commands. To save energy, the radio modem can be operated in Sleep mode, meaning that the power level is kept at the minimum when there is no reception or transmission.

SATELLINE-1915

YM1915



KEY FEATURES

- For licence free 902...928 MHz frequency band
- Uses Frequency Hopping Spread Spectrum (FHSS) technology
- Includes 128-bit AES encryption

1915 TECHNICAL SPECIFICATIONS

TRANSCIVER

Frequency Range	902 ... 928 MHz
Spread Spectrum	FHSS (Frequency Hopping Spread Spectrum)
Channel Capacity	10 hop sequences share 50 frequencies
Communication Mode	Half-Duplex
Encryption	128-bit AES

TRANSMITTER

Carrier Power	1, 10, 100, 500, 1000 mW
---------------	--------------------------

RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
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DATA MODEM

Interface	RS-232
Interface Connector	DIN41651-16pin (male)
RS interface speed	10 - 230400 bps (including non-standard baud rates)
Radio interface speed	9600 bps / 115200 bps
Data format	Asynchronous RS-232

GENERAL

Antenna Connector	Reverse Polarity SMA, 50 ohm, male
Operating voltage	+ 8 ... + 30 Vdc
Construction	Aluminium / Plastic
Size H x W x D	125 x 57 x 19 mm
Weight	115 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C

SATELLINE®-3AS 869

SATELLINE-3AS 869 uses the 869.4 to 869.65 MHz frequency band, that European Telecommunications Standards Institute (ETSI) has released for narrow and broadband ISM-purposes (industrial, scientific, and medical). The 868 to 870 MHz band is divided into sub-bands according to transmit power (max 0.5W) and duty cycle allowed for the transmitter. This band has 10 separate 25 kHz channels for a maximum power of 0.5 W ERP. Transmitter duty cycle of 10% and the maximum constant transmission time (max 36 seconds) must be controlled by data terminal equipment. Other features of the SATELLINE-3AS 869 version are equivalent with the 450 MHz version. See page 10 SATELLINE-3AS(d) for technical specifications.

SATELLINE-3AS 869

YM1021

SATELLINE-3ASd 869

YM1023

Antenna 869

YA0869



KEY FEATURES

- For licence free frequencies
- Compatible with RS-232, RS-422 and RS-485 interfaces
- Includes Message Routing features

SATELLINE®-3ASd Epic Pro

SATELLINE-3ASd Epic Pro is an IP67 (NEMA 6) classified UHF radio modem with a 10 W transmitter. It was designed for easy mobile use in demanding field conditions. According to the IP67 standard, the casing and connectors of the SATELLINE-3ASd Epic Pro are waterproof and secured against dust.

The SATELLINE-3ASd Epic Pro is equipped with a Liquid Crystal Display (LCD) and a keypad, used to indicate the current operating status, as well as for changing the operating channel and power level of the radio modem.

The SATELLINE-3ASd Epic Pro exhibits a special "Dual Band" feature. The transceiver of the radio modem offers as an option two 2 MHz frequency bands, tuned at the factory with maximum separation of 15 MHz between the highest and the lowest frequency. The radio modem can be reprogrammed to operate at any channel within those two bands.

DEPENDABLE DATA TRANSFER

In the SATELLINE-3ASd Epic Pro the error rate is minimized by means of advance checking and correction of the data packets. In Forward Error Correction (FEC), the data packets are split in several blocks. The radio modem adds correction information inside the blocks during transmission.

In a SATELLINE-3ASd Epic Pro network, any substation can function as a repeater, too. In this operating mode (store and forward), the radio modem receives a message, buffers the received data, and transmits it further to another substation, using the same radio channel as in reception.

SATELLINE-3ASd Epic Pro features embedded Message Routing software, which takes care of routing messages across a radio modem network automatically after proper settings have been made. Communication is completely transparent, which makes Message Routing directly compatible with most user protocols.

New special PCC compatible version available too. In order to get more information please contact your nearest SATEL distributor.

KEY FEATURES

- High quality 3AS Epic modem in heavy-duty enclosure.
- First IP67 classified radio modem
- With Dual Band feature
- Includes Message Routing features
- PCC compatible version available

NEW!

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM



3ASd EPIC PRO TECHNICAL SPECIFICATIONS

TRANSCEIVER

Frequency Range	370 ... 470 MHz
Channel Spacing	12.5 kHz / 20 kHz / 25 kHz
Number of Channels	160 / 100 / 80
Communication Mode	Half-Duplex

TRANSMITTER

Carrier Power	1, 5 or 10 W / 50 ohm
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RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
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DATA MODEM

Interface	RS-232
Interface Connector	8-pin ODU MINI-Snap Size 0, waterproof (incl. operating voltage feeding for Epic Pro)
RS interface speed	300 - 38400 bps
Radio interface speed	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channel)
Data format	Asynchronous RS-232

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating voltage	+11.8 ... +30 Vdc
Power consumption	1.3 VA typical (Receive) 30 VA typical (Transmit)
Construction	Aluminium Enclosure
Size H x W x D	165 x 138 x 57 mm
Weight	1300 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C
IP Classification	IP67 (NEMA 6)

Values are subject to change without notice.

SATELLINE-3ASd Epic Pro

YM3020



IP67 RADIO MODEMS

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

SATELLINE®-3ASd Epic Pro 35 W

SATELLINE-3ASd Epic Pro 35 W is an IP67 (NEMA 6) classified UHF radio modem with a high power (35 W) transmitter. As well as the standard Epic Pro with 10 Watt output power this new model with high output power is equipped with LCD and a keypad, exhibits a Dual Band features and includes the FEC operation. Epic Pro 35 W can be used as a repeater too.

HEAVY-DUTY TOOL FOR OUTDOOR USE

SATELLINE-3ASd Epic Pro 35 W is particularly well suited for mobile field applications (land surveying, for instance) under varying weather conditions. Due to the high transmitting power, connection distances of up to 80 kilometres can be covered.

KEY FEATURES

- Modem in a heavy duty enclosure.
- IP67 classified radio modem
- With Dual Band feature
- Includes Message Routing features
- NEW!** PCC compatible version available



COMPATIBILITY WITH OTHER SATEL RADIO MODEMS

Both SATELLINE-3ASd Epic Pro models are compatible with other SATELLINE-3AS(d) and Epic models too. When needed shorten distances and when IP67 classification is not needed SATELLINE-3AS(d) with 1 W output power is a proper choice.

New special PCC compatible version available too. In order to get more information please contact your nearest SATEL distributor.

SATELLINE-3ASd Epic Pro

3ASd EPIC PRO 35 W TECHNICAL SPECIFICATIONS

TRANSCIVER

Frequency Range	400 ... 470 MHz	
Channel Spacing	12.5 kHz / 25 kHz	
Number of Channels	320 / 160	
Communication Mode	Half-Duplex	
TX Duty Cycle *	100 % (22 °C / 35 °C)	40 %
35 W	20 min / 13 min	no limit
10 W	no limit / 50 min	no limit

TRANSMITTER

Carrier Power	5, 10, 20, 25 or 35 W / 50 ohm (+/- 2 dB)
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RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3) **
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DATA MODEM

Interface	RS-232
Interface Connector	Waterproof IP67, 7-pin, ODU MINI-Snap Style G4, Size 8 or 8-pin LEMO HGA. 1B. 308. CLPP
RS interface speed	300 - 38400 bps
Radio interface speed	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channel)
Data format	Asynchronous RS-232
FCC Call Sign ID	6 digits Morse code, once in 15 minutes

GENERAL

Antenna Connector	TNC, 50 ohm, female
Operating voltage	+9 ... +16 Vdc ***
Operating voltage feeding	4-pin ODU MINI-Snap Size 1
Power consumption	1.3 VA typical (Receive) 120 VA typical (Transmit)
Construction	Aluminium Enclosure
Size H x W x D	165 x 138 x 73 mm
Weight	1640 g
Operating Temperature	-25 °C ... +55 °C (tests acc. to ETSI standards) -40 °C ... +75 °C (absolute min/max)
Storage Temperature	-40 °C ... +85 °C
IP Classification	IP67 (NEMA 6)

Values are subject to change without notice.

* If high output power is used continuously or with a high duty cycle, the equipment generates excess heat. The output power is automatically decreased when necessary to prevent overheating. Typical operating times are shown in the chart with different output powers and duty cycles @ 22°C and 35°C.

** Depends on receiver settings

*** ≥ +12 Vdc @ 35 W output power

OEM PRODUCTS

In the increasingly high-pressure world of manufacturing, outsourcing has become a way of survival for many companies. To others it is simply a way of cutting costs while maintaining quality. Over the past 20 years, SATEL has worked with industry leaders to design data radio solutions for production and research needs in broad applications. Our reputation has grown as an innovator of dependable and reliable equipment designed for demanding environments.

Our design, engineering, and production facilities are housed under one roof. Close proximity between departments allows our staff to provide smoother production and quicker turnaround times.

If you are developing a product with requirements for reliable, long-range wireless data communication, SATEL offers innovative solutions based on proven technology. SATEL has a wide variety of pre-made OEM products (see some examples at right). Our OEM products are based on time-tested SATEL products, with custom form-factors to meet your needs. Our typical OEM project requires large quantities and constant communication with our design staff. Please feel free to contact your local SATEL distributor or us to discuss of the existing OEM products and your specify need. Catalogue of the existing OEM products available at www.satel.com/products/satellite/oem-products

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM



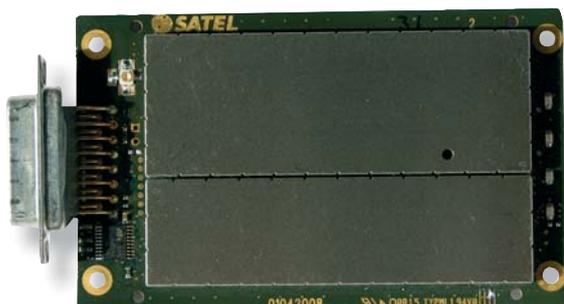
SATELLINE-M3-R1/T1 with aluminium housing

SATELLINE-M3-R1 and SATELLINE-M3-T1

SATELLINE-M3-R1/T1 are made for one-way data transfers. M3-R1 is a radio receiver module consisting of a data modem and a UHF radio receiver in a lightweight single PCB structure. M3-T1 is a radio transmitter module consisting of a data modem and a UHF radio transmitter in a lightweight single PCB structure.

M3-T1 / R1 can be modified to meet the specific requirements of user applications. For example the customer can select type of data bus and antenna connectors. Also the shape of the PCB can be selected in certain limits. The channel width (12.5, 20 or 25 kHz) and the operating frequency band within the range 403...470 MHz are freely selectable.

NEW! M3-T1 / R1 are compatible with the SATELLINE-3AS radio modem, and can be included in user systems based on the PCC protocol.



SATELLINE-M3-R1/T1 without housing

SATELLINE-M3-R1 AND SATELLINE-M3-T1 TECHNICAL SPECIFICATIONS

TRANSMITTER-RECEIVER

Frequency Range	403 ... 470 MHz
Channel Spacing	12.5 / 20 / 25 kHz
Tuning Range	67 MHz

SATELLINE-M3-T1

Carrier Power	100 mW ... 1 W
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SATELLINE-M3-R1

Sensitivity	-113 ... -110 dBm (BER < 10 E-3)
Co-Channel Rejection	> 10 dB

DATA MODEM

Interface	RS-232
Interface Connector	D15 or customer specified
RS interface speed	300 - 38400 bps
Radio interface speed	19200 bps (25 kHz channel) 9600 bps (12.5 / 20 kHz channel)
Data format	Asynchronous

GENERAL

Antenna Connector	50 ohm (TNC, SMA, MCX, MMCX...)
Operating voltage	+7 ... +30 Vdc (+/- 5 %)
Power consumption	1.2 W typical (Receive) 3 W @ 0.5 W (Transmit) 6 W @ 1 W (Transmit)
Size H x W x D	96 x 56 x 9 mm
Weight	150 g
Operating Temperature	-25 °C ... +55 °C

SATELLINK PRODUCTS

SATEL I-LINK 100 FROM RADIO MODEMS TO APPLICATIONS

A SATELLINE radio modem and I-LINK 100 offer a powerful combination for setting up a great number of applications. Building your own applications is now even easier than before. With the I-LINK I/O converter and SATELLINE radio modems you can transfer information on a switch position or the reading of a measuring gauge (analog or digital) from the point of surveillance to the control station, and vice-versa.

RELIABLE TRANSMISSION

Even though messages delivered through SATELLINE radio modems is technically well secured, a CR-protocol (Confirmation of Reception) are additionally used to ensure that a control command sent by the supervisor was correctly received by the I-LINK. The receiving end returns the message automatically to the sender station. In case the message does not match the original, the I-LINK generates a visible alarm. There is also an output for an external alarm system. Whatever your need is, the SATEL I-LINK makes interfacing with your application simple and reliable.

The I-LINK 100 is 123 x 85 x 30 mm and weighs only 120 g. Modbus compatible version is available too.

EXPANDABLE CAPACITY

Extension modules offer further capacity. The I-LINK 200 (four digital and two analog I/O ports) or I-LINK 300 (equipped with six digital I/O ports) may be connected to the I-LINK 100. A maximum of three extension modules can be added.

The C-LINK is used for receiving and transmitting recorded pulses and digital status information through an RS-232 serial interface. The 4 digital inputs sense and receive contact closure information and gauge readings, while the pulse counter senses and counts pulses from pulse initiators.

The C-LINK is equipped with 2 pulse inputs and 2 pulse outputs. An output pulse is triggered by the pulse counter, either time-based at given intervals or on a preset pulse count. One output provides a slow pulse suitable for relay-activated devices. The other output sends pulses at 10 kHz frequency. In Multipoint mode, the C-LINK can also send a fixed frequency between 0 and 5 kHz to alter the number of revolutions of a process machine. The C-LINK 100 is 123 x 85 x 30 mm and the weight is 120 g. Modbus compatible version is available too.

SATEL I-LINK 100	YI0007
SATEL I-LINK 100 MB	YI0017
SATEL I-LINK 200	YI0009
SATEL I-LINK 300	YI0010

SATEL C-LINK 100 VERSATILE I/O CONVERTER AND PULSE COUNTER

The C-LINK complements the SATEL-LINK product line featuring a digital I/O converter with a pulse counter. With the SATELLINE radio modem it provides a multipurpose tool for a variety of monitoring, metering, and process control applications.

VERSATILITY AND CAPACITY

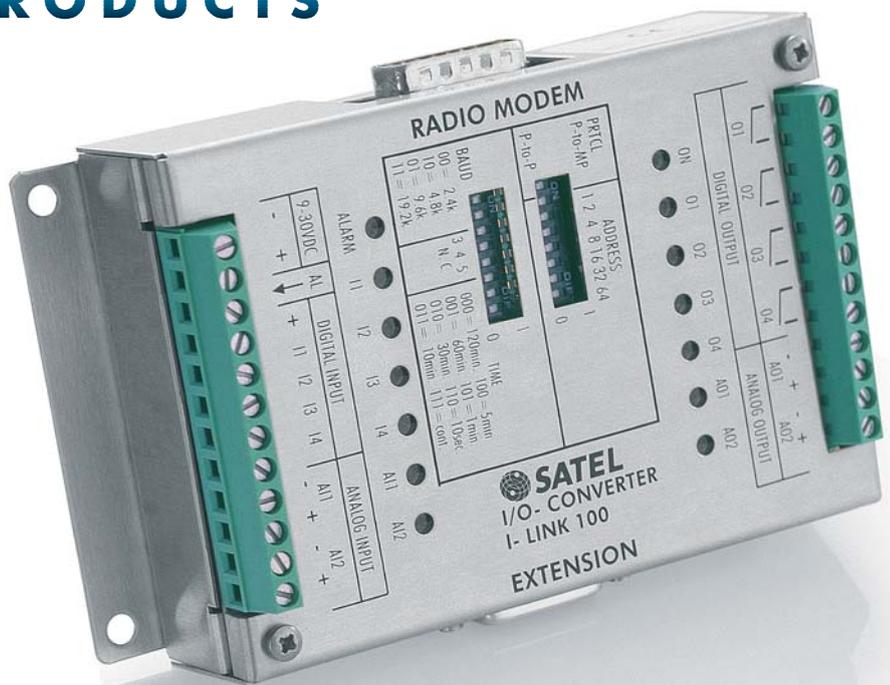
The combination of a pulse counter and digital I/O-converter makes the system flexible and versatile. Digital I/O ports can be used for driving motors and controls while the pulse input port is used for metering other pulse information related to e.g. water, energy, or gas consumption, or liquid flows.

For further capacity and functions, plug-in extension units with additional digital and analogue I/O connections are available.

SATEL C-LINK 100	YI0015
SATEL C-LINK 100 MB	YI0025

KEY FEATURES

- 4 digital I/O-ports, solid state relays
- Slow and fast counter inputs and outputs
- Time based pulse transmission
- Point-to-point or multipoint systems



SATELLINK PRODUCTS



It is connected directly to the SATELLINE-1870, 1870E or 1915 radio modem through an RS-232 interface

MINI-LINK PULSE COUNTER AND I/O-CONVERTER FOR SATELLINE-1870, 1870E OR 1915

SATEL MINI-LINK is a compact, cost-effective member of the SATELLINK product group of I/O converters. With the licence free SATELLINE-1870, 1870E or 1915 radio modem, it provides a handy tool for establishing wireless control and surveillance applications based on pulse counting and transfer of digital I/O-information.

The MINI-LINK is a versatile converter, equipped with a pulse counter input and two digital inputs and outputs. It is connected directly to the SATELLINE-1870, 1870E or 1915 radio modem through an RS-232 interface. The pulse counter is used for online control of e.g. water, electricity, and gas consumption, while the digital ports are used to transfer the contact information of field instruments. The MINI-LINK is designed to receive pulse information in the Multipoint mode only, whereas I/O digital status information can be transferred in both Multipoint and Point-to-Point systems. Modbus compatible version is available too.

SATEL MINI-LINK	YI0090
SATEL MINI-LINK MB	YI0095



RS-LINK RS-232 TO RS-485/422 SERIAL CONVERTER FOR SATELLINE-1870 AND 1870E

SATEL RS-LINK 100 is a cost-effective serial converter that can be configured to operate in compliance with RS-485 or RS-422. The galvanically isolated and surge suppression protected converter lines allow information exchange in full-duplex RS-422 or half-duplex RS-485 mode. The RS-485 or RS-422 settings are easily selected by the DIP-switches. It is also possible to terminate the lines. The six LED indicators enable monitoring the system data transfer at a glance.

SATEL RS-LINK	YI0485
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IP-LINK IP ROUTER FOR WIRELESS APPLICATIONS

WIRELESS TRANSFER OF DATA— LAST MILE TCP/IP

Industrial automation is increasingly being based on Ethernet and TCP/IP communication networks. Accordingly, the control PLCs are more often equipped with Ethernet interfaces only. For wireless TCP/IP networks, SATEL now introduces the IP-LINK IP Router.

KEY FEATURES

- IP router with two different IP-addresses
- Based on Linux operating system
- Remote configuration with Telnet or SSH Telnet
- Compatible with 3AS series radio modems

The SATEL IP-LINK is a logical extension of the SATELLINK product group. Like the previous product, I-LINK, it opens numerous applications in wireless remote control, surveillance, and data transfer.

ROUTING DATA OVER RADIO

With the SATELLINE radio modem, the IP-LINK facilitates wireless connections within or between Ethernet-based control and management systems. The IP-LINK converts the data packets transmitted on the Ethernet to a form acceptable to the radio modem and vice versa.

The IP-LINK has two IP addresses: one for the Ethernet and one for the radio modem interface. With a user-configurable routing table this feature makes it possible to route the data packets as needed. The data on the radio modem network can be encrypted for enhanced security and compressed to achieve a higher transfer rate.



IP-LINK size is 115 x 90 x 30 mm and weight is 120 g. Product is equipped with following connectors:

- D15 for SATELLINE radio modem
- D9 for console
- RJ-45 for Ethernet

SATEL IP-LINK	YI0020
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SATELLINK PRODUCTS

SATELLINK PC Pro EFFORTLESS CONTROL WITH RADIO MODEMS.

With the SATELLINK PC Pro software you can monitor functions of the controls connected to the ports of the SATELLINK series I/O-converter. Using the Multipoint function, you can receive connector data, current loop values, pulses, set output states, adjust values and monitor radio links as well as perform other functions at a number of different substations.

FUNCTIONALITY

The external appearance of the user interface has been designed for easy, at-a-glance view of all functions. The function buttons and value fields can be renamed according to their user-specified functions. The analogue values can be set to show the value to be metered and the desired metering range. These functions are practical especially when others than the normal operator are using the system. Using the conversion feature, the analogue values can be changed to be digital when pre-defined alarm settings have been exceeded.



SUPERVISION

The supervision log was designed to facilitate user monitoring. It shows all functions that arise from a change in the settings. Based on the recorded data, a graphical presentation of information such as metering results and radio settings can easily be produced with the appropriate software.

ROUTABLE

Thanks to the routing feature, the digital or analogue inputs of the I/O-converter can be routed as the output of any I/O-converter in the system. For example, in a

group alarm one input can be set as the output of several substations simultaneously.

COST-EFFECTIVE

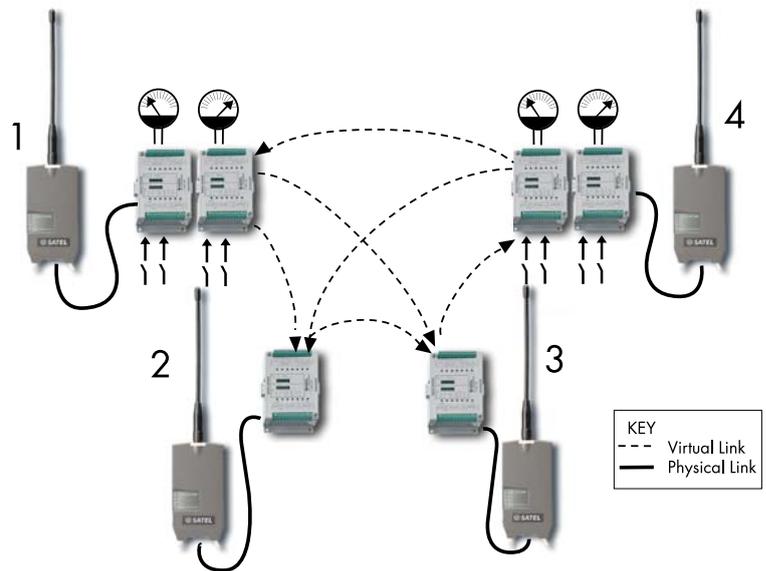
This cost-effective Multipoint software can be used to control several SATELLINK series I/O-converters and extension modules connected to SATELLINE radio modems. The maximum number of substations is 127 pcs. At maximum, three extension modules can be connected to each basic unit if necessary.

SATELLINK PC Pro

ZA0001

SATELLINK PC PRO NETWORK FEATURES

- Remote use through the WAN/LAN network
- Several servers can be connected in the same system
- Timed function settings
- An alarm may be sent as an e-mail, which can be converted to an SMS message to the operator on duty
- Routing from substation inputs to the outputs of another station/system
- Routing through other modems in the system
- Functions can be shown on top of user-selectable background image, such as a map
- Automatic restarting after a power cut-off
- Different products such as SATEL I-LINK 100, C-LINK 100 and MINI-LINK can be used in the same system
- Automatic function control in a fault situation
- Many user-friendly details
- Analogue, digital, and pulse inputs/outputs



WIRELESS M2M & M2M MINI PACKAGE

**QUICK TO INSTALL,
EASY TO USE.**

The SATEL I-LINK 100 or MINI-LINK I/O-converter and the SATELLINE-1870, 1870E or 1915 radio modem are intended for setting up various short-range wireless monitor and control networks. Together they enable transferring I/O status, 4-20 mA or pulse information. These networks are best suited to environments where setting up cable connections would be either impossible or expensive.

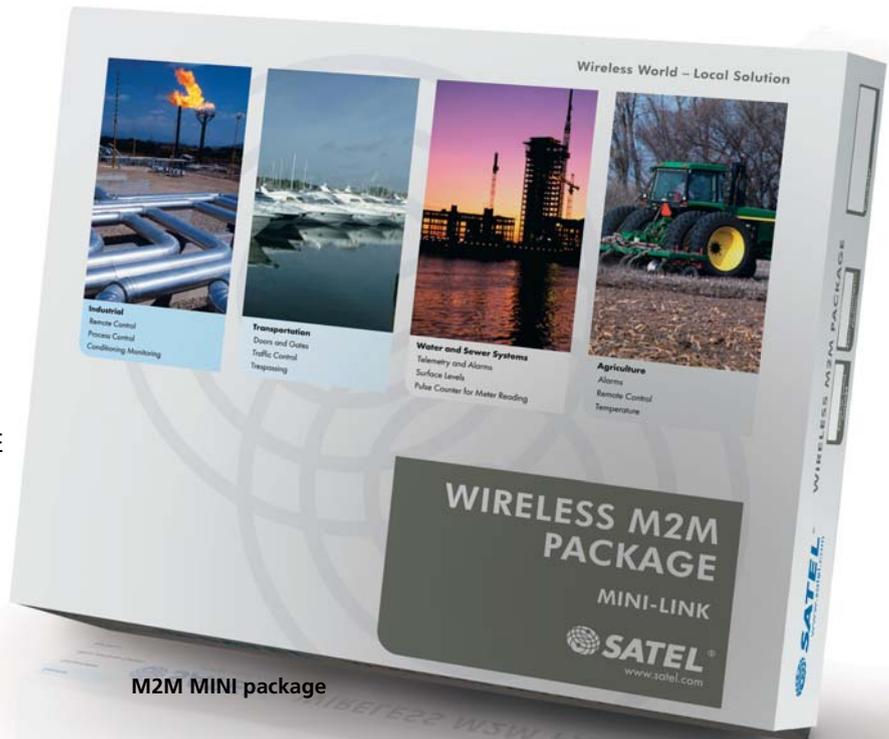
The SATELLINE-1870 and 1870E are light-weight and compact; short and medium range radio modems, which operate on pan-European Licence-free frequencies. These radio modems are well suited to industrial data transfer solutions where connection distances are measured from tens of meters up to couple of kilometers.

The SATELLINE-1915 uses the ISM licence-free frequency band of 902 to 928 MHz. The radio modem is suitable for various indoor as well as medium-range applications. Connection ranges of up to about 900 meters are achieved in urban environment. In more open terrain, distances beyond 20 kilometres are not uncommon.

The SATEL I-LINK 100 I/O-converter has four digital and two analog I/O-ports. MINI-LINK has two digital I/O-ports and fast pulse counter input.

POINT-TO-POINT OR POINT-TO-MULTIPOINT

With two SATELLINE-1870 or 1915 radio modems and SATEL I-LINK 100 or MINI-LINK converters, it is possible to setup a point-to-point connection. The easy-to-use SATEL I-LINK PC Setting and Control Program enables the setup of a wireless Point-to-Multipoint connection.



M2M MINI package

M2M POINT-TO-POINT PACKAGE

2x Licence-free radio modems
2x I-LINK 100 I/O converter
2x power supplies
Cables, antennas
User Guide

M2M Point to Point Package **YS0001**

M2M MULTIPOINT PACKAGE

3x Licence-free radio modems
2x I-LINK 100 I/O converter
3x power supplies
PC software, cables, antennas
User Guide

M2M Point to MultiPoint Package **YS0002**

MINI M2M PACKAGE

Similar to M2M packages, but includes MINI-LINK I/O-converters.

M2M MINI Point-to-Point Package **YS0011**

M2M MINI Point-to-Multipoint Package **YS0012**

ALARM TRANSFER

ALARM TRANSFER RADIO MODEMS

The SATELCODE transmitter and the SATELNODE receiver modems are used for one-way wireless transfer of alarms from the point of control or surveillance to the receiver of the information. The SATELCODE and SATELNODE product group includes a transmitter and a receiver model, which cover a wide range of alarm transfer applications. SATELCODE is a multifunction transmitter used for alarm transfer related to the safeguarding of industrial or private properties. The SATELCODE and SATELNODE provide an easy way of establishing a local-area alarm system. Each SATELCODE transmitter can monitor up to 8 alarm loops. The SATELNODE is capable of receiving contact information from up to 65,000 points, which may be located several kilometres from the base station. Alternatively, SATELNODE has 8 programmable relay outputs.



The system monitors to ensure circuits remain open or closed, depending on configuration. If a circuit connection is altered, an alarm is sent.



SATELCODE® 8i

The SATELCODE is a one-way radio modem equipped with a synthesized 0.1 to 4 watt transmitter operating in the 140-170 MHz frequency range. The SATELCODE is used to transmit alarms related to the control of production machinery or to the safety and security of people and property. An alarm is activated by either closing or opening an alarm loop. Once activated, the SATELCODE transmits a message that identifies the transmitter and the alarm information. SATELCODE serves 8 alarm loops. A diagnostic message is transmitted at a preset cycle, allowing you to know the transmitter is in perfect operating condition. The basic operational parameters, including the address, status, the time interval of the diagnostics messages, and radio channel are normally set at the factory. If necessary, they can be changed by the user.

SATELCODE 8i Transmitter

YL2601



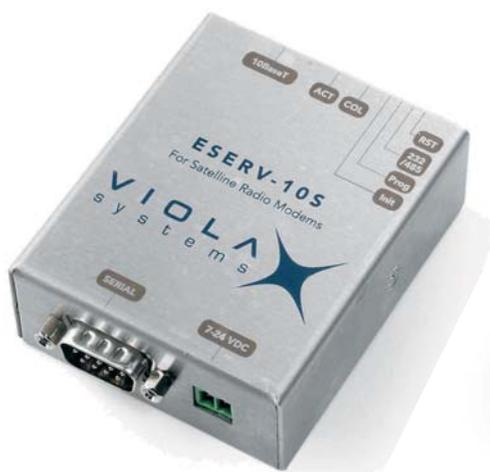
SATELNODE® X8SR

The SATELNODE X8SR is a general-purpose receiver with high sensitivity operating in the 140-170 MHz frequency range. Together with the 4 watt SATELCODE transmitter, it easily provides radio connections for several kilometers. SATELNODE X8SR also provides protocols for the receiver interface with user monitoring equipment. The received message also includes received signal strength (RSSI) information.

The SATELNODE X8SR is programmed through the RS-232 interface from a PC or a terminal, with the receiver in programming mode. All basic operating parameters, like the address of the device, the operating mode, type of reception, and data speed (1200 to 9600), can be conveniently altered and set.

SATELNODE X8SR Receiver

YV0602



ESERV-10S

ETHERNET BRIDGE, SPECIALLY DESIGNED FOR SATELLINE RADIO MODEMS

The ESERV-10S is a transparent bridge that facilitates wireless networks with SATELLINE radio modems. ESERV-10S converts the data packets transmitted on the Ethernet to a form acceptable to the radio modem and vice versa. ESERV-10S is 65 x 75 x 27 mm and is equipped with a D9 connector for serial interface and an RJ-45 connector for Ethernet.

ESERV-10S is a transparent bridge without an IP address, but offers data filtering to reduce the amount of the data to the radio channel. The data filtering is based on user configurable IP network address filtering, enabling only the needed packets to be sent to the radio channel. In addition to the data filtering, ESERV-10S uses the CRC-16 checksum to ensure error free communication.

CONFIGURATION

The maximum packet size and inter-packet delays are configurable via console to be suitable for different radio network configurations.

ESERV-10S **YP0700**



SATEL-321 Battery Pack

Available for models 2ASc, 2ASxE, 3AS(d), and 3AS(d) 869, the SATEL-321 is beneficial when using radio modems in the field. The total weight of the splash-proof SATEL-321 package including the battery, charger, and radio modem is only 1 kilogram. For easy carrying, the casing is equipped with a detachable shoulder strap. When used with the SATELLINE-3ASd, accessing the radio's menu is possible since the buttons are extended through the casing.

QUICK CHARGING

The operating time of the modem (typically 8 - 10 hours) allows time-consuming field jobs without recharging. SATEL offers both a standard charger and a car charger. The user can see at any time the remaining charge level of the battery, when used with the SATELLINE-3ASd.

The SATEL-321 measures 162 x 80 x 59 mm and the weights 1 kg with radio attached.

Complete Battery package SATEL-321	YP0321
Data cable 321 / RS-485	YC0900
Data cable 321 / RS-232	YC0901
Charging cable 321	YC0902
AC adapter with charging cable 321	YC0903
Power cable 321	YC0904



Weatherproof Housing

This accessory is a rugged, weatherproof housing for standard sized SATELLINE radios. Made of heavy duty ABS plastic, it comes complete with a cable interface kit and antenna coupling. Ideal for permanent applications.

Housing H-WP **YI0001**

Weatherproof housing for SATELLINE-3AS(d) Epic models.

Housing H-WP-X2 **YI0006**



Weather Housing

The unique design of this flexible, splash-proof weather housing offers the perfect solution for simple installations.

Housing H-WPm2 **YI0004**

Power Supply

Power supply for DIN-rail. IN 100-240 Vac, OUT 24 Vdc / 2.5 A.

Power supply PS-DIN-2 **YI0118**

CABLES



CRS-2F. D15 male to D9 female. 2 meters. With Power Lead.

RADIO MODEM CABLES

INTERFACE ADAPTERS

These interface adapters are equipped with a programming mode switch. The NARS-1F and NARS-1F-4A are primarily used for demo and configuration purposes. The adapter matches the lower connection on SATELLINE radio modems.

NARS-1F	D15 male to D9 female. 650 mA fuse. RS-232 Interface. With 2 meter power supply cable	YC0200
NARS-1F-4A	Same as NARS-1F. With 4A fuse for Epic only.	YC0204
NARS-2	D15 male to screw connector. 650 mA fuse. Adaptor for RS-422 or RS-485 interface.	YC0485
NARS-2-4A	Same as NARS-2. With 4A fuse for Epic only.	YC0486

INTERFACE CABLES

These cables connect radio modems to other terminal equipment. Each cable includes a 2 meter power supply cable. CRS-2F is pictured at the top of this page.

CRS-1M	D15 male to D25 male. 2 meters.	YC0101
CRS-1F	D15 male to D25 female. 2 meters.	YC0102
CRS-2M	D15 male to D9 male. 2 meters.	YC0103
CRS-2F	D15 male to D9 female. 2 meters.	YC0104
CRS-18F	DIN4165-16 to D9 female. 1.5 meters Includes PROG and SHDN wires for 1870 modem.	YC0187
CRS-18IF	DIN4165-16 to D15 Female. 40 cm. Connects SATELLINE-1870 to I-LINK 100 or C-LINK 100.	YC0190
CRS-9	D9 - D9 female. 2 meters. No power cable.	YC0201
CRS-PB	For Profibus Interface. D15 - D9 male. 2 m.	YC0501
CRS-TSU	D15 male to D15 female. Connects SATELLINE radio modems to I-LINK or C-LINK 100	YC0271
CRS-NMS	1.5 m cable D15 male to 2 x D9 female. From NMS master modem to user system and NMS PC.	YC0302

ADDITIONAL CABLES

ESERV-10S	Null Modem Cable for ESERV-10S and IP-LINK	YC0700
CRS-IPT	2 m test cable D15 female to D15 female between IP-LINKs.	YC0402

ANTENNA RF CABLES

CRF-1	TNC male to TNC female. 1 meters.	YC1101
CRF-5F	TNC male to TNC female. 5 meters.	YC1105
CRF-5M	TNC male to TNC male. 5 meters.	YC1106
CRF-15	TNC right-angle male to TNC female. 15 cm.	YC1115
CRF-1, SMA	SMA female to SMA male. 1 meter. For SATELLINE-1870 modems	YC2101
CRF-5,SMA	SMA female to SMA male. 5 meters. For SATELLINE-1870 modems	YC2105
RG213	Low loss cable. 1.6 dB / 10 m.	YC1000
RG213 Connectors	TNC male to TNC male.	YC1002
ECOFLEX10	Low loss cable. 0.9 dB / 10m.	YC1004
ECOFLEX10 Connectors	TNC male to N male OR TNC male to TNC male.	YC1003
AIRCOM+	Low loss cable. 0.8 dB / 10 m.	YC1001
AIRCOM+ Connectors	TNC male to N male OR TNC male to TNC male.	YC1003
ECOFLEX15	Low loss cable. 0.6 dB / 10m.	YC1005
ECOFLEX15 Connectors	N male to N male with N female to TNC male adapter.	YC1006

INSTALLATION PARTS FOR DIN-RAIL

DIN-1	96 x 70 mm	ME0205
DIN-2	67 x 70 mm	ME0210
DIN	For Epic	ME0213

321 CABLES

Accessory cables used with the 321 Battery Pack.

Data cable 321 / 485	YC0900
Data cable 321 / 232	YC0901
Charging cable 321	YC0902
AC adapter with charging cable 321	YC0903
Mains Power cable 321	YC0904

OMNI DIRECTIONAL ANTENNAS

- 1** These portable omni-directional antennas are offered directly by SATEL. Our distributors also offer other specialized antennas, like offset pattern and directional antennas. Contact your distributor for a complete antenna listing.



1 GAINFLEX ANTENNA

Half Wave whip antenna. Flexible, highly elastic antenna. Attach directly or with a cable to modem.

Frequencies	400 ... 435 MHz 435 ... 470 MHz
Connection	TNC, 50 Ω, male
Length	420 mm
Weight	40 g

Antenna Gainflex 400-435 MHz **YA0106**

Antenna Gainflex 435-470 MHz **YA0103**

2 ANTENNA 1870 AND 1870E

For use with the SATELLINE-1870 and 1870E. Attach directly to modem or with cable to ground plane.

Frequency	868 ... 870 MHz
Connection	SMA, 50 Ω, male
Length	169 mm
Weight	35 g

Antenna 1870 **YA1869**

3 ANTENNA 1915

For use with the SATELLINE-1915. Attach directly to modem or with cable to ground plane.

Frequency	902 ... 928 MHz
Connection	RP SMA, male
Length	171 mm
Weight	18 g

Antenna 1915 **YA0915**

4 MULTIFLEX ANTENNA

Quarter Wave whip antenna. Flexible, highly elastic antenna. Attach directly to modem or with cable to ground plane.

Frequency	400 ... 470 MHz
Connection	TNC, 50 Ω, male
Length	165 mm
Weight	35 g

Antenna Multiflex 400-470 MHz **YA0101**

5 MINIFLEX VHF ANTENNA

For use with the SATELLINE-3AS(d) VHF. Attach directly to modem or with cable to ground plane.

Frequency	146 ... 174 MHz
Connection	TNC, 50 Ω, male
Length	161 mm
Weight	40 g

Antenna Miniflex VHF **YA0302**

6 ANTENNA 869

For use with the SATELLINE-3AS 869. Quarter Wave whip antenna. Attach directly to modem or with cable to ground plane.

Frequency	869 MHz
Connection	TNC, 50 Ω, male
Length	69 mm
Weight	35 g

Antenna 869 **YA0869**

7 MINIFLEX ANTENNA

Extra short, highly elastic antenna. Attach directly to modem.

Frequencies	400 ... 435 MHz 435 ... 470 MHz
Connection	TNC, 50 Ω, male
Length	67 mm
Weight	18 g

Antenna Miniflex 400-435 MHz **YA0104**

Antenna Miniflex 435-470 MHz **YA0102**

2

3

4

5

6

7



ANTENNA SELECTION

HOW TO SELECT YOUR ANTENNA

With proper antenna selection, the overall performance of a radio network can be significantly improved. Proper antenna configuration makes a network more controlled, closed, and tolerant to possible interference.

ANTENNA TYPES

There are three types of antennas distinguished by radiation characteristics: **omni-directional antennas, offset-pattern antennas and directional antennas.** The usage of different antenna types is highly dependent on the shape and nature of the radio network: point to point, point to multipoint, number of base stations, fixed or mobile substations, possible repeaters, diversity reception, etc.

POINT TO POINT NETWORKS

In point to point, fixed radio networks, it is always highly recommended to use directional antennas (see diagram for CAY, CAY+, CAY++, CAY+++, CAY++++) when applicable. This is because of better control over the system and closed construction: the signal is forced and noise collected only to and from the relevant directions. This also minimizes the total amount of radio interference in general.

POINT TO MULTIPOINT NETWORKS

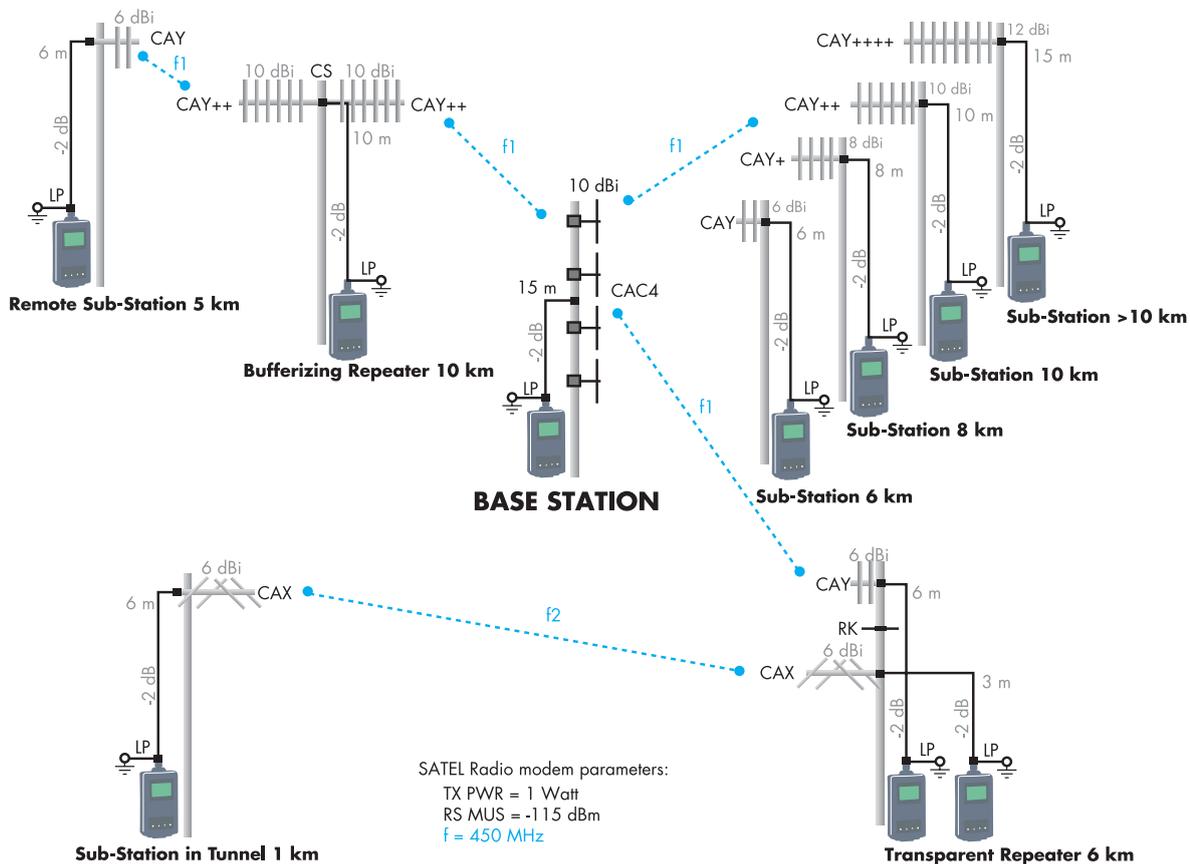
In point to multipoint radio networks, one or multiple base stations are serving multiple substations—fixed or mobile. Typically, base stations are equipped with omni-directional (CAE2, CAE4, CAGP, CAGP+) or offset pattern antennas (CAC2, CAC4) in order to serve substations inside a big angle. Usually, the system layout is not symmetrical nor is the base station in the symmetrical center point. In these cases, the offset pattern base station antenna is the best choice. If all the substations are within a small angle, the directional base station antenna is recommended for the reasons mentioned above. The fixed substations should always be equipped with directional antennas. The mobile substations usually have to be equipped with omni-directional antennas.

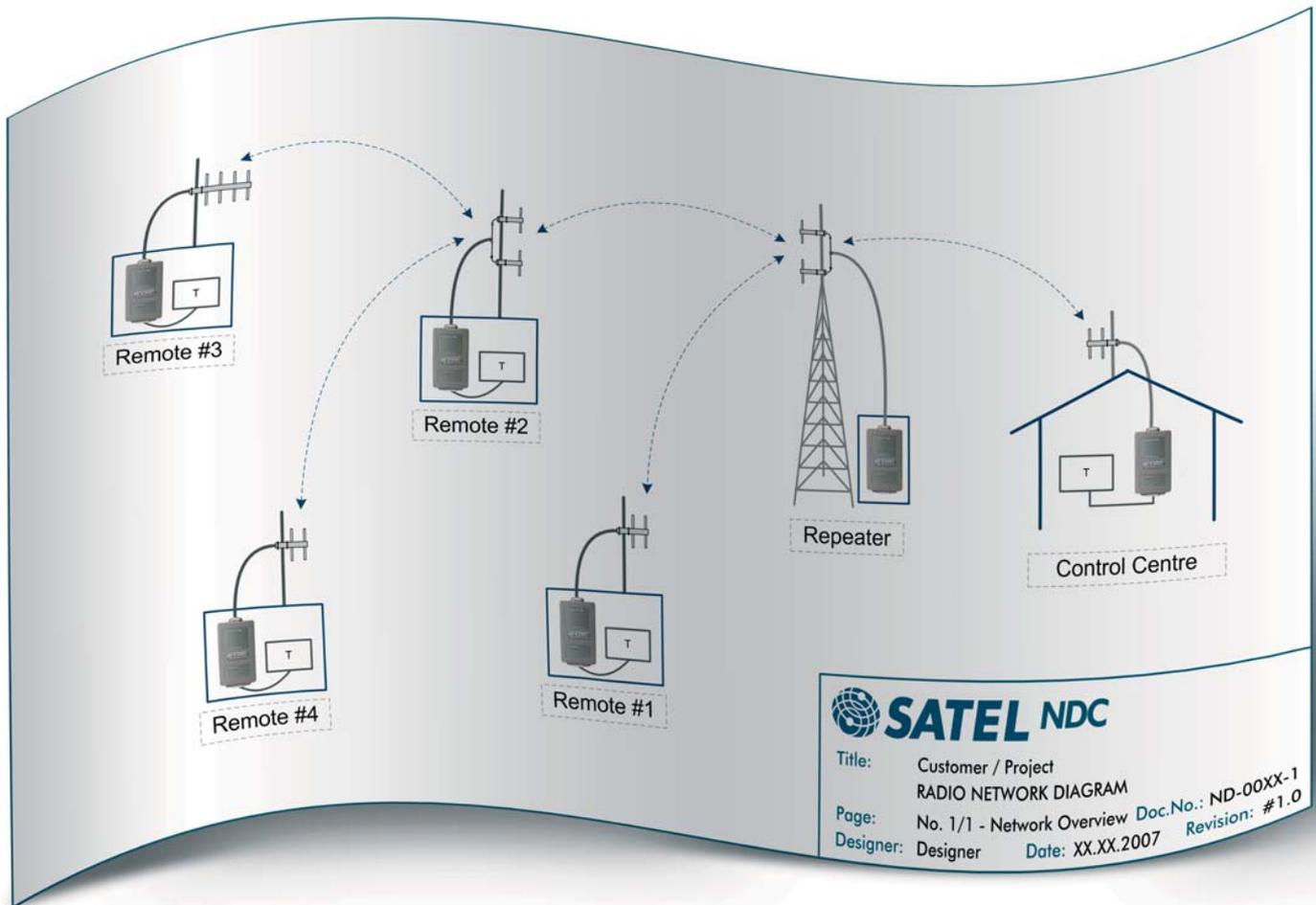
DIVERSITY (DUAL) ANTENNAS

In space diversity applications, dual antennas, chosen as mentioned above, they are used and located physically separated on a vertical or horizontal axis. In polarization diversity, the special cross-polarized antennas (CAX, CAX+, CAX++) can be used. Multiple antennas can also be combined to form arrays in order to find more gain and radiation pattern combinations to meet the requirements. The antennas are combined with power splitters (CS) to maintain the impedance match. When mounting the antennas at high locations, it is also recommended to use separate lightning protectors (LP) to ensure the radio modem against lightning striking the antenna, mast or surroundings.

REPEATER STATIONS

When using repeaters, transparent of buffering, each repeater output has to be considered as a base station for its own subsystem and the corresponding antennas chosen accordingly for both the base station and substations.





SATEL NDC
 Title: Customer / Project
 RADIO NETWORK DIAGRAM
 Page: No. 1/1 - Network Overview Doc.No.: ND-00XX-1
 Designer: Designer Date: XX.XX.2007 Revision: #1.0

OUR NETWORK DESIGN SERVICE WANTS TO HELP YOU CREATE A TROUBLE-FREE WIRELESS DATA TRANSFER NETWORK.

In case you are not familiar in using wireless radio data modems or if your system is complicated and you are not sure how to design the network, please feel free to contact us. However small your system might be, it is big enough for us! The quickest way of getting support is to contact a distributor in your own country. They are able to communicate with you in your own language and they are also close by. However, if they do not have the resources or application specific know-how, we are prepared to assist them and you as well. Please feel free to contact our Network Design Service at ndc@satel.com

Having been in this business over twenty years, we are happy to share our experience with you in designing your radio network.

This service could include the following (all or only a part depending on your case):

- A budgetary price to start so you can estimate the overall expenses for your project. This would be based on the description of your system.
- Propagation measurements on site to ensure that the system will work properly
- Actual design of the network based on the measurements
- Binding offer for the entire radio network including the radios, antennas with cables, data cables, connectors needed, etc.
- Delivery of the high quality products in a short time thanks to our own production
- Installation of the radio network as an option together with our local distributor
- Testing of the system after installation, including training of your staff
- Handing over of the network to you
- Guarantee

DISTRIBUTORS

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