

IMPORTANT NOTICE

All rights to this manual are owned solely by SATEL Oy (referred to in this user guide as SATEL). All rights reserved. The copying of this manual (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.

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.

Salo, Finland 2023

NOTE! This is a short form user guide for SATEL products. Complete user guide for each model is available in electronic format on SATEL web site www.satel.com

RESTRICTIONS ON USE

SATELLINE radio modems have been designed to operate on frequency ranges, the exact use of which differs from one region and/or country to another. The user of a radio modem must take care that the said device is not operated without the permission of the local authorities on frequencies other than those specifically reserved and intended for use without a specific permit

WARNING! Users of SATELLINE radio modems in North America should be aware, that due to the allocation of the frequency band 406.0 – 406.1 MHz for government use only, the use of radio modem on this frequency band without a proper permit is strictly forbidden.

WARRANTY AND SAFETY INSTRUCTIONS

Read these safety instructions carefully before using the product:

- Warranty will be void, if the product is used in any way that is in contradiction with the instructions given in this manual, or if the radio modem housing has been opened or tampered with.
- The radio modem is only to be operated at frequencies allocated by local authorities, and without exceeding the given maximum allowed output power ratings. SATEL and its distributors are not responsible, if any products manufactured by it are used in unlawful ways.
- The devices mentioned in this manual are to be used only according to the instructions described in this manual. Faultless and safe operation of the devices can be guaranteed only if the transport, storage, operation and handling of the devices are appropriate. This also applies to the maintenance of the products.
- To prevent damage both the radio modem and any terminal devices must always be switched OFF before connecting or disconnecting the serial connection cable. It should be ascertained that different devices used have the same ground potential. Before connecting any power cables, the output voltage of the power supply should be checked.

DECLARATION OF CONFORMITY

Hereby, SATEL Oy declares that SATELLINE radio modems are in compliance with the essential requirements (radio performance, electromagnetic compatibility and electrical safety) and other relevant provisions of Directive 2014/53/EU. Therefore, the equipment is labeled with the CE-marking (image down below).



Declaration of Conformity documents are available from the manufacturer SATEL Oy (www.satel.com) or from local SATEL distributor.

TABLE OF CONTENTS

IMPORTANT NOTICE.....	1
RESTRICTIONS ON USE.....	2
DECLARATION OF CONFORMITY	3
TABLE OF CONTENTS	4
1 SATELLINE -3AS VHF	6
1.1 TECHNICAL SPECIFICATIONS FOR SATELLINE-3AS VHF (YM5000) AND -3ASd VHF (YM5010)	6
1.2 TECHNICAL SPECIFICATIONS FOR SATELLINE-3AS VHF C (YM5020) AND -3ASd VHF C (YM5030)	6
1.3 PINNING ORDER	7
2 SATEL-EASY+	8
2.1 TECHNICAL SPECIFICATIONS FOR SATEL-EASY+ (YM6010, YM6015, YM6050, YM6055).....	8
2.1 PINNING ORDER	8
3 SATEL-EASY PRO+	10
3.1 TECHNICAL SPECIFICATIONS FOR SATEL-EASY PRO+.....	10
3.2 DUTY CYCLE FOR SATEL-EASY PRO+	10
3.3 PINNING ORDERS	11
4 SATELLINE-EASY, -EASY 869, -EASY (865-867 MHZ)	12
4.1 TECHNICAL SPECIFICATIONS FOR SATELLINE-EASY (YM6500, YM6550, YM6510, YM6560)	12
4.2 TECHNICAL SPECIFICATION FOR SATELLINE-EASY 869 (YM6501, YM6551)	12
4.3 TECHNICAL SPECIFICATION FOR SATELLINE-EASY, 865-867 MHZ (YM6501, YM6551).....	13
4.4 PINNING ORDER	14
5 SATELLINE-EASY PRO 35W	15
5.1 TECHNICAL SPECIFICATIONS FOR SATELLINE-EASY PRO 35W (YM6803 AND YM6813)	15
5.2 DUTY CYCLE FOR SATELLINE-EASY PRO 35W.....	15
5.3 PINNING ORDERS	16
6 SATEL COMPACT-PROOF	17
6.1 TECHNICAL SPECIFICATION FOR SATEL COMPACT-PROOF (YM6570, YM6571)	17
6.2 TECHNICAL SPECIFICATION FOR SATEL COMPACT-PROOF, 869 MHZ, (YM6575, YM6576)....	17
6.3 TECHNICAL SPECIFICATION FOR SATEL COMPACT-PROOF, 865-867 MHZ, (YM6575, YM6576)	18
6.4 SPECIFICATION FOR BATTERY	18
6.5 CHARGING INDICATORS	19
6.6 PINNING ORDERS	19
7 SATEL EASY-PROOF AND SATEL PROOF-TR4+ / -TR9	20
7.1 TECHNICAL SPECIFICATION FOR SATEL EASY-PROOF (YM6580, YM6585)	20
7.2 TECHNICAL SPECIFICATION FOR SATEL PROOF-TR4+ (YM6577, YM6578) / -TR9 (YM6410, YM6411, YM6412).....	20
7.3 PINNING ORDER	21
8 CUSTOMIZED RADIO MODEMS AND MODULES	22

8.1	SATELLINE-M3 VHF (YM6000) TECHNICAL SPECIFICATIONS.....	22
8.2	SATELLINE-M3-TR1 (YM6300, YM6310) TRANSCEIVER MODULE	22
8.3	PINNING ORDER FOR D15 FEMALE CONNECTOR ADAPTER	23
8.4	SATELLINE-M3-TR1 869 (YM6301) TRANSCEIVER MODULE	24
8.5	SATELLINE-M3-TR1, 865-867 MHZ, (YM6301) TRANSCEIVER MODULE	24
8.6	PINNING ORDER FOR TR1 869 AND 865 MHZ VARIANT, 26-PIN CONNECTOR	25
8.7	PINNING ORDER FOR D15 FEMALE CONNECTOR ADAPTER	26
8.8	SATEL-TR4+ (YM7470, YM7475, YM7480, YM7485) TRANSCEIVER MODULE	27
8.9	SATEL-R4+ (YM7495, YM7496, YM7490, YM7491) RECEIVER MODULE	27
8.10	SATEL-TR300 (YM7300, YM7305, YM7315) TRANSCEIVER MODULE	28
8.11	PINNING ORDER FOR SATEL-TR4+, -R4+ AND TR300	28
8.12	SATELLINE-M3-TR9 (YM7900, YM7910, YM7915, YM7920) TRANSCEIVER MODULE.....	29
8.13	SATELLINE-M3-R9 (YM7950) RECEIVER MODULE	29
8.14	SATEL-TR49 (YM8490, YM8495, YM8500, YM8505, YM8510, YM8515, YM8520, YM8525)	30
	TRANSCEIVER MODULE	30
8.15	SATEL-TR489 (YM8810, YM8815, YM8820, YM8825) TRANSCEIVER MODULE	30
8.16	PINNING ORDER FOR SATELLINE-TR9, -R9, SATEL-TR49 AND TR489	31
8.17	SATEL-TR49 SNAPON (YM8600, YM8605, YM8610, YM8615, YM8630, YM8635)	32
	TRANSCEIVER MODULE	32
8.18	PINNING ORDER FOR SATEL-TR49 SNAPON.....	33
9	ADDITIONAL EQUIPMENT	35
9.1	SATELLINK I/O-CONVERTERS.....	35
10	ACCESSORIES	36
10.1	INTERFACE CABLES AND ADAPTERS FOR RS-232 INTERFACE.....	36
10.2	INTERFACE CABLES AND ADAPTERS FOR RS-485/422 INTERFACE	36
10.3	NMS CABLE.....	37
10.4	PROGRAMMING CABLE	37
10.5	RF CABLES	37
10.6	ANTENNAS	38
10.7	POWER SUPPLIES AND POWER CABLES	39
10.8	FILTERS AND LIGHTNING PROTECTORS	39
11	SOFTWARE	40
11.1	SATEL NETCO DEVICE	40
11.2	SATEL NETCO DESIGN	40
11.3	SATELLINE SATERM.....	40
11.4	SATEL NMS PC.....	40
11.5	SATEL CONFIGURATION MANAGER	41
11.6	SATEL NETCO NMS.....	41
11.7	FCS MONITOR.....	41
12	HOW TO ESTABLISH A WIRELESS DATA LINK	42
12.1	LIST OF EQUIPMENT.....	42
12.2	EQUIPMENT SETUP.....	42
12.3	PARAMETER SETUPS	43
12.4	COMMUNICATION TEST OVER THE LINK	43
13	SETTINGS	44
14	ERROR CORRECTION (FEC)	45
15	CHECK LIST / TROUBLE SHOOTING	46
16	RECYCLING	47

1 SATELLINE -3AS VHF

1.1 Technical specifications for SATELLINE-3AS VHF (YM5000) and -3ASd VHF (YM5010)

The model SATELLINE-3ASd VHF (YM5010) is equipped with LCD and push-buttons.

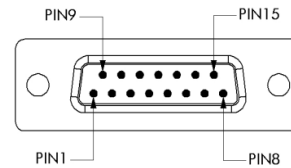
Subject	Value
Frequency range	135 ... 174 MHz
Tuning range	135 ... 155, 138 ... 160, 155 ... 174 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+10.6 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.7 W / 6.6 W @ 1 W, 22 W @ 5 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	137 x 67 x 29 mm
Weight	265 g

1.2 Technical specifications for SATELLINE-3AS VHF C (YM5020) and -3ASd VHF C (YM5030)

Both models are equipped with a heat sink, which is the appropriate choice for continuous transmission.

The model SATELLINE-3ASd VHF C (YM5030) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	135 ... 174 MHz
Tuning range	135 ... 155, 138 ... 160, 155 ... 174 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+10.6 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.7 W / 6.6 W @ 1 W, 22 W @ 5 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	137 x 80 x 56 mm
Weight	550 g



13 Pinning order

D15 female connector in radio modem.

- DTE is an abbreviation for Data Terminal Equipment
- DIR. column below denotes the direction of the signal:
"IN" is from DTE to the radio modem, "OUT" is from the radio modem to the DTE.

PIN	NAME	DIR.	LEVEL	EXPLANATION
1	DTR	IN	0..30V	Data Terminal Ready. The pin can be used to wake-up the radio module from the standby mode. >+2 VDC = ON, Not connected = ON, <+0.6 VDC = STANDBY
2	Pin 2 has alternative functions depending on the <i>Port2</i> configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if <i>Port2</i> selection is RS-232)
	A'	OUT	RS-422	<i>Port2</i> Receive Data positive (if <i>Port2</i> selection is RS-422)
A	IN/OUT	RS-485	<i>Port2</i> Data positive. <i>Note**</i>) (if <i>Port2</i> selection is RS-485)	
3	Pin 3 has alternative functions depending on the <i>Port2</i> configuration, see below.			
	RD2	OUT	RS-232	<i>Port2</i> Receive Data (if <i>Port2</i> selection is RS-232)
	B'	OUT	RS-422	<i>Port2</i> Receive Data negative (if <i>Port2</i> selection is RS-422)
B	IN/OUT	RS-485	<i>Port2</i> Data negative. <i>Note**</i>) (if <i>Port2</i> selection is RS-485)	
4	Pin 4 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	<i>Port2</i> Transmit Data (if <i>Port2</i> selection is RS-232)
	A	IN	RS-422	<i>Port2</i> Transmit Data positive (if <i>Port2</i> selection is RS-422)
5	Pin 5 has alternative functions depending on the hardware assembly, see below.			
	B	IN	RS-422	<i>Port2</i> Transmit data negative (default hardware)
RSSI	OUT	0..5V	Analogue RSSI (requires the special hardware assembly, needs to be defined in order sheet!)	
6	CTS	OUT	RS-232	Clear To Send. This signal indicates that the radio modem serial interface is ready to receive data from DTE. <i>Note*</i>)
7, 8	GND	-		Operating voltage and Signal Ground
9	RD1	OUT	RS-232	<i>Port1</i> Receive Data to DTE from the radio modem
10	DSR	OUT	RS-232	Data Set Ready. Indicates that the radio modem is ON.
11	TD1	IN	RS-232	<i>Port1</i> Transmit Data from DTE to the radio modem.
12	MODE	IN	0..30V	<2VDC or connected to ground = <i>Programming Mode</i> >3VDC or Not connected = <i>Data Transfer Mode</i> <i>Note***</i>)
13	RTS	IN	RS-232	Request To Send from DTE. <i>Note*</i>)
14, 15	V _b	-	+9...30 VDC	Operating Voltage.

Note! Unused pins can be left unconnected.

*Note**) RTS and CTS signals apply to the Data port-either *Port1* or *Port2* depending on the configuration.

*Note***) A and B designators are opposite in Profibus standard.

*Note****) *Programming Mode* is for changing the settings of the radio modem via *Programming menu*. Normally the MODE line is NOT connected i.e. the radio modem is in *Data Transfer Mode*.

2 SATEL-EASy+

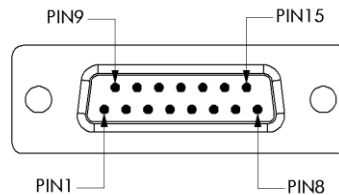
2.1 Technical specifications for SATEL-EASy+ (YM6010, YM6015, YM6050, YM6055)

The models SATEL-EASy+ YM6050 and YM6055 are equipped with LCD and push-buttons. Models YM6010 and YM6050 are with AES128 encryption support.

Subject	Value
Frequency range	403 ... 473 MHz
Tuning range	70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-116 dBm / 1 W
Interface	Port1: RS-232 Port2: RS-232 / 485 / 422
Operating voltage	+7 ... +27.5 Vdc (-15% / +20%)
Power consumption RX / TX	<1.5 W / <5.5 W
Data speed radio max. / serial	28800 / 115200 bps
Connectors	D15 / TNC female
Size H x W x D	138 x 67 x 29 mm
Weight	<350 g

2.1 Pinning order

D15 female connector in radio modem.



PIN	NAME	I/O	LEVEL	EXPLANATION
1	DTR	IN	MAX +27.5V	Data Terminal Ready. This pin can be used to wake-up the radio modem from standby mode. >+3 VDC = ON, <+0.6 VDC = STANDBY. By default, this pin can be left unconnected.
2	Pin 2 has alternative functions depending on the Port2 configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if Port2 Interface mode is RS-232)
3	A'	OUT IN/OUT	RS-422 RS-485	Port2 Receive Data positive (if Port2 Interface mode is RS-422) Shared input/output Data in RS-485 mode
	B'	OUT IN/OUT	RS-422 RS-485	Port2 Receive Data negative (if Port2 Interface mode is RS-422) Shared input/output Data in RS-485 mode
4	Pin 4 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	Port2 Transmit Data (if Port2 Interface mode is RS-232)
5	A	IN	RS-422	Port2 Transmit Data positive (if Port2 Interface mode is RS-422)
	B	IN	RS-422	Port2 Transmit data negative

6	CTS	OUT	RS-232	Clear To Send. This signal indicates that the radio modem serial interface is ready to receive data from DTE. <i>Note*)</i>
7, 8	GND	-		Operating voltage ground / signal ground. Signal ground has a galvanic connection to the modem casing.
9	RD1	OUT	RS-232	Port1 Receive Data to DTE from the radio modem
10	DSR	OUT	RS-232	Data Set Ready. Indicates that the radio modem is ON.
11	TD1	IN	RS-232	Port1 Transmit Data from DTE to the radio modem.
12	MODE	IN	MAX +27.5V	<2VDC or connected to ground = Programming Mode >3VDC or Not connected = Data Transfer Mode <i>Note**)</i>
13	RTS	IN	RS-232	Request To Send from DTE. <i>Note*)</i>
14, 15	V_b	-	See specs	Operating Voltage +7...27.5 VDC

Note! Unused pins can be left unconnected.

Note)* RTS and CTS signals apply to the selected Data port only (Port1 or Port2).

*Note**)* Programming Mode is for bringing the modem to a serial port state: Data port 1 38400N81. By default, modem is in Data Transfer Mode in a case Pin 12 is floating.

3 SATEL-EASy Pro+

3.1 Technical specifications for SATEL-EASy Pro+

(YM6820, YM6823, YM6825, YM6830, YM6833, YM6835, YM6840, YM6843, YM6845)

YM6820 is with AES128 encryption support and 25 W TX power.

YM6823 is with AES128 encryption support and 35W TX power.

YM6825 is w/o encryption support, with 25 W TX power.

YM6830 is with AES128 encryption support and 25 W TX power, for AU.

YM6833 is w/o encryption support, with 35 W TX power.

YM6835 is w/o encryption support, with max. 25 W TX power, for AU.

YM6840 is with AES128 encryption support and 35W TX power, for BR.

YM6843 is with AES128 encryption support and RS-422/-485 interface.

YM6845 is w/o encryption support, with 35W TX power, for BR.

Subject	Value
Frequency range *)	403 ... 473 MHz
Tuning range	70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity	-114 dBm (4FSK, 12.5 kHz, FEC ON) BER = 10 ⁻²
TX power max.	25 or 35 W, depending on the model
Interface	RS-232 YM6843 port 2: RS-232/-485/-422 (data / NMS)
Operating voltage	+9 ... +30 Vdc (-15% / +20%)
Power consumption, typical	
RX	1.8 W
TX	60 ... 72 W @ 25 W / 84 ... 97 W @ 35 W
Data speed radio max. / serial	28800 / 115200 bps
Connectors	8-pin ODU / 2-pin ODU / TNC female
Size H x W x D	180 x 138 x 71 mm
Weight	1400 g
IP classification	IP67 (NEMA6)

*) In USA and Canada this product is certified to use frequencies 406.1 – 430 MHz and 450 – 470 MHz. Using this device in USA or Canada outside these frequencies is prohibited.

3.2 Duty cycle for SATEL-EASy Pro+

If high output power is used continuously or with a high cycle, the equipment generates excess heat. The output power is automatically decreased, when necessary, to prevent overheating.

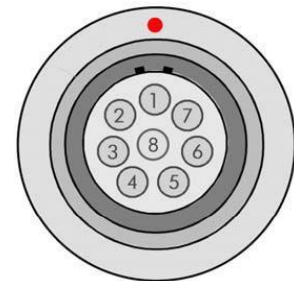
Three different duty cycle cases which are shown in the table below are measured with the following Ton and Toff times.

Duty Cycle/%	T _{on} /ms	T _{off} /ms
100	ON all time	-
75	850	280
50	850	850

3.3 Pinning orders

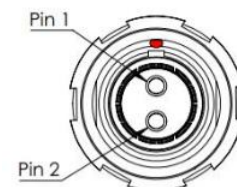
a) Data connector SATEL-EASy Pro+
8-pin ODU, GL1LAC-P08LFG0-0000

1	RTS
2	CTS
3	GND
4	RD
5	TD
6	MODE (Data/Prog)
7	Not connected
8	Not connected



b) Power connector SATEL-EASy Pro+
2-pin ODU, G82B0C-P02LTS0-0000

1	PWR (+)
2	GND



4 SATELLINE-EASy, –EASy 869, –EASy (865-867 MHz)

4.1 Technical specifications for SATELLINE-EASy (YM6500, YM6550, YM6510, YM6560)

The models SATELLINE-EASy YM6550 and YM6560 are equipped with LCD and push-buttons. Models YM6510 and YM6560 are with AES128 encryption support.

Subject	Value
Frequency range	330 ... 420 / 403 ... 473 MHz
Tuning range	90 / 70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 1 W
Interface	Port1: RS-232 fixed Port2: RS-232 / 422
Operating voltage	+3.5 ... +7.5 / +7 ... +27.5 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	139 x 67 x 29 mm
Weight	250 g

4.2 Technical specification for SATELLINE-EASy 869 (YM6501, YM6551)

The model SATELLINE-EASy 869 YM6551 is equipped with LCD and push-buttons.

Subject	Value
Frequency range	869.400 ... 870.000 MHz
Tuning range	See the user guide
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 500 mW
Interface	Port1: RS-232 Port2: RS-232 / 422
Operating voltage	+7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 3.8 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	139 x 67 x 29 mm
Weight	250 g

According to a recommendation of ETSI, the frequencies range 869.4...869.65 MHz is reserved for use of license free radio appliances. The application of this recommendation varies in each country, and for this reason local regulations concerning this frequency range must always be checked.

In frequency range 869.4...869.65 MHz, the maximum allowed radiated power of an antenna is 500 mW ERP (+27dBm). When calculating the power, antenna cable attenuation and antenna gain must be taken into account. For example, if the gain of the antenna is 10 dBd and the attenuation of the antenna cable used is -3dB, the maximum allowed transmission power is 100 mW (+20 dBm). It should be noted that by increasing the gain of the antennas, connection distance could be increased. This is due to the fact that the output power of the transmission remains constant, but the added antenna gain of the receiving end will enable reception of weaker signals than otherwise possible.

System designers must take into account that at the frequency range of 869.4 ... 869.65 MHz the transmitter is allowed to be ON only 10% of the time. Whether this limit is exceeded or not, depends on the protocol used. At a frequency range of 869 MHz there are in addition to the frequency channel 869.4...869.65 MHz also other ranges, but at these ranges the maximum allowed radiated power is 25 mW and the transmitter is allowed to be ON only 1 % or 0.1 % of the time.

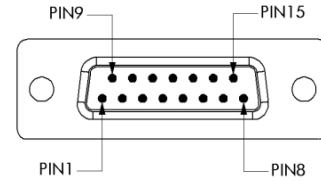
4.3 Technical specification for SATELLINE-EASy, 865-867 MHz (YM6501, YM6551)

The model SATELLINE-EASy, 865-867 MHz, YM6551 is equipped with LCD and push-buttons.

These variants of SATELLINE-EASy are ready to use on the Indian licence free channels.

Subject	Value
Frequency range	865 ... 867 MHz
Tuning range	2 MHz
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 1 W
Interface	Port1: RS-232 Port2:RS-232 / 422
Operating voltage	+7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	139 x 67 x 29 mm
Weight	250 g

4.4 Pinning order



D15 female connector in radio modem.

PORT AND TYPE	PIN	DIRECTION	NAME	EXPLANATION
PORT1: RS-232	6	OUT	CTS	*
	9	OUT	RD1	Receive data (Port1)
	11	IN	TD1	Transmit data (Port1)
	13	IN	RTS	*
PORT2: RS-232 / 422 232 ON / 422 OFF	2	OUT	CD	
	3	OUT	RD2	Receive data (Port2)
	4	IN	TD2	Transmit data (Port2)
	5	OUT	-	-
PORT2: RS-232 / 422 422 ON / 232 OFF	2	OUT	A'	Receive data positive
	3	OUT	B'	Receive data negative
	4	IN	A	** Transmit data positive
	5	IN	B	** Transmit data negative
PORT2: LVTTTL	2	OUT	CTS	*
	3	OUT	RD	Receive data (Port2)
	4	IN	TD	Transmit data (Port2)
	5	IN	RTS	*
PORT2: TTL	2	OUT	CTS	*
	3	OUT	RD	Receive data (Port2)
	4	IN	TD	Transmit data (Port2)
	5	IN	RTS	*
COMMON PINS	1	IN	DTR	ON (V _b or NC) / STANDBY (GND)
	10	OUT	DSR	
	12	IN	MODE	DATA (NC) / SETUP (GND)
	7, 8	-	GND	Power Ground
	14, 15	-	V _b	Operating Voltage

Direction **IN** is from DTE (Data Terminal Equipment) to the radio modem.

Direction **OUT** is to the DTE from the radio modem.

NOTE! Unused pins can be left unconnected.

*) RTS and CTS handshaking connections remain the same irrespective of the port used (Port 1 or Port 2).

**) A and B designators are opposite in Profibus standard.

5 SATELLINE-EASy Pro 35W

5.1 Technical specifications for SATELLINE-EASy Pro 35W (YM6803 and YM6813)

The model YM6813 is with AES128 encryption support.

Subject	Value
Frequency range	403 ... 473 MHz
Tuning range	70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 25* or 35 W
Interface	RS-232
Operating voltage	+10.6 ... +13.3 Vdc (-15% / +20%) (≥ +12 Vdc @ 35 W)
Power consumption	
RX	1.8 W
TX	100 W @ 25 W / 120 W @ 35 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU / 4-pin ODU / TNC female
Size H x W x D	189 x 138 x 71 mm
Weight	1420 g
IP classification	IP67 (NEMA6)

* Limited 25 W output power is available as an order option.

5.2 Duty cycle for SATELLINE-EASy Pro 35W

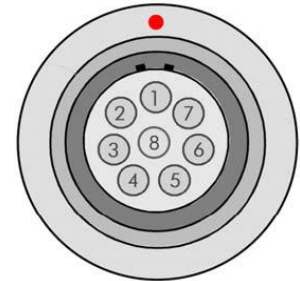
If high output power is used continuously or with a high cycle, the equipment generates excess heat. The output power is automatically decreased when necessary, to prevent overheating.

Duty cycle	100 % (22 °C / 35 °C)	40 %
Output power 35 W	20 min / 13 min	No limit
Output power 10 W	No limit / 20 min	No limit

5.3 Pinning orders

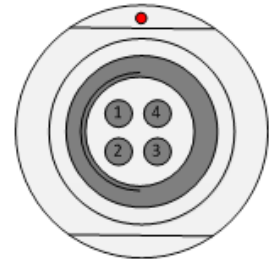
a) SATELLINE-EASy Pro 35W
Connector: 8-pin ODU, MINI-SNAP

1	RTS
2	CTS
3	SGND
4	RD
5	TD
6	PROG
7	Not connected
8	Not connected



b) Power connector SATELLINE-EASy Pro 35W
Connector: 4-pin ODU MINI-SNAP Style G4 size 1

1	PWR (+)
2	PWR (+)
3	GND
4	GND



6 SATEL Compact-Proof

6.1 Technical specification for SATEL Compact-Proof (YM6570, YM6571)

SATEL Compact-Proof YM6571 is without battery.

SATEL Compact-Proof YM6570 is with battery.

Subject	Value
Frequency range	330 ... 420 / 403 ... 473 MHz
Tuning range	90 / 70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 1 W
Interface	RS-232
Operating voltage	+10.6 ... +13.3 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU / 4-pin ODU / TNC female
Size H x W x D	187 x 84 x 50 mm
Weight	w/o battery 520 g / w battery 850 g
IP classification	IP67 (NEMA6)

6.2 Technical specification for SATEL Compact-Proof, 869 MHz, (YM6575, YM6576)

SATEL Compact-Proof, 869 MHz, YM6576 is without battery. YM6575 is with battery.

Subject	Value
Frequency range	869.4125 ... 869.6375 MHz *)
Tuning range	10 channels
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 500 mW
Interface	RS-232
Operating voltage	+10.6 ... +13.3 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 3.8 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU / 4-pin ODU / TNC female
Size H x W x D	187 x 84 x 50 mm
Weight	YM6576 520 g / YM6575 850 g
IP classification	IP67 (NEMA6)

*) See more information about the usage of the 869 MHz frequency band from page 13.

6.3 Technical specification for SATEL Compact-Proof, 865-867 MHz, (YM6575, YM6576)

SATEL Compact-Proof, 865-867 MHz, YM6576 is without battery.

SATEL Compact-Proof, 865-867 MHz, YM6575 is with battery.

This variant of SATEL Compact-Proof is ready to use on the Indian licence free channels.

Subject	Value
Frequency range	865 ... 867 MHz
Tuning range	2 MHz
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 1 W
Interface	RS-232
Operating voltage	+10.6 ... +13.3 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU / 4-pin ODU / TNC female
Size H x W x D	187 x 84 x 50 mm
Weight	YM6576 520 g / YM6575 850 g
IP classification	IP67 (NEMA6)

6.4 Specification for battery

Subject	Value
Battery type	Panasonic NCR18650, Li-Ion, 7.2 V, 8700 mAh
Operating / Charging Voltage	+10.6 ... +13.3 Vdc (-15% / +20%)
Charging time	Empty to full 5.5 hrs (+20 C°)
Charge / discharge cycles	>500 times
Charging temperature	+5 ... +45 C°
Operational temperature	-20 ... +60 C°
Operating times appr.	+60 C° (1 W, TX 100%) 13 h +60 C° (1 W, TX 50%) 22 h -20 C° (1 W, TX 100%) 10 h -20 C° (1 W, TX 50%) 15 h -20 C° (RX only) 44 h
Power consumption, modem OFF state	6 mW

6.5 Charging indicators

Charging conditions, charging power connected

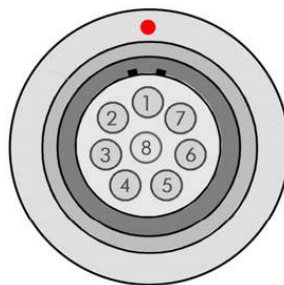
Colour	Value
Green	Charging power connected or charging completed (charging power used as a primary power source)
Orange	Pre-Charging and battery detect
Red	Battery charging
Blinking orange	Pre-Charging time or Charging time exceeded, possible defect battery
Blinking green	Charging temperature limit exceeded, charging is not possible at this time

Non charging conditions, charging power not connected

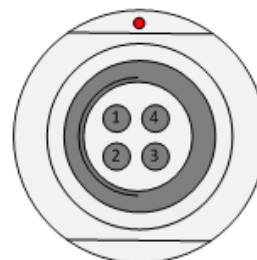
Colour	Value
Green	More than 50% of capacity is available.
Orange	Less than 50% of capacity is available
Red	Less than 20% of capacity is available
Blinking red	Less than 10% of capacity is available. Connect to a charger immediately

6.6 Pinning orders

Data connector: 8-pin ODU, MINI-SNAP	
1	RTS
2	CTS
3	SGND
4	RD
5	TD
6	PROG
7	Not connected
8	Not connected



Power connector: 4-pin ODU MINI-SNAP Style G4 size 1	
1	PWR (+)
2	PWR (+)
3	GND
4	GND



7 SATEL EASy-Proof and SATEL Proof-TR4+ / -TR9

7.1 Technical specification for SATEL EASy-Proof (YM6580, YM6585)

SATEL EASy-Proof YM6585 is with AES128 encryption support.

Subject	Value
Frequency range	330 ... 420 / 403 ... 473 MHz
Tuning range	90 / 70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 1 W
Interface	RS-232
Operating voltage	+7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	Deutsch DT04-6P-CL09 / TNC female
Size H x W x D	176 x 95 x 42 mm
Weight	460 g
IP classification	IP69K

7.2 Technical specification for SATEL Proof-TR4+ (YM6577, YM6578) / -TR9 (YM6410, YM6411, YM6412)

SATEL Proof-TR4+ YM6577 is with AES128 encryption support.

SATEL Proof-TR9 YM6410 is region all model.

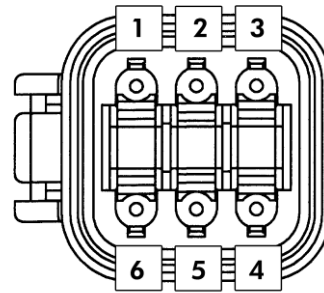
SATEL Proof-TR9 YM6411 is region US / CA, YM6412 region AU, NZ and BR.

Subject	Value
Frequency range	403 ... 473 / 902 ... 928 MHz
Tuning range	70 MHz @ TR4
Channel spacing	6.25 ^{*)} / 12.5 / 20 ^{*)} / 25 kHz selectable @ TR4
Spreading method	Frequency hopping @ TR9
RX Sensitivity / TX power max.	-118 ... -105 dBm / 1 W
Interface	RS-232 (TD, RD lines)
Operating voltage	+7 ... +27.5 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W (typical)
Data speed radio max. / serial	28800 / 115200 bps @ TR4+ 115200 / 115200 bps @ TR9
Connectors	Deutsch DT04-6P-CL09 / TNC female
Size H x W x D / Weight	174 x 95 x 46 mm / <500 g
IP classification	IP69K

*) Uses 12.5 kHz channel width

7.3 Pinning order

Data connector: Deutsch DT04-6P-CL09	
1	Vb, Operating Voltage
2	Not connected
3	Not connected
4	TD
5	RD
6	GND



8 CUSTOMIZED RADIO MODEMS AND MODULES

Down below examples of the customized radio modems. Ask your local SATEL distributor about the various options.

8.1 SATELLINE-M3 VHF (YM6000) technical specifications

In an aluminum housing.

Subject	Value
Frequency range	135 ... 174 MHz
Tuning range	135 ... 155, 138 ... 160, 155 ... 174 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+10.6 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.7 W / 6.6 W @ 1 W, 22 W @ 5 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC or SMA female
Size H x W x D	114 x 61 x 22 mm
Weight	265 g

Pinning order is the same than for SATELLINE-3AS VHF, see page 7.

8.2 SATELLINE-M3-TR1 (YM6300, YM6310) transceiver module

SATELLINE-M3-TR1 YM6310 is with AES128 encryption support.

SATELLINE-M3-TR1 is available either without housing in PCB format or in a stainless steel or aluminum housing.

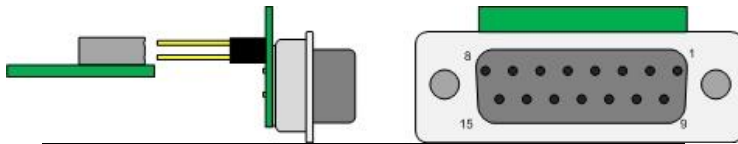
In PCB format the module is available with TNC, MCX, SMA or MMCX antenna connector. Stainless steel housing is equipped either with TNC or MCX antenna connector. Aluminum housing is available with TNC, SMA, MCX or MMCX antenna connector.

Data connector type is either D15 female, 26-pin female socket or 26-pin male strip. Note that 26-pin connectors are only available for without housing model.

Module can be delivered also without connectors.

Subject	Value
Frequency range	330 ... 420 / 403 ... 473 MHz
Tuning range	90 / 70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 1 W
Interface	RS-232, 422, LVTTTL, TTL
Operating voltage	+3.5 ... +7.5 / +7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 3 W@0.5W, 7W@1W
Data speed radio max. / serial	19200 / 38400 bps
Size H x W x D	89 x 49 x 10 mm PCB format
Weight	50 g PCB format

8.3 Pinning order for D15 female connector adapter



PORT	PIN	DIR	NAME
PORT 1 RS-232	6	OUT	CTS*
	9	OUT	RD1
	11	IN	TD1
	13	IN	RTS*
PORT 2 TTL/LVTTTL	2	OUT	CTS
	3	OUT	RD
	4	IN	TD
	5	IN	RTS
PORT 2 RS-232	2	OUT	CD
	3	OUT	RD2
	4	IN	TD2
	5	-	NC
PORT 2 RS-422	2	OUT	A'
	3	OUT	B'
	4	IN	A
	5	IN	B
COMMON	1	IN	DTR
	10	OUT	DSR
	12	IN	MODE
	7,8	-	GND
	14,15	-	VB

8.4 SATELLINE-M3-TR1 869 (YM6301) transceiver module

SATELLINE-M3-TR1 869 is available either without housing in PCB format or in aluminum housing.

In PCB format the module is available with TNC, MCX, SMA or MMCX antenna connector. Aluminum housing is available with TNC, SMA, MCX or MMCX antenna connector.

Data connector type is either D15 female, 26-pin female socket or 26-pin male strip. Note that 26-pin connectors are only available for without housing model. Module can be delivered also without connectors.

Subject	Value
Frequency range	869.400 ... 870.000 MHz
Tuning range	0.25 MHz
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 500 mW
Interface	Port1: RS-232/Port2: LVTTL, TTL or RS-232/422
Operating voltage	+7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 3.8 W
Data speed radio max. / serial	19200 / 38400 bps
Size H x W x D	88 x 49 x 9 mm or 139 x 63 x 23 mm
Weight	50 g or 250 g

8.5 SATELLINE-M3-TR1, 865-867 MHz, (YM6301) transceiver module

This variant of SATELLINE-M3-TR1 is ready to use on the Indian licence free channels. It has the same housing and connector options than the 869 MHz variant.

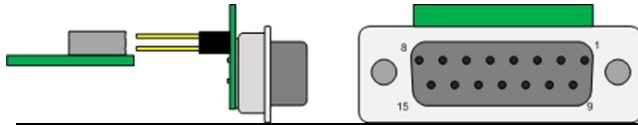
Subject	Value
Frequency range	865 ... 867 MHz
Tuning range	2 MHz
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-111 dBm / 1 W
Interface	Port1: RS-232/Port2: LVTTL, TTL or RS-232/422
Operating voltage	+7 ... +25 Vdc (-15% / +20%)
Power consumption RX / TX	1.2 W / 7 W
Data speed radio max. / serial	19200 / 38400 bps
Size H x W x D	88 x 49 x 9 mm or 139 x 63 x 23 mm
Weight	50 g or 250 g

8.6 Pinning order for TR1 869 and 865 MHz variant, 26-pin connector

I/O column below denotes the direction of the signal: "IN" is from DTE (Data Terminal Equipment) to the radio modem. "OUT" is from the radio modem to DTE.				
PIN	NAME	I/O	LEVEL	EXPLANATION
1, 2, 3,4	V _b	-	Power	+6...30 VDC
5	RTS	IN	RS-232	Request To Send from DTE. <i>Note*</i>)
6	MODE	IN	0..30V	<2VDC or connected to ground = Programming Mode >3VDC or Not connected = Data Transfer Mode <i>Note**</i>)
7	TD1	IN	RS-232	Port1 Transmit Data from DTE to the radio modem.
8	DSR	OUT	RS-232	Data Set Ready. Indicates that the radio modem is ON.
9	RD1	OUT	RS-232	Port1 Receive Data to DTE from the radio modem
10	BOOT	IN	0...5V	Boot flash enable (only for factory use)
11	SPARE1	-		Reserved for future purposes
12	SPARE2	-		Reserved for future purposes
13	CD_TTL	OUT	TTL	Carrier Detect (in case power/interface-module is TTL)
			LVTTL	Carrier Detect (in case power/interface-module is LVTTL)
14	GPIIN	IN		General purpose input for specific purposes
15	GPOUT	OUT		General purpose output for specific purposes
16	CD_RS	OUT	RS-232	Reserved for future purposes
17	DTR	IN	0..30V	Data Terminal Ready. The pin can be used to wake-up the radio module from the standby mode. >+3 VDC = ON, <+0.6 VDC or not connected = STANDBY
18	Pin 18 has alternative functions depending on the Port2 configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if Port2 Interface level is RS-232)
	A'	OUT	RS-422	Port2 Receive Data positive (if Port2 Interface level is RS-422)
	CTS	OUT	TTL	Clear To Send <i>Note*</i>) (if Port2 Interface level is TTL)
LVTTL			Clear To Send <i>Note*</i>) (if Port2 Interface level is LVTTL)	
19	Pin 19 has alternative functions depending on the Port2 configuration, see below.			
	RD2	OUT	RS-232	Port2 Receive Data (if Port2 Interface level is RS-232)
		OUT	TTL	Port2 Receive Data (if Port2 Interface level is TTL)
		OUT	LVTTL	Port2 Receive Data (if Port2 Interface level is LVTTL)
B'	OUT	RS-422	Port2 Receive Data negative (if Port2 Interface level is RS-422)	
20	Pin 20 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	Port2 Transmit Data (if Port2 Interface level is RS-232)
		IN	TTL	Port2 Transmit Data (if Port2 Interface level is TTL)
		IN	LVTTL	Port2 Transmit Data (if Port2 Interface level is LVTTL)
A	IN	RS-422	Port2 Transmit Data positive (if Port2 Interface level is RS-422)	
21	Pin 21 has alternative functions depending on the hardware assembly, see below.			
	RTS	IN	TTL	Request To Send <i>Note*</i>) (if Port2 Interface level is TTL)
			LVTTL	Request To Send <i>Note*</i>) (if Port2 Interface level is LVTTL)
B	IN	RS-422	Port2 Transmit data negative	
22	CTS	OUT	RS-232	Clear To Send. This signal indicates that the radio modem serial interface is ready to receive data from DTE. <i>Note*</i>)
23, 24, 25, 26	GND	-		Operating voltage ground / signal ground. Galvanically connected to the modem casing.

Note! Unused pins can be left unconnected.
Note)* RTS and CTS signals apply to the selected Data port (either Port1 or Port2).
*Note**)* Programming Mode is for changing the settings of the radio modem via Programming menu.
 Normally the MODE line is NOT connected i.e. the modem is in Data Transfer Mode.

8.7 Pinning order for D15 female connector adapter



PIN	NAME	I/O	LEVEL	EXPLANATION
1	DTR	IN	0..30V	Data Terminal Ready. The pin can be used to wake-up the radio module from the standby mode. >+3 VDC = ON, <+0.6 VDC or not connected = STANDBY
2	Pin 2 has alternative functions depending on the Port2 configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if Port2 Interface level is RS-232)
	A'	OUT	RS-422	Port2 Receive Data positive (if Port2 Interface level is RS-422)
	CTS	OUT	TTL	Clear To Send <i>Note*)</i> (if Port2 Interface level is TTL)
LVTTTL			Clear To Send <i>Note*)</i> (if Port2 Interface level is LVTTTL)	
3	Pin 3 has alternative functions depending on the Port2 configuration, see below.			
	RD2	OUT	RS-232	Port2 Receive Data (if Port2 Interface level is RS-232)
		OUT	TTL	Port2 Receive Data (if Port2 Interface level is TTL)
		OUT	LVTTTL	Port2 Receive Data (if Port2 Interface level is LVTTTL)
B'	OUT	RS-422	Port2 Receive Data negative (if Port2 Interface level is RS-422)	
4	Pin 4 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	Port2 Transmit Data (if Port2 Interface level is RS-232)
		IN	TTL	Port2 Transmit Data (if Port2 Interface level is TTL)
		IN	LVTTTL	Port2 Transmit Data (if Port2 Interface level is LVTTTL)
A	IN	RS-422	Port2 Transmit Data positive (if Port2 Interface level is RS-422)	
5	Pin 5 has alternative functions depending on the hardware assembly, see below.			
	RTS	IN	TTL	Request To Send <i>Note*)</i> (if Port2 Interface level is TTL)
			LVTTTL	Request To Send <i>Note*)</i> (if Port2 Interface level is LVTTTL)
B	IN	RS-422	Port2 Transmit data negative	
6	CTS	OUT	RS-232	Clear To Send. This signal indicates that the radio modem serial interface is ready to receive data from DTE. <i>Note*)</i>
7, 8	GND	-		Operating voltage ground / signal ground. Galvanically connected to the modem casing.
9	RD1	OUT	RS-232	Port1 Receive Data to DTE from the radio modem
10	DSR	OUT	RS-232	Data Set Ready. Indicates that the radio modem is ON.
11	TD1	IN	RS-232	Port1 Transmit Data from DTE to the radio modem.
12	MODE	IN	0..30V	<2VDC or connected to ground = Programming Mode >3VDC or Not connected = Data Transfer Mode <i>Note**)</i>
13	RTS	IN	RS-232	Request To Send from DTE. <i>Note*)</i>
14, 15	V_b	-	Power	Operating Voltage. Depends on the assembled power module: +3...9 VDC (Only for SATELLINE-M3-TR1) / +6...30 VDC

Note! Unused pins can be left unconnected.
Note)* RTS and CTS signals apply to the selected Data port (either Port1 or Port2).
*Note**)* Programming Mode is for changing the settings of the radio modem via Programming menu.
 Normally the MODE line is NOT connected i.e. the modem is in Data Transfer Mode.

8.8 SATEL-TR4+ (YM7470, YM7475, YM7480, YM7485) transceiver module

SATEL-TR4+ is available without housing in PCB format. Models YM7470 and YM7480 are with AES128 encryption. Models YM7480 and YM7485 have DTE connector on TOP, while others on BOTTOM.

Subject	Value
Frequency range	403 ... 473 MHz
Tuning range	70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	CMOS / UART
Operating voltage	+3.8 ... +5.5 Vdc
Power consumption RX / TX	0.89 W / 4.8 W
Data speed radio max. / serial	28800 / 115200 bps
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.9 mm
Weight	20 g

8.9 SATEL-R4+ (YM7495, YM7496, YM7490, YM7491) receiver module

SATEL-R4+ is available without housing in PCB format. Models YM7490 and YM7491 are with AES128 encryption. Models YM7496 and YM7491 have DTE connector on TOP, while others on BOTTOM.

Subject	Value
Frequency range	403 ... 473 MHz
Tuning range	70 MHz
Channel spacing	6.25 / 12.5 / 20 / 25 kHz selectable
RX Sensitivity	-115 dBm
Interface	CMOS / UART
Operating voltage	+3.8 ... +5.5 Vdc
Power consumption RX	0.86 W
Data speed radio max. / serial	28800 bps / 115200 bps
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.9 mm
Weight	20 g

8.10 SATEL-TR300 (YM7300, YM7305, YM7315) transceiver module

SATEL-TR300 is available without housing in PCB format. Model YM7300 is with AES128 encryption. Model YM7315 has DTE connector on TOP, while others on BOTTOM.

Subject	Value
Frequency range	320 ... 380 MHz
Tuning range	60 MHz
Channel spacing	6.25 / 12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-113 dBm / 1 W
Interface	CMOS / UART
Operating voltage	+3.8 ... +5.5 Vdc
Power consumption RX / TX	0.9 W / 6.4 W
Data speed radio max. / serial	28800 / 115200 bps
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.9 mm
Weight	20 g

8.11 Pinning order for SATEL-TR4+, -R4+ and TR300

Pin No.	Signal name	Type	Direction	Pin State	Description
1,2	VCC_IN	POWER	IN	External Voltage	DC input
3,4	GND	GND	-	External Ground	Ground reference for power and signals
5	VCC_IO	POWER	IN	External Voltage	Device IO driver input
6	ENA_MOD	IO	IN	Internal Pull Down	Module ENA pin
7	RD1	CMOS	OUT	Output Driver	Receive data, active low.
8	CTS1	CMOS	OUT	Output Driver	Clear To Send, active low.
9	TD1	CMOS	IN	Internal Pull Up	Transmit Data, active low.
10	RTS1	CMOS	IN	Internal Pull Up	Ready to send, active low.
11	GPI01	CMOS	OUT	Internal Pull Down	Reserved for future use.
12	GPI02	CMOS	OUT	Internal Pull Down	Reserved for future use.
13	GPI03	CMOS	IN	Internal Pull Up	Reserved for future use.
14	GPI04	CMOS	IN	Internal Pull Up	Reserved for future use.
15	STAT	CMOS	OUT	Output Driver	Various sequences *)
16	GPI05	CMOS	IN	Internal Pull Up	Reserved for future use.
17	SERVICE	CMOS	IN	Internal Pull Up	Input for service access, active low. *)
18	GPI06	CMOS	OUT	Internal Pull Down	Reserved for future use.
19	GPI07	CMOS	OUT	Internal Pull Down	Reserved for future use.
20	GPI08	CMOS	OUT	Internal Pull Down	Reserved for future use.

*) Please see more information from the Integration Guide.

8.12 SATELLINE-M3-TR9 (YM7900, YM7910, YM7915, YM7920) transceiver module

SATELLINE-M3-TR9 is available without housing in PCB format. YM7910 is for US/CA. YM7915 is for AU. Model YM7920 has DTE connector on TOP, while others on BOTTOM.

Subject	Value
Frequency range	902 ... 928 MHz
Spreading method	Frequency hopping
Modulation method	2-GFSK
Hopping bands	7, user selectable
Hopping patterns	15 per band, 105 total, user selectable
Hopping channels	50-112, user selectable
RX Sensitivity / TX power max.	-109 dBm / 1 W
Interface	CMOS / UART
Operating voltage	+3.5 ... +5.5 Vdc
Power consumption RX / TX	300 mW / 3.2 W
Data speed radio max. / serial	115200 / 115200 bps
Radio compatibility	Freewave / Intuicom
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.7 mm
Weight	20 g

8.13 SATELLINE-M3-R9 (YM7950) receiver module

SATELLINE-M3-R9 is available without housing in PCB format.

Subject	Value
Frequency range	902 ... 928 MHz
Spreading method	Frequency hopping
Hopping bands	7, user selectable
Hopping patterns	15 per band, 105 total, user selectable
Hopping channels	50-112, user selectable
RX Sensitivity	-109 dBm
Interface	CMOS / UART
Operating voltage	+3.5 ... +5.5 Vdc
Power consumption RX	300 mW
Data speed radio max. / serial	115200 / 115200 bps
Radio compatibility	Freewave / Intuicom
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.7 mm
Weight	20 g

8.14 SATEL-TR49 (YM8490, YM8495, YM8500, YM8505, YM8510, YM8515, YM8520, YM8525) transceiver module

SATEL-TR49 is available without housing in PCB format.
YM8490, YM8500, YM8510 and YM8520 are with AES128 encryption support.
YM8500 and YM8505 follows US / CA frequency hopping patterns.
YM8510 and YM8515 are for AU / BR, YM8520 and YM8525 for NZ.

Subject	Value
Frequency range	410 ... 475 MHz / 902 ... 928 MHz
Tuning range	65 MHz @ 400 MHz
Channel width	12.5 / 20 / 25 kHz @ 400 MHz
Spreading method	Frequency hopping @ 900 MHz
Modulation method	4-GFSK, GMSK @ 400 MHz 2-GFSK @ 900 MHz
Hopping bands	7, user selectable
Hopping patterns	15 per band, 105 total, user selectable
Hopping channels	50-112, user selectable
RX Sensitivity / TX power (50 ohm)	-120 dBm (BER 1% @ 12.5 kHz) / 1 W @ 400 MHz -109 dBm (BER=10 ⁻⁴) / 1 W @ 900 MHz
Interface	CMOS / UART
Operating voltage	+3.7 ... +5.5 Vdc
Power consumption RX / TX	440 mW / 4.8 W @ 400 MHz 440 mW / 4.1 W @ 900 MHz
Data speed radio max. / serial	19200 / 115200 bps @ 400 MHz 115200 / 115200 bps @ 900 MHz
Radio compatibility	SATEL 3AS, TrimTalk 450s, TrimMark III, PacCrest-GMSK, -4FSK, -FST @ 400 MHz Freewave / Intuicom @ 900 MHz
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.9 mm
Weight	20 g

8.15 SATEL-TR489 (YM8810, YM8815, YM8820, YM8825) transceiver module

SATEL-TR489 is available without housing in PCB format.
YM8810 and YM8820 are with AES128 encryption support.
YM8820 and YM8825 follows US / CA frequency hopping patterns.

Subject	Value
Frequency range	403 ... 473 MHz / 856 ... 876 MHz / 902 ... 928 MHz
Tuning range	70 MHz @ 400 MHz / 20 MHz @ 800 MHz

Channel width	12.5 / 25 / 50*) kHz @ 400 MHz 25 / 50 kHz @ 800 MHz
Spreading method	Frequency hopping @ 900 MHz
Modulation method	4-, 8-, 16FSK @ 400 MHz / 4FSK @ 800 MHz 2-GFSK @ 900 MHz
Hopping bands	7, user selectable @ 900 MHz
Hopping patterns	15 per band, 105 total, user selectable @ 900 MHz
Hopping channels	50-112, user selectable @ 900 MHz
RX Sensitivity / TX power (50 ohm)	-115 dBm (BER 10 ⁻² @ 12.5 kHz) / 1 W @ 400 MHz -110 dBm (BER 10 ⁻²) / 0.5 W @ 800 MHz -108 dBm (BER 10 ⁻²) / 1 W @ 900 MHz
Interface	CMOS / UART
Operating voltage	+3.8 ... +5.5 Vdc
Power consumption RX / TX	940 mW / 6.8 W @ 400 MHz 960 mW / 5.6 W @ 800 MHz 420 mW / 4.3 W @ 900 MHz
Data speed radio max. / serial	28800 / 115200 bps @ 400 MHz 38400 / 115200 bps @ 800 MHz 115200 / 115200 bps @ 900 MHz
Radio compatibility	SATEL 3AS, TrimTalk 450s, TrimMark III, PacCrest-GMSK, -4FSK, -FST @ 400 MHz Freewave / Intuicom @ 900 MHz
Connectors	1.27 mm pitch socket / U.FL
Size H x W x D	57 x 36 x 6.9 mm
Weight	20 g

*) Ask for availability

8.16 Pinning order for SATELLINE-TR9, -R9, SATEL-TR49 and TR489

Pin No.	Signal name	Type	Direction	Pin State	Description
1,2	VCC_IN	POWER	IN	External Voltage	DC input
3,4	GND	GND	-	External Ground	Ground reference for power and signals
5	VCC_IO	POWER	IN	External Voltage	Device IO driver input
6	ENA_MOD	IO	IN	Internal Pull Down	Module ENA pin
7	RD1	CMOS	OUT	Output Driver	Receive data, active low
8	CTS1	CMOS	OUT	Output Driver	Clear To Send, active low
9	TD1	CMOS	IN	Internal Pull Up	Transmit Data, active low
10	RTS1	CMOS	IN	Internal Pull Up	Ready to send, active low

11	GPIO1	CMOS	OUT	Internal Pull Down	Reserved for future use
12	GPIO2	CMOS	OUT	Internal Pull Down	Reserved for future use
13	GPIO3	CMOS	IN	Internal Pull Up	Reserved for future use
14	GPIO4	CMOS	IN	Internal Pull Up	Reserved for future use
15	STAT	CMOS	OUT	Output Driver	Various sequences *)
16	GPIO5	CMOS	IN	Internal Pull Up	Reserved for future use
17	SERVICE	CMOS	IN	Internal Pull Up	Input for service access, active low *)
18	GPIO6	CMOS	OUT	Internal Pull Down	Reserved for future use
19	GPIO7	CMOS	OUT	Internal Pull Down	Reserved for future use
20	GPIO8	CMOS	OUT	Internal Pull Down	Reserved for future use

*) Please see more information from the Integration Guide.

8.17 SATEL-TR49 SnapOn (YM8600, YM8605, YM8610, YM8615, YM8630, YM8635) transceiver module

SATEL-TR49 SnapOn is available without housing in PCB format.

YM8600, YM8610 and YM8630 are with AES128 encryption support. YM8610 and YM8615 are for US / CA. YM8630 and YM8635 are for AU / BR.

Subject	Value
Frequency range	410 ... 475 MHz / 902 ... 928 MHz
Tuning range	65 MHz @ 400 MHz
Channel width	12.5 / 25 kHz @ 400 MHz
Spreading method	Frequency hopping @ 900 MHz
Modulation method	GMSK, 4-GFSK @ 400 MHz 2-GFSK @ 900 MHz
Hopping bands	7, user selectable @ 900 MHz
Hopping patterns	15 per band, 105 total, user selectable @ 900 MHz
Hopping channels	50-112, user selectable @ 900 MHz
RX Sensitivity / TX power (50 ohm)	-120 dBm (BER 1% @ 12.5 kHz) / 1 W @ 400 MHz -109 dBm (BER=10 ⁻⁴) / 1 W @ 900 MHz
Interface	CMOS / UART
Operating voltage	+3.3 Vdc (+/-9% Vdc)
Power consumption RX / TX	400 mW / 4.8 W @ 400 MHz 400 mW / 4 W @ 900 MHz
Data speed radio max. / serial	19200 / 115200 bps @ 400 MHz 115200 / 115200 bps @ 900 MHz

Radio compatibility	SATEL 3AS, TrimTalk 450s, TrimMark III, PacCrest-GMSK, -4FSK, -FST @ 400 MHz Freewave / Intuicom @ 900 MHz
Connectors	PCIe MiniCard full size / U.FL
Size H x W x D	51 x 30 x 4.8 mm
Weight	12 g

8.18 Pinning order for SATEL-TR49 SnapOn

Pin No.	Mini PCI express standard description	SATEL Pin Description, I/O type	Pin State TBD
1	WAKE#	LED I/O output	Active low (0-0.2 V) Inactive (open)
2	3.3 Vaux	Vcc IN	High
3	COEX1	NA	-
4	GND	GND	GND
5	COEX2	NA	-
6	+1.5 V	NA	-
7	CLKREQ#	NA	-
8	UIM_PWR	NA	-
9	GND	GND	GND
10	UIM_DATA	NA	-
11	REFCLK-	NA	-
12	UIM_RESET	NA	-
13	REFCLK+	NA	-
14	UIM_RESET	NA	-
15	GND	GND	GND
16	UIM_Vpp	NA	-
17	Reserved	NA	-
18	GND	GND	GND
19	Reserved	NA	-
20	W_DISABLE#	Shut down for the modem	Active low (0.0 – 0.2 V)
21	GND	GND	GND
22	PERST#	MCU Reset	Active (GND-0.4 V) Inactive (2.0-3.6 V)
23	PERp0	NA	-
24	+3.3 Vaux	Vcc IN	High
25	PERp0	NA	-
26	GND	GND	GND
27	GND	GND	GND
28	+1.5 V	NA	-
29	GND	GND	GND

Pin No.	Mini PCI express standard description	Direction TBD	Pin State TBD
30	SMB_CLK	NA	-
31	PETn0	NA	-
32	SMB_DATA	NA	-
33	PETp0	NA	-
34	GND	GND	GND
35	GND	GND	GND
36	USB_D-	USB Data minus	High 2.0V - Vcc IN Low -0.5 V - 0.8 V
37	GND	GND	GND
38	USB_D+	USB Data plus	High 2.0V - Vcc IN Low -0.5 V - 0.8 V
39	+3.3 Vaux	Vcc IN	
40	GND	GND	GND
41	+3.3 Vaux	Vcc IN	High
42	LED_WWAN#	LED I/O output	Active low (0-0.2 V) Inactive (open)
43	GND	GND	GND
44	LED_WLAN#	LED I/O output	Active low (0-0.2 V) Inactive (open)
45	Reserved	NA	-
46	LED_WPAN#	LED I/O output	Active low (0-0.2 V) Inactive (open)
47	Reserved	NA	-
48	+1.5 V	NA	-
49	Reserved	NA	-
50	GND	GND	GND
51	Reserved	NA	-
52	+3.3 Vaux	Vcc IN	High

9 ADDITIONAL EQUIPMENT

SATEL can offer following additional equipments for SATELLINE radio modems.

9.1 SATELLINK I/O-converters

	I-LINK 100	I-LINK 300
Order code	YI0007	YI0010
Digital I/Os	4	6
Analogue I/Os	2	-
Pulse counter	-	-
Modbus compatibility *)	Yes	Yes
Modem compatibility **)	G1	G1
Note		***)

*) Special Modbus compatible variants available. Ask more information from your local SATEL distributor.

****) Following modems belong to the group G1:**

- SATELLINE-3AS VHF, -3ASd VHF, -3AS VHF C, -3ASd VHF C
- SATELLINE-EASy
- SATEL-EASy+
- SATELLINE-EASy 869
- SATELLINE-M3 VHF
- SATELLINE-M3-TR1
- SATELLINE-M3-TR1 869

***) I-LINK 300 is extension unit for I-LINK 100. A maximum of three extension modules can be added to each I-LINK converters.

10 ACCESSORIES

SATEL can offer following accessories for SATELLINE radio modems.

10.1 Interface cables and adapters for RS-232 interface

Type	Description	Length	Note
NARS-1F (YC0200)	Adapter D15 m / D15 f, 650 mA fuse	-	Inc. 2m power supply wires and Prog Mode switch
NARS-1F-4A (YC0204)	As NARS-1F, but with 4A fuse	-	For EASy, VHF modems
CRS-9 (YC0201)	Cable D9 m / D9 f	2 m	-
CRS-2M (YC0103)	Cable D15 m / D9 m	2 m	Inc. power supply wires
CRS-2F (YC0104)	Cable D15 m / D9 f	2 m	Inc. power supply wires
NARS-ST (YC0240)	Adapter cable ODU 8-pin m / D15 f	0.4 m	For EASy Pro 35W and Compact-Proof
CRS-35W 8- pin (YC0368)	Cable ODU 8-pin m / D9 f	2 m	For EASy Pro 35W and Compact-Proof
CRS-35W 8-/7- pin (YC0369)	Cable ODU 8-pin m / 7- pin m	2 m	For EASy Pro 35W and Compact-Proof
CRS-35W 8-/8- pin 0/30 (YC0359)	Cable ODU 8-pin m (0 deg) / 8-pin m (30 deg)	2 m	For EASy Pro 35W and Compact-Proof
CRS-35W 8-/8- pin (YC0359)	Cable ODU 8-pin m / 8- pin m	2 m	For EASy Pro 35W and Compact-Proof

10.2 Interface cables and adapters for RS-485/422 interface

Type	Description	Length	Note
NARS-2 (YC0485)	Adapter D15 m / screw terminals, 650 mA fuse	-	Screw terminals for RS- 485/422 and power supply
NARS-2-4A (YC0486)	As NARS-2, but with 4A fuse	-	For EASy, VHF modems
CRS-PB (YC0501)	Cable D15 m / D9 m	2 m	Inc. power supply wires

10.3 NMS cable

Type	Description	Length	Note
CRS-NMS (YC0302)	Cable D15 m / 2 x D9f, from master modem to user system and NMS PC	1.5 m	Inc. power supply wires

10.4 Programming cable

Type	Description	Length	Note
PROG-35W 8- pin (YC0302)	Cable ODU 8-pin m / D9 f	2 m	For EASy Pro 35W and Compact-Proof

10.5 RF cables

Type	Description	Length	Note
CRF-1 (YC1101)	TNC m / TNC f	1 m	RG58 (3 dB / 10m)
CRF-5F (YC1105)	TNC m / TNC f	5 m	RG58 (3 dB / 10m)
CRF-5M (YC1106)	TNC m / TNC m	2 m	RG58 (3 dB / 10m)
CRF-1, SMA (YC2101)	SMA m / TNC f	1 m	RG58 (3 dB / 10m)
CRF-5, SMA (YC2105)	SMA m / TNC f	5 m	RG58 (3 dB / 10m)
ECOFLEX 10 (YC1004)	Low loss cable	X	0.9 dB / 10m
ECOFLEX 15 (YC1005)	Low loss cable	X	0.6 dB / 10m

10.6 Antennas

Examples of antennas for UHF frequency modems (except SATELLINE-EASy Pro 35W):

Type	Description
Gainflex 400 – 435 (YA0106)	Half-wave antenna
Gainflex 435 – 470 (YA0103)	Half-wave antenna
CA420Q (YA0107)	Sleeve fed quarter wave whip, 405 – 440 MHz
CA450Q (YA0107)	Sleeve fed quarter wave whip, 440 – 475 MHz
Miniflex 400 – 435 (YA0104)	Helix antenna
Miniflex 435 – 470 (YA0102)	Helix antenna

Examples of antennas for SATELLINE-EASy Pro 35W (order code for all CA-antennas is YA0107):

Type	Description
CA4200 CA4500	Omnidirectional coaxial dipole, 2 dBi, 405-440 MHz 440-475 MHz
CA405GP+ CA410GP+ CA420GP+ CA430GP+ CA435GP+ CA440GP+ CA445GP+ CA450GP+ CA460GP+ CA470GP+	Omnidirectional ground plane, 6 dBi, 401-409 MHz 406-414 MHz 416-424 MHz 426-434 MHz 431-439 MHz 436-444 MHz 441-449 MHz 446-454 MHz 456-464 MHz 465-475 MHz
CA400Y CA420Y CA450Y	Directional yagi, 6 dBi, 380-410 MHz 405-440 MHz 440-475 MHz
CA400Y+ CA420Y+ CA450Y+	Directional yagi, 8 dBi, 380-410 MHz 405-440 MHz 440-475 MHz

Example of antenna for other SATELLINE modems:

Type	Description
Antenna 869 (YA0869)	Half-wave antenna for EASy 869 modems

Please contact your local SATEL distributor in order to get more information of different antennas.

10.7 Power supplies and power cables

Type	Description
Power supply DIN rail (YP7524)	IN 100-240 Vac / OUT 24 Vdc / 2.5 A, power supply for DIN rail mounting
Power Adapter 150W (YP0150)	230 Vac / 12 Vdc / 12.5 A, power supply for EASy Pro and Compact-Proof
C-P-35W 2m (YC0355)	2 m cable, ODU 4-pin male / 4mm lab plugs for EASy Pro 35W and Compact-Proof
C-P-35W 3m (YC0353)	3 m cable, ODU 4-pin male / Alligator clip for EASy Pro 35W and Compact-Proof
C-P-SAE 35W-4pin (YC0352)	2 m cable, ODU 4-pin male / SAE connector for EASy Pro 35W and Compact-Proof
A-AC (YP0115)	Power supply, IN 100-240 Vac, OUT 15 Vdc / 4.6 A
AC Adapter 40W (YP1240)	AC adapter, 2.1 mm DC jack. IN 100-240 Vac, OUT 12 Vdc / 3.34 A for Compact-4BT
Mains Cable C-M (YC0904)	For YP0150, YP0115 and YP1240 with Europlug

10.8 Filters and lightning protectors

If a radio system is installed in an environment that contains high-power transmitters or sources of radio frequency interference, it is highly recommendable to insert suitable filters between each radio modem and its antenna. If a station is installed to a location exposed to lightning, it is recommended inserting a lightning protector to the feed-line outside the protected zone. SATEL technical support can give guidance in the selection of suitable products.

11 SOFTWARE

Following software are available for SATEL radio modems:

11.1 SATEL NETCO DEVICE

SATEL NETCO DEVICE is a software for configuring and reprogramming a SATEL device. The configuration parameters can be read and written from/to the locally connected, powered device. The device configuration can be also created/saved/explored from/to a file without device connection.

The most common use case for which the SATEL NETCO DEVICE is optimized for is editing existing parameters in a SATEL radio product using local connection, such as serial interface.

11.2 SATEL NETCO DESIGN

SATEL NETCO DESIGN is an intuitive and user-friendly software for network design, configuration and management. It supports the SATEL XPRS radio family for IP communication configuration (L2 or L3) and SATEL radio modems with routing feature support, such like SATEL-EASy+.

The user interface of the product is web browser -based and can therefore be used both locally and remotely. Design with graphical user interface for easy optimizing network design and deployment in a few simple steps, with local and remote connection to SATEL radios.

11.3 SATELLINE SaTerm

SATELLINE SaTerm is a terminal software to assist in the configuration, testing and reprogramming of the SATEL devices. This software supports the Routing Setup -mode, a graphical tool for easy configuration of the Message Routing feature (Source Routing). Routing Setup refers to Message Routing feature for SATEL-EASy+ and SATELLINE-EASy family radio modems, where messages can be automatically routed over the radio network to correct recipient terminal.

This SW can assist in tests procedures and configuration for the radios via terminal interface with SL command support.

11.4 SATEL NMS PC

SATEL NMS PC is a software for creating and managing SATEL-EASy+ and SATELLINE-3AS VHF product families for NMS Routing networks with radio network monitoring option.

NMS Routing refers to NMS Message Routing feature, where messages can be automatically routed over the radio network to correct recipient terminal, monitoring and diagnostics included for the radio network. Graphical design of topology for NMS

Message Routing, remote modification of settings, online storing and trending of field data with programmable alarm triggers.

11.5 SATEL Configuration Manager

SATEL Configuration Manager is a software for configuring and reprogramming a SATEL device. The parameters can be read and written from/to the connected, powered device. The program file can be saved into a separate file to be used to other devices.

The most common use case for which the SATEL Configuration Manager is optimized for is editing existing parameters in a SATEL radio product using locally connected product over a serial interface. Minimum requirements: COM port with baud rate min. 9600 bps (alternatively with industrial level USB-RS-232 converter).

11.6 SATEL NETCO NMS

SATEL NETCO NMS is an intuitive and user-friendly network configuration software for network design and management with radio network monitoring option. The software supports configuration of the Routing Setup and NMS Routing Setup -modes for SATEL-EASy+ product family (and legacy SATELLINE-3AS NMS products for NMS Routing) and configuration of the XPRS radio family.

The user interface of the product is web browser -based and can therefore be used both locally and remotely. Design with graphical user interface for easy optimizing network design and deployment in a few simple steps, with local and remote connection to SATEL radios.

11.7 FCS Monitor

Free Channel Scan Monitor program can be used for setting the FCS parameters and for loading them to modems and for monitoring the channels for noise or interference. FCS feature supported in SATELLINE-EASy radio modem family.

In order to get more information of software contact your local distributor or us.

<https://www.satel.com/products/software/>

NOTE: All the software are for free and are supplied “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.

12 HOW TO ESTABLISH A WIRELESS DATA LINK

Down below is the guidance how to establish a basic wireless data link with a pair of SATEL radio modems and their accessories.

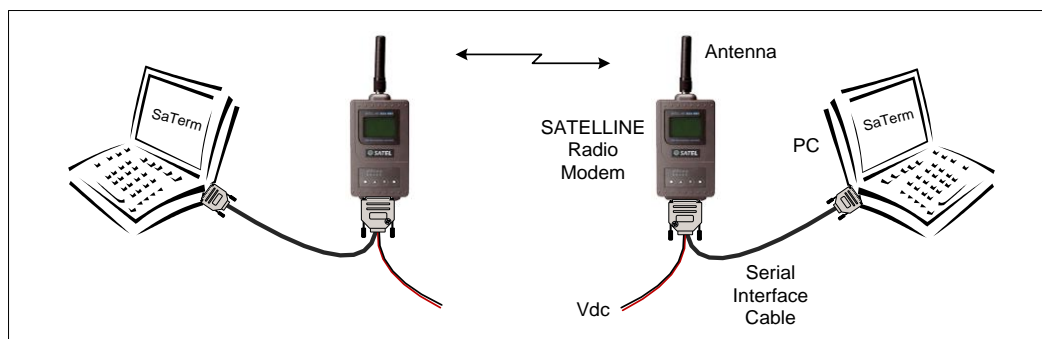
12.1 List of equipment

- two SATEL radio modems
- two antennas
- two serial interface cables
- two DC power supplies
- two PCs
- SaTerm software

Antennas and serial interface cables are selected according to your SATELLINE modem type as shown in the table below. Order code for antennas and cables in brackets.

Radio modem type	Antenna	Serial interface cable
SATELLINE-EASy SATEL-EASy+	MINIFLEX 400-435 (YA0104) or MINIFLEX 435-470 (YA0102)	CRS-2F (YC0104) or NARS-1F (YC0200) & CRS-9 (YC0201)
SATELLINE-EASy 869	ANTENNA 869 (YA0869)	CRS-2F (YC0104) or NARS-1F (YC0200) & CRS-9 (YC0201)

12.2 Equipment setup



12.3 Parameter setups

The following parameters shall be set equally in both radio modems

- Radio frequency
- Channel spacing
- Error correction
- Error check
- Number of data bits in a serial character

The serial interface parameters below must be the same in the radio modem and in the PC connected to it. Please note that these settings can be configured differently in the two ends of the link.

- Serial interface type
- Data speed
- Parity
- Number of stop bits

12.4 Communication test over the link

SATELLINE SaTerm software can be used to transmit (Transmit window) and receive (Terminal window) data over the radio modem link. See more information on the SaTerm software features in its user guide.

13 SETTINGS

The configuration of SATEL radio modems can be easily changed. Simply by connecting the PROG pin to ground (GND) the radio modem will switch into Programming Mode. Serial port PORT 1 is used whenever the radio modem is in the Programming Mode. The serial port settings are 9600 bps, N, 8,1 (data transfer speed 9600 bps, no parity, character length 8 bits and one (1) stop bit). PORT 1 of the radio modem is connected to a terminal device or a PC, which is in terminal emulation state. This can be accomplished by using a suitable program such as the SaTerm, the Windows™ Hyper Terminal program or SATEL Configuration Manager. See the chapter “11 SOFTWARE” to find the correct program. Modem transmits the programming menu in text format to the terminal.

The configuration settings for the modems that contain push buttons and a LCD-display can be modified without the help of an external terminal device. The radio modem will switch into Programming Mode by pressing the ”SETUP”(■)button.

If the SL-command function has been activated modem settings can be changed without switching the radio modem into Programming Mode. Serial port settings will remain as those defined previously when the radio modem was in Programming Mode.

14 ERROR CORRECTION (FEC)

SATEL radio modems have an error correction feature called the FEC method (Forward Error Correction). When FEC is enabled (ON), the radio modem automatically adds additional error correction information, which increases the amount of transmitted data by 30 %. It is used by the receiving radio modem to correct erroneous bits - as long as the ratio of correct and erroneous bits is reasonable.

FEC improves the reliability of data transfer via the radio interface especially in unfavorable conditions. FEC function should be used when link distances are long or received signal is otherwise low due to poor propagation conditions or multipath fading. It is also recommended to use FEC in case there are intermittent interferences on the radio channel.

FEC function decreases data transfer throughput by app. 30 %. Contact your local SATEL distributor in order to get more information of the exact transfer delays introduced by using FEC function. Though transfer delays are slightly longer, it is still recommended to set FEC function on for the best data transmission quality.

15 CHECK LIST / TROUBLE SHOOTING

The following points must be taken into account when installing and configuring a radio modem:

1. All operating voltages of all the equipment must always be switched OFF before connecting the serial interface cable.
2. When considering the exact placement of a radio modem and/or its antenna, the following points must be taken into account to guarantee optimal results:
 - The antenna should be installed in open space as far as possible from any possible sources of interference
 - The radio modem should not be installed onto a strongly vibrating surface
 - The radio modem should be installed in such a way as to minimise exposure to direct sunlight or excessive humidity
3. To ensure reliable operation the voltage output of the power supply used must be stable enough and the current capability of the power supply must be sufficient.
4. The antenna must be installed according to instructions.
5. Settings of the radio modem must correspond to settings of the terminal.
6. All radio modems in the same system must be configured using the same settings (radio frequency, channel spacing and data field length).

In case you need technical support please feel free to contact your local SATEL distributor or send e-mail to our technical support: technical.support@satel.com

16 RECYCLING

According to Finnish legislation a producer is liable for the recycling and other waste management of equipment put on the market by the producer.

All SATEL devices can be recycled as electronic waste.

Please refer to your nearest recycling collection point.

When disassembled, the device is recycled as follows:

- Housings and mechanical parts, see recycling and material label in component
- PCBs are electronic waste

If necessary, contact SATEL or nearest distributor for more information.