

# THE SATEL CATALOGUE



**ON THE COVER**  
SATELLINE®-3ASd NMS  
PAGE 7

# GROWING DEMAND FOR HIGH QUALITY SATELLINE MODEMS

On year 2006 we reached 20 year milestone in history of SATEL Oy. In addition to celebrations, 20th operation year included addition in management and personnel, expansion of our facilities, upgrade of production equipment, new distributors, new application and of course new additions to world-known SATELLINE product families.

## NEW PRODUCTS

Guided by our principle to focus on high demanding industrial applications, we have two new products to highlight. Now we have filled the last gap in demanding industrial application frequencies by introduction of licence free SATELLINE-1915 product suitable for markets outside Europe. You

will also find SATELLINE-3ASd Epic Pro, which is the most rugged and high-performance radio in UHF market at the moment, featuring in addition to all well-known SATEL features, also IP67 (NEMA 6) protection classification. In addition to these novel products, SATEL has introduced various improvements in usability, performance and durability.

Finally you will notice new look of SATEL modems, making it even easier for your customers to recognize that you have selected the best modem available in the market.

—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 most 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 a leading supplier in Europe and are currently extending our business into other market areas. During the past years, our sales have steadily grown 20 to 50 percent per annum.

### 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

# CONTENTS

## PRODUCT GUIDES

<b>APPLICATIONS</b>	<b>4</b>
See how SATEL is used	
<b>TYPE APPROVALS</b>	<b>5</b>
See where SATEL is type approved	

## SATELLINE® PRODUCTS

<b>VHF RADIO MODEMS WITH NMS</b>	
SATELLINE-3AS(d) VHF	<b>6</b>

<b>UHF RADIO MODEMS WITH NMS</b>	
SATELLINE-3AS(d) NMS	<b>7</b>
SATELLINE-3AS(d) Epic NMS	<b>8</b>

<b>UHF RADIO MODEMS</b>	
SATELLINE-2ASc	<b>10</b>
SATELLINE-2ASxE	<b>11</b>
SATELLINE-3AS(d)	<b>12</b>
SATELLINE-3AS(d) Epic	<b>13</b>

<b>LICENCE FREE RADIO MODEMS</b>	
SATELLINE-1870	<b>14</b>
SATELLINE-1870E	<b>14</b>
<b>NEW!</b> SATELLINE-1915	<b>15</b>
SATELLINE-3AS(d) 869	<b>15</b>

<b>IP67 RADIO MODEMS</b>	
<b>NEW!</b> SATELLINE-3ASd Epic Pro	<b>16</b>

<b>OEM RADIO MODEMS</b>	<b>18</b>
-------------------------	-----------

## SATELLINK PRODUCTS

<b>I-LINK</b>	<b>19</b>
<b>C-LINK</b>	<b>19</b>
<b>MINI-LINK</b>	<b>20</b>
<b>RS-LINK</b>	<b>20</b>
<b>IP-LINK</b>	<b>20</b>
<b>SATELLINK PC PRO</b>	<b>21</b>

## QUICK START PRODUCTS

<b>M2M PACKAGE</b>	<b>22</b>
<b>M2M MINI PACKAGE</b>	<b>22</b>

## ALARM TRANSFER PRODUCTS

<b>SATELCODE 8i</b>	<b>23</b>
<b>SATELNODE X8SR</b>	<b>23</b>

## ACCESSORIES

<b>ESERV-10S</b>	<b>24</b>
<b>SATEL-321 BATTERY PACK</b>	<b>24</b>
<b>HOUSING &amp; POWER</b>	<b>24</b>
<b>CABLES</b>	<b>25</b>
<b>ANTENNAS</b>	<b>26</b>

## APPENDIX

<b>HOW TO SELECT YOUR ANTENNA</b>	<b>27</b>
Basic steps in antenna selection	
<b>NETWORK DESIGN CENTER</b>	<b>28</b>
A professional resource	
<b>PLANNING A NETWORK</b>	<b>29</b>
Basic steps in network planning	
<b>DISTRIBUTORS</b>	<b>30</b>
Locate your nearest distributor	

©2008 SATEL Oy. All rights to this catalogue are owned solely by SATEL OY (referred to in this catalogue as SATEL). All rights reserved. The copying of this catalogue (without the written permission from the owner) by printing, copying, recording or by any other means, or the full or partial translation of the manual to any other language, including all programming languages, using any electrical, mechanical, magnetic, optical, manual or other methods or devices is forbidden. SATEL reserves the right to change the technical specifications or functions of its products, or to discontinue the manufacture of any of its products or to discontinue the support of any of its products, without any written announcement and urges its customers to ensure, that the information at their disposal is valid. SATEL software and programs are delivered "as is". The manufacturer does not grant any kind of warranty including guarantees on suitability and applicability to a certain application. Under no circumstances is the manufacturer or the developer of a program responsible for any possible damages caused by the use of a program. The names of the programs as well as all copyrights relating to the programs are the sole property of SATEL. Any transfer, licensing to a third party, leasing, renting, transportation, copying, editing, translating, modifying into another programming language or reverse engineering for any intent is forbidden without the written consent of SATEL.

### 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  
PAGE 7



# 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 worldwide 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
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
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									
USA									
Vietnam									

\*Project approval to be applied case-by-case.

\*\*Special versions only for Korea available.

# 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 138...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	<b>YM5000</b>
SATELLINE-3ASd VHF with Display	<b>YM5010</b>
SATELLINE-3AS VHF with Heat Sink	<b>YM5020</b>
SATELLINE-3ASd VHF with Display and Heat Sink	<b>YM5030</b>



## TECHNICAL SPECIFICATIONS

### TRANSCEIVER

Frequency Range	138...174 and 218...238 MHz
Channel Spacing	12.5 kHz / 25 kHz
No. Of Channels	1760 max.
Frequency Stability	< ± 650 Hz
Type of Emission	F1D
Communication Mode	Half-duplex

### TRANSMITTER

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

### 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")
Construction	Aluminium enclosure
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	<b>YM1075</b>
SATELLINE-3AS NMS	<b>YM1070</b>

VHF with NMS

UHF with NMS

UHF

Licence Free

IP67

OEM



## TECHNICAL SPECIFICATIONS

### TRANSCIVER

Frequency Range	370...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	370...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 RS-232, RS-422, RS-485

### 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



## 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.

### KEY FEATURES

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

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.

### 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

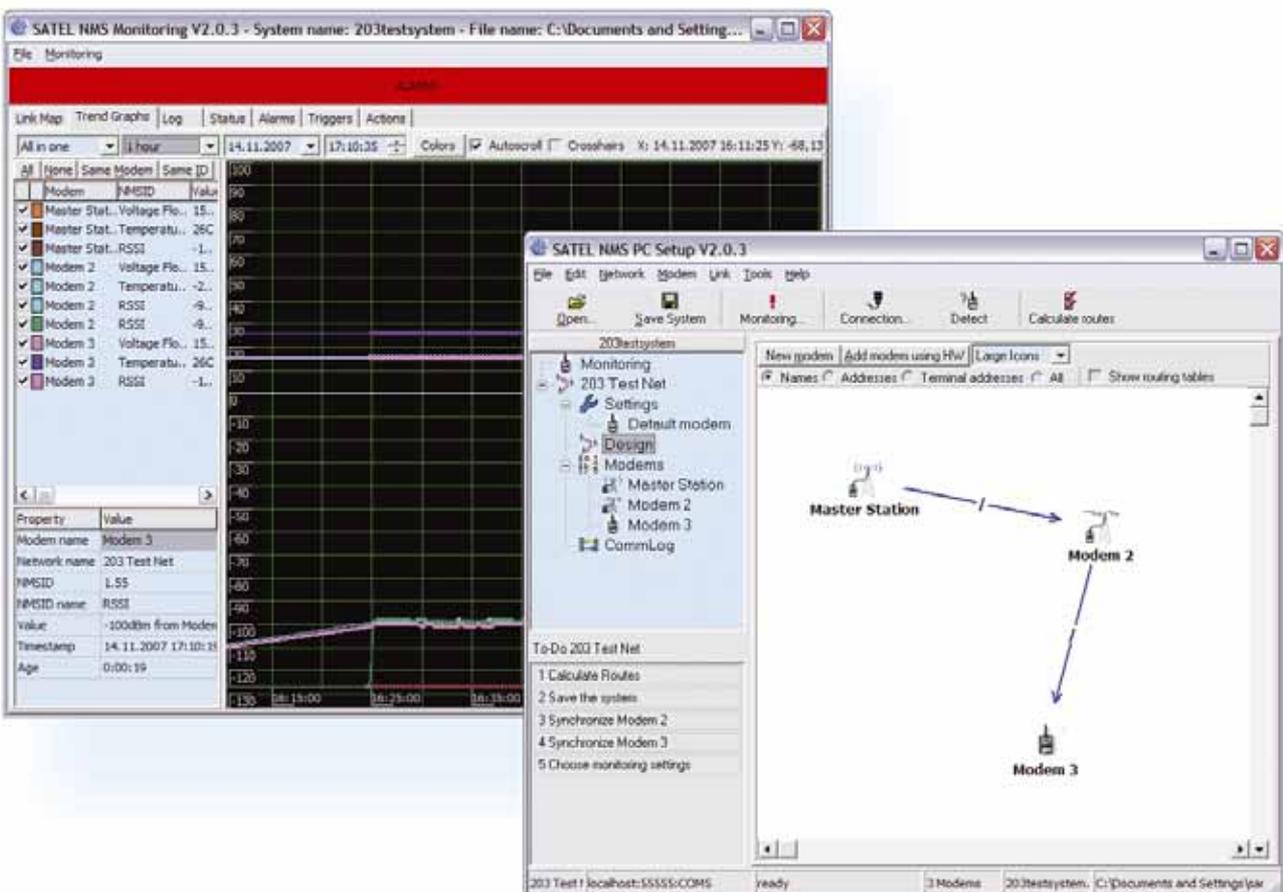
UHF with NMS

UHF

Licence Free

IP67

OEM



# UHF RADIO MODEMS

VHF with NMS
UHF with NMS
<b>UHF</b>
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, a small, lightweight radio modem used for diverse applications in half-duplex data message transfer, features a synthesized 80-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.

### KEY FEATURES

- Compatible with 1AS & 2AS radio modems.
- Compatible with RS-232.
- 80 or 100 Channels.
- 380-470 MHz.
- Signal Strength Indicator.
- Operating Voltage +9 to +30 Vdc

### CHARACTERISTICS

Data speed can be selected in the range 300-4800 bits (25 kHz) or 300-2400 bits (20 kHz). 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

## 2ASc TECHNICAL SPECIFICATIONS

### TRANSCIVER

Frequency Range	380 ... 470 MHz
Channel Spacing	20 or 25 kHz
No. Of Channels	100 or 80

### TRANSMITTER

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

### RECEIVER

Sensitivity	<-115 dBm (BER < 10E-3)
Adjacent Channel	> 70 dB

### DATA MODEM

Interface	RS-232
Interface connector	D15, female
Data speed of RS Interface	300-4800 bps (25 kHz) 300-2400 bps (20 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



## SATELLINE-2ASxE

SATELLINE-2ASxE is mostly used for local data communications in industrial and urban environments. Thanks to its small size it can easily be mounted and integrated into fixed and mobile terminals. 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.

### CHARACTERISTICS

The function of SATELLINE-2ASxE is like a communication cable, except the data transfer happens in the half-duplex mode. The SATELLINE-2ASxE complies with the European specification ETS 300 113. The output power

of the transmitter is 1 watt, and the sensitivity of the receiver is less than -115 dBm, which gives an operating range of tens of kilometers. The radio modem

features data speed max 4800 or 9600 bps depending on channel spacing. It can be operated at a voltage range of +9...+30 Vdc.

### OPERATING MODES AND AUXILIARY FUNCTIONS

The SATELLINE-2ASxE has three modes of operation: programming mode, test mode, and data transfer mode. In the programming mode, the parameters and functions of the radio modem are set from a computer via the RS-232 interface. The data transfer mode of SATELLINE-2ASxE includes a command program function that allows the radio channel and addresses to be changed online from the serial port of the radio data modem. The radio modem is compatible with most protocols used worldwide. The SATELLINE-2ASxE radio modem also works as a repeater station, so

### KEY FEATURES

- Compatible with RS-232.
- Each radio can act as a repeater.
- 380-470 MHz.
- Tens of kilometres range.
- 9600 bps maximum.

wider coverage of the radio network is simple. In this function, it receives a data packet and transmits it over a longer distance as soon as it's received.

### SOFTWARE

SATELLINE-2ASxE uses programmable software with many functions and settings. Controlling the radio modem's operating status is as convenient as using a PC—you simply set a table of parameters with an RS-232 interface from any personal computer.

### 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**

VHF with NMS
UHF with NMS
<b>UHF</b>
Licence Free
IP67
OEM



## 2ASxE TECHNICAL SPECIFICATIONS

### TRANSCEIVER

Frequency Range	380...470 MHz
Channel Spacing	12.5 kHz, 20 kHz or 25 kHz
No. Of Channels	160, 100 or 80

### TRANSMITTER

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

### RECEIVER

Maxium Usable Sensitivity	< - 115 (BER < 10 E-3)
Co-Channel Rejection	> - 8 dB
Adjacent Channel Selectivity	> 60 dB / > 70 dB or > 70 dB
Intermodulation Attenuation	> 65 dB
Spurious Radiations	< 2 nW

### DATA MODEM

Interface	RS-232
Interface connector	Connector D 15, female
Data speed of RS Interface	1200...4800 bps (12.5/20 kHz channel) 1200...9600 bps (25 kHz channel)
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

# 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.

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

## 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.



## TECHNICAL SPECIFICATIONS

### TRANSCIEVER

Frequency Range	370...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.

### 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.

#### KEY FEATURES

- 10 Watt transmitter offers potential 90 km range.
- Diversity reception improves reception.
- Compatible with SATELLINE-3AS(d) modems

### 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.

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

SATELLINE-3AS Epic	<b>YM3000</b>
SATELLINE-3ASd Epic	<b>YM3001</b>

### POWER SAVE VERSION

SATELLINE-3AS Epic DB PWRS	<b>YM3008</b>
SATELLINE-3AS Epic C PWRS	<b>YM3009</b>

### WITH HEAT SINK

SATELLINE-3AS Epic C	<b>YM3002</b>
SATELLINE-3ASd Epic C	<b>YM3003</b>

### DUAL BAND

SATELLINE-3AS Epic DB	<b>YM3004</b>
SATELLINE-3ASd Epic DB	<b>YM3005</b>

### DUAL BAND WITH HEAT SINK

SATELLINE-3AS Epic C DB	<b>YM3006</b>
SATELLINE-3ASd Epic C DB	<b>YM3007</b>



VHF with NMS
UHF with NMS
<b>UHF</b>
Licence Free
IP67
OEM

## 3AS EPIC TECHNICAL SPECIFICATIONS

### TRANSCEIVER

Frequency Range	370 ... 470 MHz
Channel Spacing	12.5 / 20 or 25 kHz
No. Of Channels	160 or 80

### TRANSMITTER

Carrier Power	1 ... 10 W / 50 ohm
Carrier Power Stability	+ 2 dB / - 3 dB

### RECEIVER

Sensitivity	< -115 dBm (BER < 10E-3)
Co-Channel Rejection	> - 12 dB
Adjacent Channel Selectivity	> 60 dB / > 70 dB
Intermodulation Attenuation	> 65 dB
Spurious Radiations	< 2 nW
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)
Weight	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

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

VHF with NMS  
 UHF with NMS  
 UHF  
**Licence Free**  
 IP67  
 OEM

## 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.

#### KEY FEATURES

- Licence Free radio modem
- For short distances

### 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	<b>YM4000</b>
Antenna 1870	<b>YA1869</b>

### 1870 AND 1870E TECHNICAL SPECIFICATIONS

#### TRANSCIEVER

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)
-------------	-------------------------

#### 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

**NEW!**

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	<b>YM4010</b>
Antenna for 1870E	<b>YA1869</b>



## 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

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

## 1915 TECHNICAL SPECIFICATIONS

### TRANSCEIVER

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)
-------------	-------------------------

### 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 12 SATELLINE-3AS(d) for technical specifications.

### KEY FEATURES

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



SATELLINE-3AS 869

YM1021

SATELLINE-3ASd 869

YM1023

Antenna 869

YA0869

# IP67 RADIO MODEMS

VHF with NMS
UHF with NMS
UHF
Licence Free
IP67
OEM

## SATELLINE®-3ASd Epic Pro

NEW!

SATELLINE-3ASd Epic Pro is an IP67 (NEMA 6) classified UHF radio modem with a high power (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.

### HEAVY-DUTY TOOL FOR OUTDOOR USE

SATELLINE-3ASd Epic Pro 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

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

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

SATELLINE-3ASd Epic Pro

YM3020



#### 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
---------------	-----------------------

#### RECEIVER

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

#### DATA MODEM

Interface	RS-232
Interface Connector	Lemo compatible 8-pin, waterproof
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
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)



VHF with NMS

UHF with NMS

UHF

Licence Free

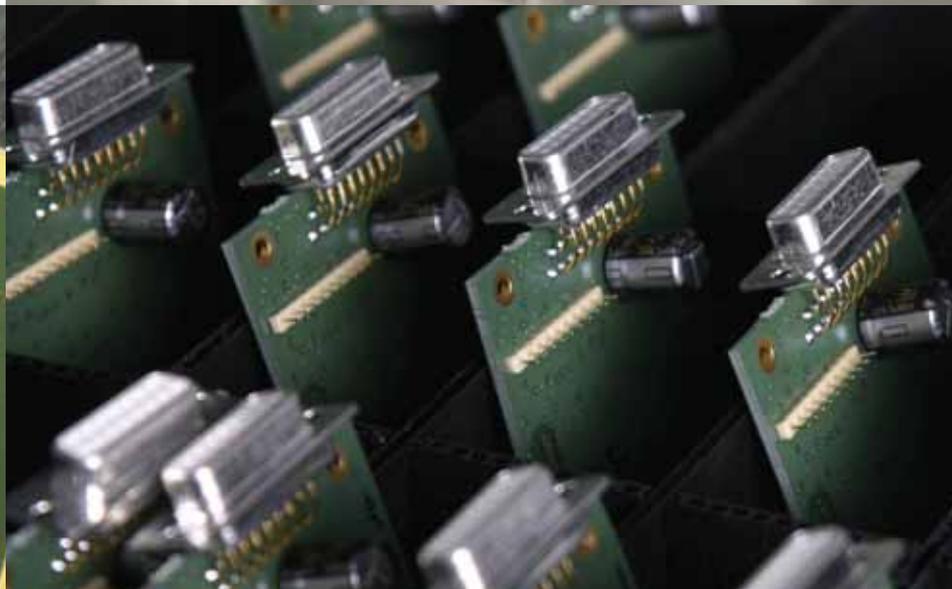
IP67

OEM

## 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](http://www.satel.com)



# 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.

SATEL I-LINK 100	<b>YI0007</b>
SATEL I-LINK 100 MB	<b>YI0017</b>
SATEL I-LINK 200	<b>YI0009</b>
SATEL I-LINK 300	<b>YI0010</b>

## 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.

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.

### 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	<b>YI0015</b>
SATEL C-LINK 100 MB	<b>YI0025</b>



### 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



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	<b>YI0090</b>
SATEL MINI-LINK MB	<b>YI0095</b>



## 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	<b>YI0485</b>
---------------	---------------

## 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	<b>YI0020</b>
---------------	---------------

# SATELLINK PRODUCTS

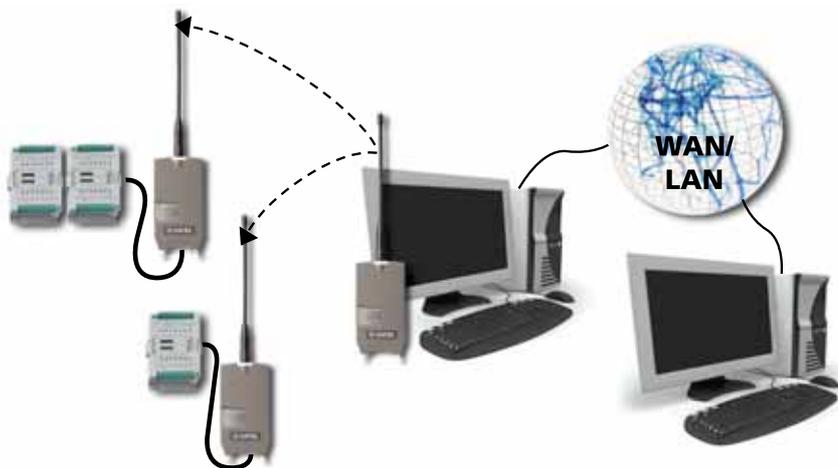
## SATELLINK PC Pro

### 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

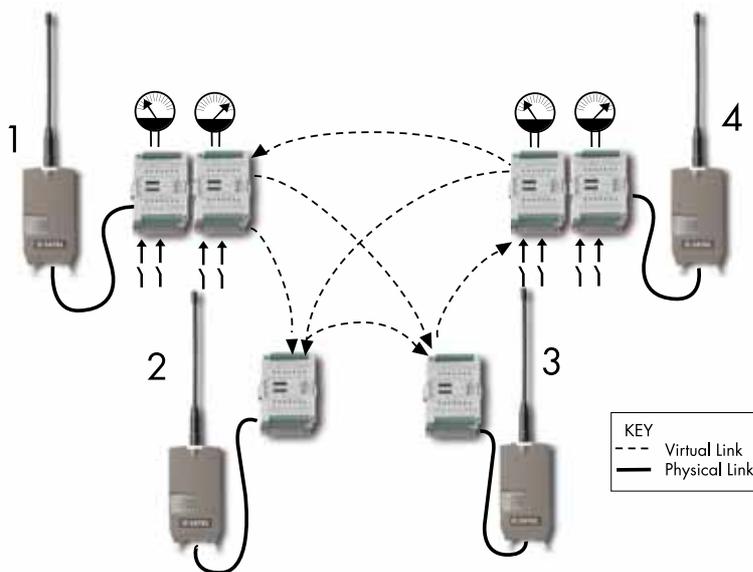
This cost-effective Multipoint software can be used to control several SATELLINK series I/O-converters and extension modules connected to SATELLINE radio modems. The maximum number of substations is 127 pcs. At maximum, three extension modules can be connected to each basic unit if necessary.

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.

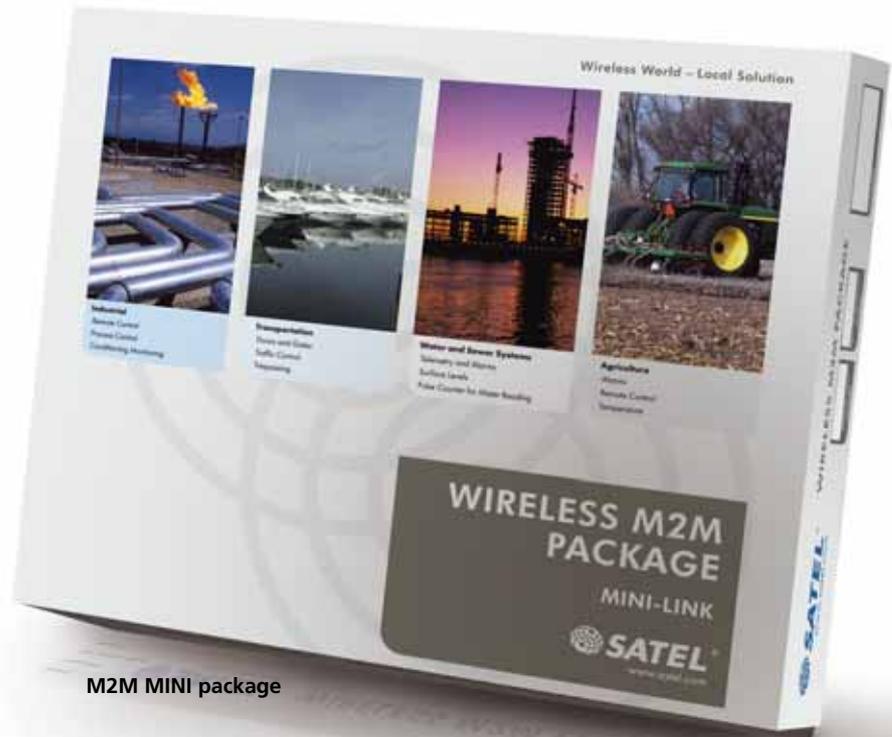
The SATELLINE-1870 and 1870E are light-weight and compact; short and medium range radio modems, which operate on pan-European Licence-free frequencies. These radio modems are well suited to industrial data transfer solutions where connection distances are measured from tens of meters up to couple of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

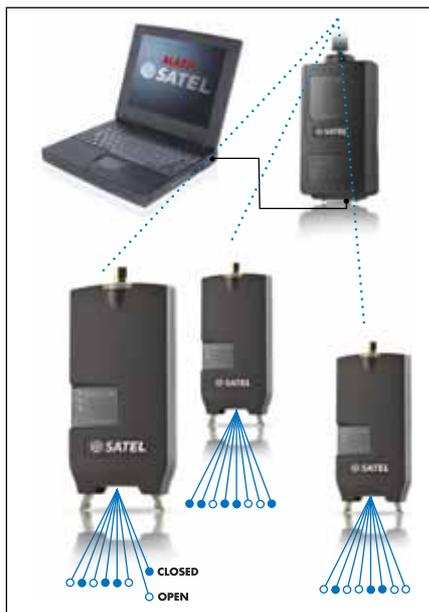
Similar to M2M packages, but includes MINI-LINK I/O-converters.

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

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

## ALARM TRANSFER 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

# ACCESSORIES



## 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	<b>YP0321</b>
Data cable 321 / RS-485	<b>YC0900</b>
Data cable 321 / RS-232	<b>YC0901</b>
Charging cable 321	<b>YC0902</b>
AC adapter with charging cable 321	<b>YC0903</b>
Power cable 321	<b>YC0904</b>



## 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 **YP0118**



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.

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

### 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.

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

## ADDITIONAL CABLES

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

## ANTENNA RF CABLES

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

## INSTALLATION PARTS FOR DIN-RAIL

<b>DIN-1</b>	96 x 70 mm	<b>ME0205</b>
<b>DIN-2</b>	67 x 70 mm	<b>ME0210</b>
<b>DIN</b>	For Epic	<b>ME0213</b>

## 321 CABLES

Accessory cables used with the 321 Battery Pack.

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

# ANTENNAS

## OMNI DIRECTIONAL ANTENNAS

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 to modem or with cable to ground plane.

<b>Frequencies</b>	400 ... 435 MHz 435 ... 470 MHz
<b>Connection</b>	TNC, 50 Ω, male
<b>Length</b>	420 mm
<b>Weight</b>	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.

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

Antenna 1870 **YA1869**

### 3 ANTENNA 1915

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

<b>Frequency</b>	902 ... 928 MHz
<b>Connection</b>	RP SMA, male
<b>Length</b>	171 mm
<b>Weight</b>	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.

<b>Frequency</b>	400 ... 470 MHz
<b>Connection</b>	TNC, 50 Ω, male
<b>Length</b>	165 mm
<b>Weight</b>	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.

<b>Frequency</b>	146 ... 174 MHz
<b>Connection</b>	TNC, 50 Ω, male
<b>Length</b>	161 mm
<b>Weight</b>	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.

<b>Frequency</b>	869 MHz
<b>Connection</b>	TNC, 50 Ω, male
<b>Length</b>	69 mm
<b>Weight</b>	35 g

Antenna 869 **YA0869**

### 7 MINIFLEX ANTENNA

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

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

Antenna Miniflex 400-435 MHz **YA0104**

Antenna Miniflex 435-470 MHz **YA0102**

## 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

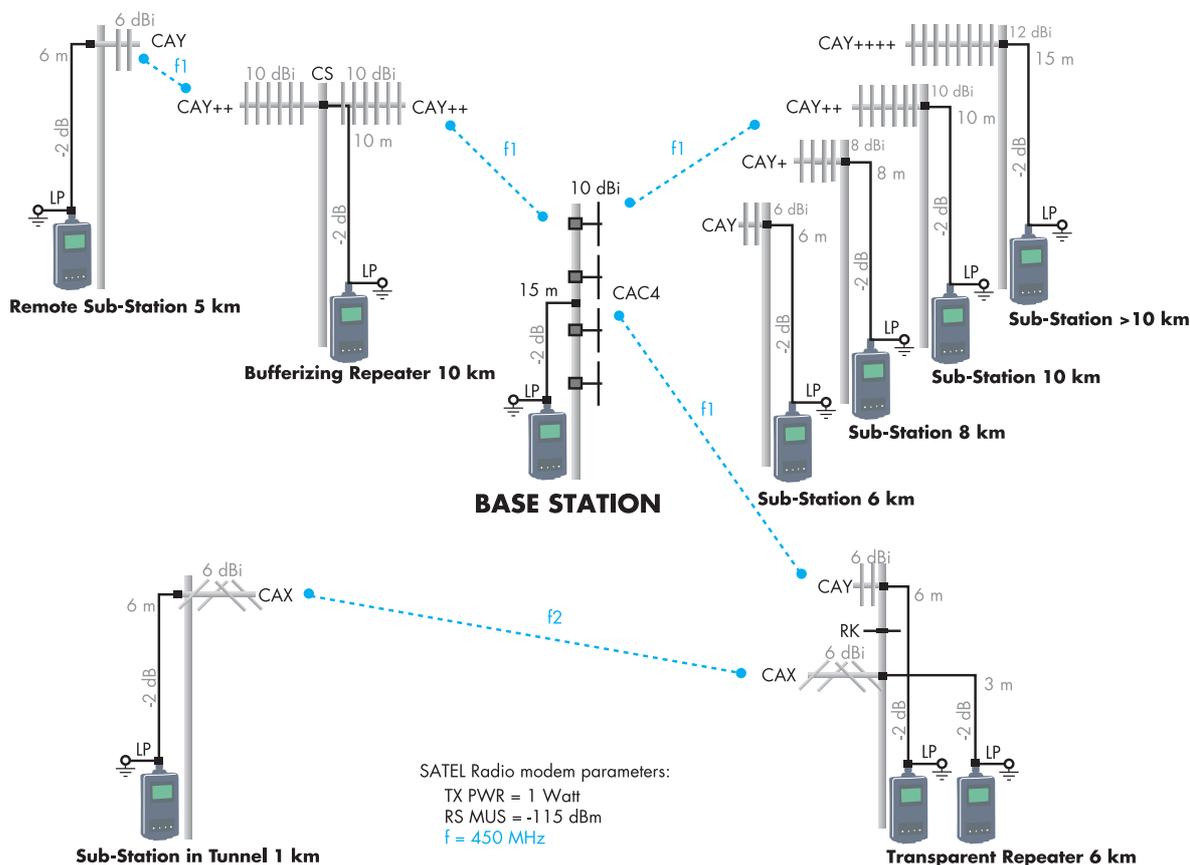
In point to multipoint radio networks, one or multiple base stations are serving multiple substations—fixed or mobile. Typically, base stations are equipped with omni-directional (CAE2, CAE4, CAGP, CAGP+) or offset pattern antennas (CAC2, CAC4) in order to serve substations inside a big angle. Usually, 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.

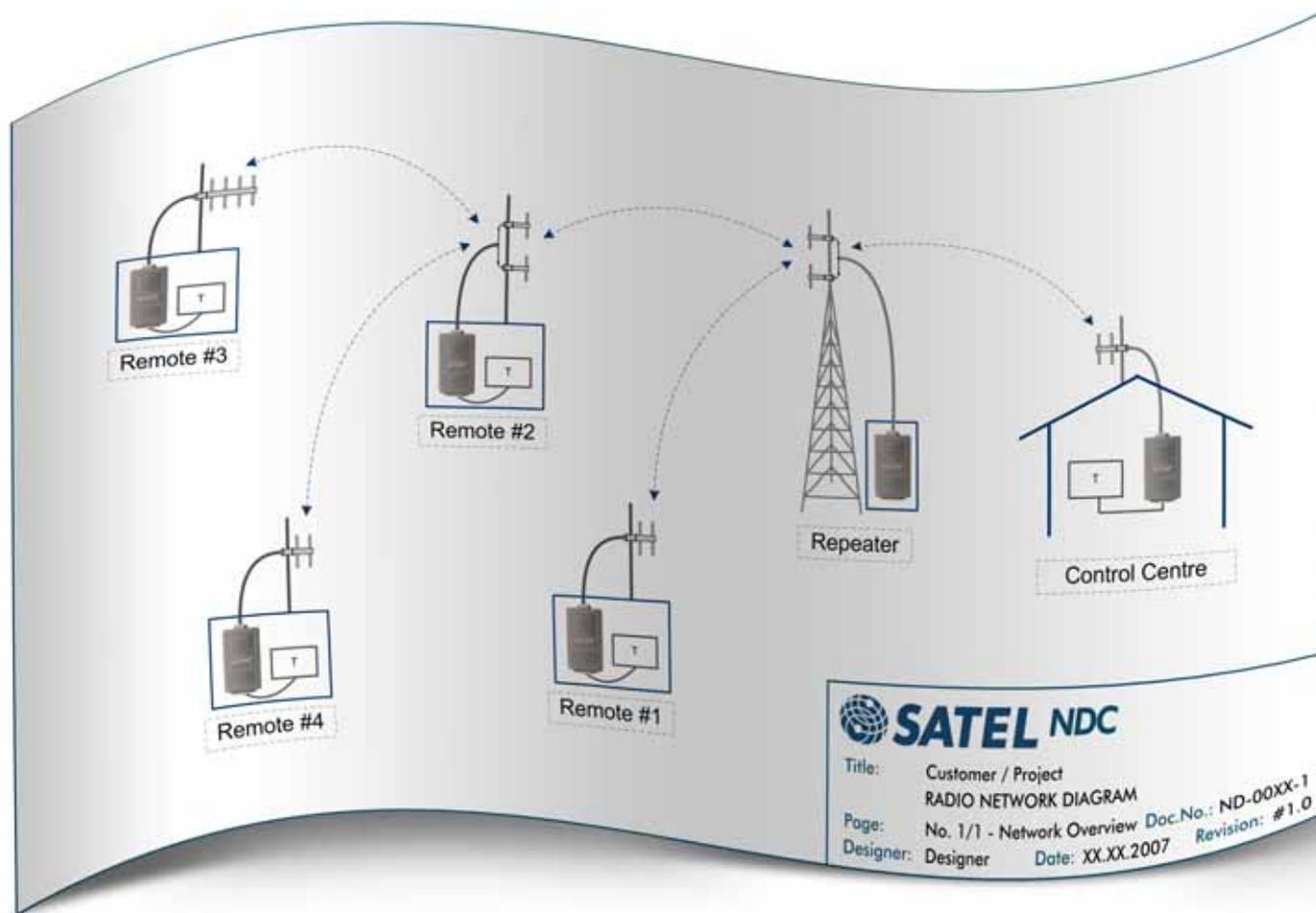
### DIVERSITY (DUAL) ANTENNAS

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.





**OUR NETWORK DESIGN CENTER 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 Center at [ndc@satel.com](mailto: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

# PLANNING A NETWORK

## PLAN NETWORK REQUIREMENTS

Like other engineering tasks, design of a radio modem network requires a set of rules to be followed for producing the desired result. Both the radio connections themselves and the compatibility of the surrounding system need to be considered.

The first part of the design is to evaluate the requirements the system environment, geography, and the local radio frequency and transmission laws.

## SYSTEM ENVIRONMENT

- Data protocol
- Interface types
- Maximum response times

## GEOGRAPHY

- Station locations
- Topographic profiles
- Buildings or other obstacles

## LOCAL RADIO TRANSMISSION REGULATIONS (AUTHORITIES)

- Available radio channels
- Max. Radiated power
- Tx/Rx duty cycle

## PLAN NETWORK HARDWARE

With the desired system performance and the limitations above in mind, the first version of the radio modem network can be designed:

1. Radio modem types and serial cable wirings are specified.
2. Radio links are simulated giving the antenna types and heights, feed cable lengths, and whether any additional repeater stations will be needed.
3. If necessary, other system components like RF filters, RF relays, combiners, lightning protectors, power supplies, and installation parts are specified.
4. Data transmission delays are calculated for the sufficient number of RF channels.

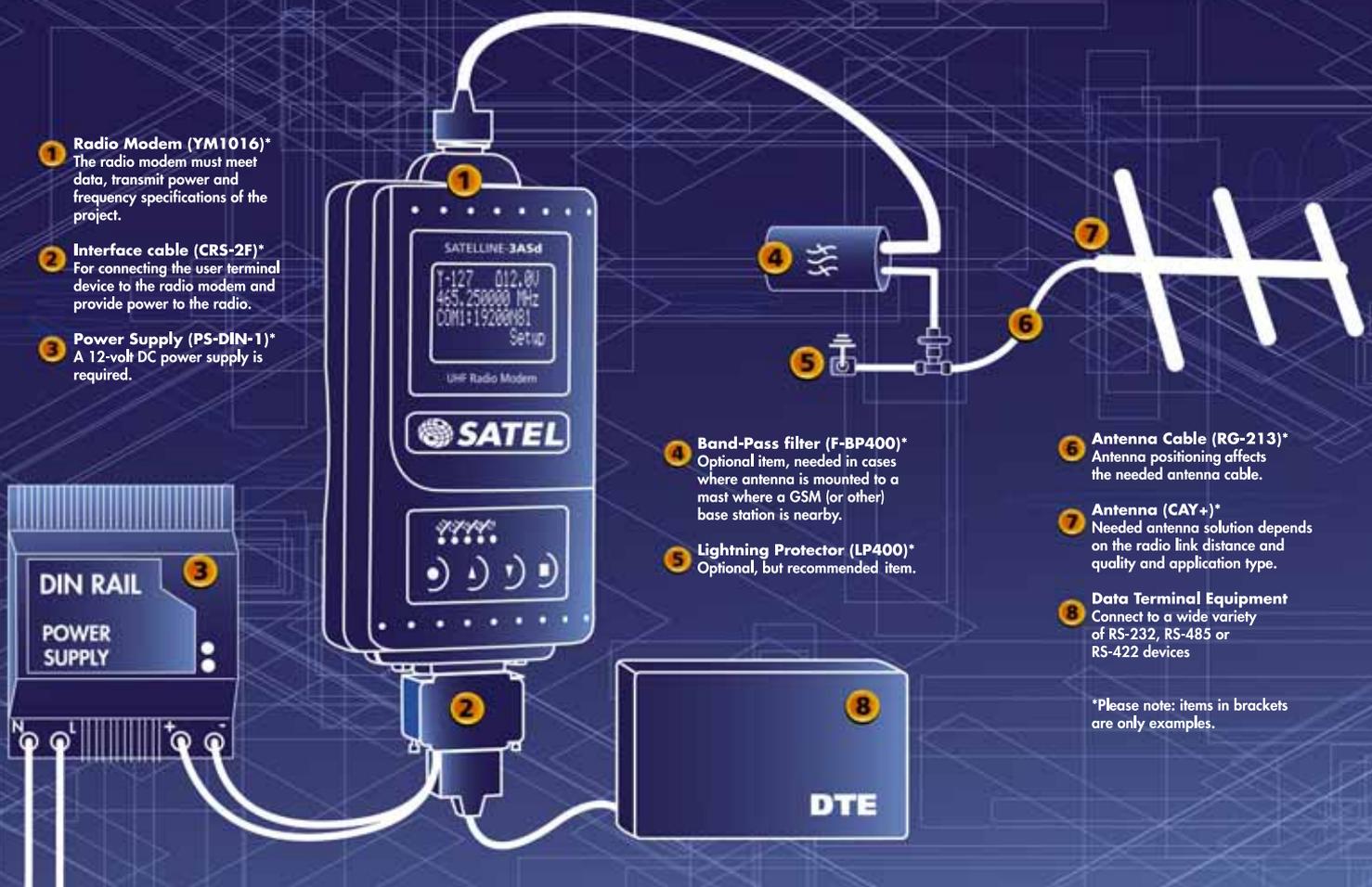
After these four steps, the system design is typically detailed enough for a commercial quotation.

## TEST THE COMPONENTS BEFORE FINAL INSTALLATION

Data communication tests at the factory, radio signal propagation, and radio interference tests on the field are important. The tests verify the functionality of the designed system, compatibility to the surrounding system, and the correct settings of the devices. Proper signal-to-interference margin is essential for reliable error-free radio communications.

## REPEAT TESTS AFTER FINAL INSTALLATION

By repeating the communication tests after the final installations, the system designer may verify that the radio network design works with the desired application.



# DISTRIBUTORS

## AFRICA

### SATEL SA

51 Brunton Circle  
Founders View South  
Modderfontein 1645 GAUTENG  
Tel +27 11 201 3200  
mark@satelsa.co.za  
www.i8a8.co.za  
SATEL SA serves Africa excluding Northern Africa.

## AUSTRALIA

### Rojone PTY Limited

61 Aero Rd, Ingleburn  
NSW 2565 SYDNEY  
Tel +61 2 9829 1555  
livia@rojone.com.au  
www.rojone.com.au

## AUSTRIA

### SATEL Radio Modems AUSTRIA

Mariahilfer Strasse 123/3  
AT-1060 VIENNA  
Tel +43 1 59999770  
info@satelaustria.com  
www.satelaustria.com

## BELGIUM

### SATEL Benelux b.v.

Broekbergenlaan 48  
NL-2071 EW SANTPOORT-NOORD  
The Netherlands  
Tel +31 23 538 9502  
info@satelbv.nl  
www.satelbv.nl

## BRAZIL

### Mapra Electronica Ltda

Av. São João, 568 Jd. Icatu  
18110-21 Votorantim-SP  
Tel +55 152105 0400  
mario.sergio@mapra.com.br  
www.mapra.com.br

## BULGARIA

### CONTROL SYSTEM Bulgaria EODD

Velcho Atanasov Street 53, fl. 2, ap. 4  
BG-1505 SOFIA  
Tel +359 2 979 7420  
Tel2: +359 2 979 7426  
info@controlsystem.bg  
www.controlsystem.bg

## CANADA

### MDA Controls Inc., CANADA

1131 Invicta Drive, Unit 4  
L6H 4M1  
OAKVILLE, ONTARIO  
Tel +1 905 845 3666  
Tel2: +1 888 558 9956  
joe.altman@mdacontrols.com  
www.mdacontrols.com

## CENTRAL AMERICA & CARIBBEAN

### SATEL CARIBE CORP

7625 NW 54th Street  
FL 33166 MIAMI, USA  
Tel +1 305 592 0593  
isolares@satelcaribe.com  
www.satelcaribe.com  
SATEL Caribe Corp serves: Antigua, Aruba, Bahamas, Barbados, Bermuda, Bonaire, British West Indies, Cayman Islands, Curaçao, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Netherlands Antilles, Puerto Rico, St. Maarten, St. Lucia, St. Vincent, Trinidad/Tobago, Turks and Caicos, US Virgin Islands and the following Central American countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama

## CHILE

### Equipos Profesionales de Comunicaciones

Cordillera 321, modulo A12  
Flexcenter Puerto Vespacio  
CL-873 0605 Quilicura, Santiago  
Tel: +56 2 7390103  
info@epcom.cl  
www.epcom.cl

## CHINA P.R.

### SATEL China Co., Ltd

Room109, No.3, Songbai East Street,  
BaiyunDistrict  
CN-510405 GUANGZHOU, GUANG-  
DONG Tel +86 20 8638 9526  
Tel2 +86 20 8638 9536  
xuhaixiu@163.com  
www.gzkeyin.com

## CROATIA

### MICRO-LINK d.o.o.

Franje Fuša 12  
HR-10000 ZAGREB  
Tel +385 1 363 6884  
microlink@microlink.hr  
www.microlink.hr  
MICRO-LINK d.o.o serves Croatia and Bosnia and Herzegovina

## CZECH REPUBLIC

### ControlTech s.r.o.

Tridvorská 1371  
CZ-28002 KOLÍN  
Tel +420 321 7420 11  
info@controltech.cz  
www.controltech.cz

## DENMARK

### COMSYSTEM A/S

Porthusvej 9 B  
DK-3490 KVISTGAARD  
Tel +45 49 139 693  
salg@comsystem.dk  
www.comsystem.dk

## ECUADOR

### SEIN S.A.,

Viñedos N45-238 y Guarumos  
Sector El Inca  
Quito  
Tel +593 2 226 8661  
Tel2: +593 2 246 7393  
carlos.duque@sein.com.ec  
www.sein.com.ec

## EGYPT

### I.C.E.E.S

P.O. Box 2773 El Horia, Heliopolis  
EG-11361  
CAIRO  
Tel +20 2 2267 0427  
Tel2: +20 12 215 3813  
info@icees-eg.com  
www.icees-eg.com

## ESTONIA

### ALARMTEC AS

Saku 15  
EE-11314 TALLINN  
Tel +372 6 598 800  
alarmtec@alarmtec.ee  
www.satel.ee  
Alarmtec AS serves Estonia, Latvia and Lithuania.

## FRANCE

### COMATIS

8, rue Carnot  
FR-78210 SAINT CYR L'ECOLE  
Tel +33 1 3930 2900  
info@comatis.com  
www.comatis.com  
COMATIS serves France and following North African countries: Algeria, Cameroun, Congo, Democratic Republic of Congo, Center African Republic, Benin, Burkina Fasso, Ivory Cost, Guinea, Mali, Morocco, Nigeria, Senegal, Tchad, Togo and Tunisia.

## GERMANY

### WELOTEC GmbH

Zum Hagenbach 7  
DE-48366 LAER  
Tel +49 2554 9130 00  
info@satel.de  
www.satel.de

## GREECE

### CONTROL SYSTEM Ltd.

13, Chlois Str.  
GR-54627 THESSALONIKI  
Tel +302 310 521 055  
info@controlsystem.gr  
www.controlsystem.gr

## HUNGARY

### ControlTech s.r.o.

Baross u.165.  
HU-2040 BUDAÖRS  
Tel +36 23 445 900  
info@controltechhungary.hu  
www.controltechhungary.hu

## ICELAND

### Naust Marine hf

Skeidarasi 3  
IS-210 GARDABÆ  
Tel +354 565 8080  
thp@naust.is  
www.naust.is

## INDIA

### LOTUS WIRELESS

B-7, E-E Industrial Development Area,  
B-Block, Autonagar  
IN-530012 VISAKHAPATNAM  
Tel +91 891 276 1678  
info@lotuswireless.com  
www.lotuswireless.com

## INDONESIA

See Singapore

## IRELAND

### Sigma Wireless Communications Ltd

McKee Avenue, Finglas,  
11 DUBLIN  
Tel +353 1 814 2100  
sales@sigma.ie  
www.sigmapwireless.com  
Sigma Wireless Communications Ltd is serving Ireland and Northern Ireland

## ISRAEL

### Arrowmid Group Ltd

108 Yigal Alon st  
IL-67891 TEL AVIV  
Tel +972 36 247 080  
info@arrowmid.com  
www.arrowmid.com

## ITALY

### SARTELCO SISTEMI S.r.l.

Via Torri Bianche, 1  
IT-20059 VIMERCATE (MI)  
Tel +39 039 629 051  
sistemi@sartelco.it  
www.sartelco.it

## KAZAKHSTAN

### Winncom Technologies

30A, Kabanbay Batir St.,  
Office 601-605  
KZ-010000 ASTANA  
Tel +7 3172 59 24 42  
sales@winncom.kz  
www.winncom.kz

## KOREA

### Thomas Trading Co. Ltd.

431-716 #Techno Town C-3201, #889-1  
Kwan Yang 2-Dong Anyang-Si  
KYUNG GI-DO  
Tel +82 31 424 3030  
system@thomas.co.kr  
www.thomas.co.kr

**LATIN AMERICA**

**Onyx International Networks LLC**  
3651 Peachtree Parkway Ste E310  
30024 SUWANEE, GA, USA  
Tel +1 678 467 4758  
info@onyxinternational.net  
www.onyxinternational.net

**LATVIA**

*See Estonia*

**LITHUANIA**

*See Estonia*

**LUXEMBOURG**

**SATEL Benelux b.v.**  
Broekbergenlaan 48  
NL-2071 EW SANTPOORT-NOORD, The Netherlands  
Tel +31 23 538 9502  
info@satelbv.nl  
www.satelbv.nl

**MALAYSIA**

*See Singapore*

**MEXICO**

**Rosbach de México, S.A. de C.V., MEXICO**  
1a. Cerrada de Xola No.30,  
Col. Del Valle  
MX-03100  
MÉXICO, D.F.  
Tel +52 1 555 147 0547  
ventas@rossbach.com.mx  
www.rossbach.com.mx

**THE NETHERLANDS**

**NAUTIKARIS b.v.**  
Broekbergenlaan 48  
NL-2071 EW SANTPOORT-NOORD  
Tel +31 23 538 9502  
info@nautikaris.com  
www.nautikaris.com

**NORTHERN AFRICA**

*See France*

**NORWAY**

**SATEL NORGE AS**  
Hoydaveien 17  
NO-1523 MOSS  
Tel +47 69 27 70 40  
produktinfo@satel.no  
www.satel.no

**PHILIPPINES**

*See Singapore*

**POLAND**

**ASTOR sp. z o.o.**  
ul. Smolensk 29  
PL-31112 KRAKOW  
Tel +48 12 428 6300  
satel@astor.com.pl  
www.astor.com.pl

**PORTUGAL**

**AEROSISTEMAS LDA**  
Rua de S. Bernardo 108 3  
PT-1200 LISBON  
Tel +351 21 414 2362  
service@aerosistemas.net  
www.aerosistemas.net

**ROMANIA**

**SC.TA.EL IMPEX SRL**  
13 Sergent Latea Gheorghe street  
sector 6  
RO-061663 BUCHAREST  
Tel +40 76666 1394  
tael@digiro  
www.tael.ro

**RUSSIA**

**Winncom Technologies Corp.**  
1, Partiyinyi pereulok  
RU-115093 MOSCOW  
Tel +7 495 692 8179  
sales.ru@winncom.com  
www.winncom.ru

**SAUDI ARABIA**

**Saudi Telecommunication & Power EST.**  
P.O. Box 14783  
31434 Dammam  
Tel +966 3 820 0477  
Tel2 +966 554 966 633  
mansour@stpest.com  
www.stpest.com

**SINGAPORE**

**SATEL (S.E.A.) Pte Ltd**  
371 Beach Road, # 07-04 Keypoint  
SG-199597 SINGAPORE  
Tel +65 62912925  
jeffreylim@satel-sea.com  
www.satel-sea.com  
*SATEL (S.E.A.) Pte Ltd serves Singapore, Malaysia, Thailand, Indonesia and Philippines.*

**SLOVAK REPUBLIK**

**ControlTech s.r.o.**  
Frantiskánska 5  
SK-91700 TRNAVA  
Tel +421 33 59138 11  
info@controltech.sk  
www.controltech.sk

**SLOVENIA**

**METRONIK d.o.o.**  
Stegne 9A  
SI-1000 LJUBLJANA  
Tel +386 1 514 0800  
info@metronik.si  
www.metronik.si  
*METRONIK d.o.o serves Slovenia and Serbia and Montenegro*

**SPAIN**

**SATEL SPAIN S.L.**  
Avda de España 135,  
Bloque 2A, - Oficina 7  
ES-28231 LAS ROZAS, MADRID  
Tel +34 91 636 22 81  
info@satelspain.com  
www.satelspain.com

**SWEDEN**

**Induo AB**  
Rökerigatan 19  
SE-121 63 JOHANNESHOV  
Tel +46 8 659 43 00  
info@induowireless.com  
www.induowireless.com

**SWITZERLAND**

**LINK COMPUTER SERVICES s.a.**  
Chemin des Rosiers 9  
CH-1763 GRANGES-PACCOT/FR  
Tel +41 26 469 0700  
linkcomputer@datacomm.ch

**TAIWAN**

**ENVIRONMENTAL SCIENCE & ENG'N CORP.**  
14F, No. 31, Sec.2 San Min Rd.  
Pan Chiao City  
TAIPEI HSIEN  
Tel +886 2 2963 4300  
sales@esne.com.tw  
www.esne.com.tw

**THAILAND**

*See Singapore*

**TURKEY**

**BILKO AS**  
Perpa Ticaret Merkezi, B-Blok Kat 11  
No:1740  
TR-80270 OKMEYDANI, ISTANBUL  
Tel +90 212 320 1383  
bilko@bilko-automation.com  
www.bilko-automation.com

**UKRAINE**

**Winncom Technologies Corp.**  
18A, Kikvidze st.  
UA-01103 KIEV  
Tel +1 440 498 9510  
Tel2 +380 67 410 4187  
ds@winncom.com  
www.winncom.ru

**UNITED ARAB EMIRATES**

**Gulf Commercial Group is serving UAE, Iran and Qatar**  
P.O. Box 25940  
DUBAI  
Tel +971 4 343 9496  
Tel2: +971 50 145 5900  
radwan.zein@gcgest.com  
www.gcgest.com

**UNITED KINGDOM**

**Saderet Limited**  
The Old Parsonage, St. Judes  
IM7 2EW  
Isle of Man, British Isles  
Tel +44 1624 880366  
Tel2: +44 7717 222187  
andy@saderet.co.uk  
www.saderet.co.uk

**XL SYSTEMS LTD**

XL House, Leas Road, Warlingham  
CR6 9LN SURREY  
Tel +44 1883 622 778  
sales@xls.co.uk  
www.xls.co.uk

**UNITED STATES**

**SATEL North America L.L.C**  
200 Spangler Ave.  
IL 60126 ELMHURST  
Tel +1 800 292 9778  
Tel2 +1 800 776 7706  
mleibold2@satelnorthamerica.com  
www.satelnorthamerica.com  
*SATEL's Officially Approved US Service Office. Contact for your service, technical support and sales needs excluding the west coast.*

**SATEL-West**

10680 S.DeAnza Blvd. #D  
CA 95014 CUPERTINO  
Tel +1 800 915 1109  
info@satel-west.com  
www.satel-west.com  
*SATEL-West serves CA, OR, AZ, NV, ID, UT, AK and WA states in the USA*

**UZBEKISTAN**

**Winncom Technologies**  
16, Iliyeva str.  
UZ-100090 TASHKENT  
Tel +998 71 1206253  
f.roziyev@winncom.com  
www.winncom.ru

**VENEZUELA**

**FERRUM Energy Solutions**  
Calle 3-B con Calle 2-A  
Edif. FERRUM  
La Urbina - Caracas  
Tel +58 0212 241 13 60  
agalipolli@ferrum-ca.com  
www.ferrum-ca.com

**VIETNAM**

**TRIEUHA Co. Ltd**  
Suite 1505, 17T5 Tower  
New Urban Area  
Trunghoa-Nhanchinh HANOI  
Tel +84 4 251 0400  
info@trieuha.com  
www.trieuha.com



**SATEL Oy**, Meriniitynkatu 17, P.O. Box 142, FI-24101, Salo, FINLAND  
Tel: +358 2 777 7800, Fax: +358 2 777 7810 E-mail: [info@satel.com](mailto:info@satel.com)  
[www.satel.com](http://www.satel.com)