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Salo, Finland 2013

NOTE! This is a short form user guide for SATEL products. Complete user guide for each model is available in electronical 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 1999/5/EC. Therefore the equipment is labeled with the CE-marking (examples down below).

The notification sign informs user that the operating frequency range of the device is not harmonized throughout the market area, and the local spectrum authority should be contacted before the usage of the radio modem.

Declaration of Conformity –certificates are available from the manufacturer SATEL Oy or from local SATEL distributor.

TABLE OF CONTENTS

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 / 218 … 238 MHz
Tuning range	135 … 155, 138 … 160 MHz 155 … 174, 218 … 238 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
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

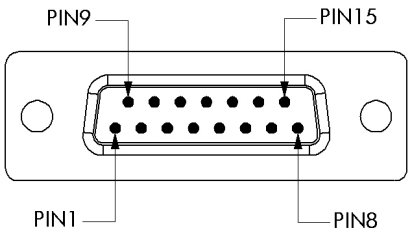
1.2 Technical specifications for SATELLINE-3AS VHF C (YM5020) and -3ASd VHF C (YM5030)

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 / 218 … 238 MHz
Tuning range	135 … 155, 138 … 160 MHz 155 … 174, 218 … 238 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
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

1.3 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 *Port2* configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if *Port2* selection is RS-232)
	A'	OUT	RS-422	*Port2* Receive Data positive (if *Port2* selection is RS-422)
	A	IN/OUT	RS-485	*Port2* Data positive. *Note***) (if *Port2* selection is RS-485)
3	Pin 3 has alternative functions depending on the *Port2* configuration, see below.			
	RD2	OUT	RS-232	*Port2* Receive Data (if *Port2* selection is RS-232)
	B'	OUT	RS-422	*Port2* Receive Data negative (if *Port2* selection is RS-422)
	B	IN/OUT	RS-485	*Port2* Data negative. *Note***) (if *Port2* selection is RS-485)
4	Pin 4 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	*Port2* Transmit Data (if *Port2* selection is RS-232)
	A	IN	RS-422	*Port2* Transmit Data positive (if *Port2* selection is RS-422)
5	Pin 5 has alternative functions depending on the hardware assembly, see below.			
	B	IN	RS-422	*Port2* 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. *Note**)
7, 8	**GND**	-		Operating voltage and Signal Ground
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 Note****)
13	**RTS**	IN	RS-232	Request To Send from DTE. *Note**)
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 SATELLINE-3AS NMS and Epic NMS

2.1 Technical specifications for SATELLINE-3AS NMS (YM1070) and -3ASd NMS (YM1075)

Special Dual Band version available of both models. Dual Band offers 2 x 2 MHz tuning range with maximum 15 MHz separation between the highest and lowest frequency.

The model SATELLINE-3ASd NMS (YM1075) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	1.4 W / 6 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	250 g

2.2 Technical specifications for SATELLINE-3AS Epic NMS (YM3010) and -3ASd Epic NMS (YM3011)

Both models are with diversity reception.

Special Dual Band version available of both models.

The model SATELLINE-3ASd Epic NMS (YM3011) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 10 W
Interface	RS-232, 422, 485
Operating voltage	+11.8 … +30 Vdc
Power consumption RX / TX	1.6 W / 36 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	154 x 123 x 29 mm
Weight	580 g

2.3 Technical specifications for SATELLINE-3AS Epic C NMS (YM3012) and -3ASd Epic C NMS (YM3013)

Both models are with diversity reception.

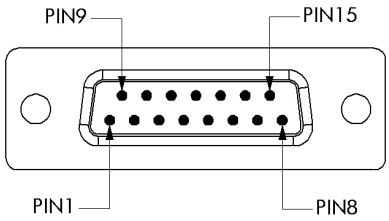
Both models are equipped with a heat sink, which is the appropriate choice for continuous transmission.

The model SATELLINE-3ASd Epic C NMS (YM3013) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 10 W
Interface	RS-232, 422, 485
Operating voltage	+11.8 … +30 Vdc
Power consumption RX / TX	1.6 W / 36 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	154 x 151 x 77 mm
Weight	1480 g

2.4 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 *Port2* configuration, see below.			
	CD	OUT	RS-232	Carrier Detect (if *Port2* selection is RS-232)
	A'	OUT	RS-422	*Port2* Receive Data positive (if *Port2* selection is RS-422)
	A	IN/OUT	RS-485	*Port2* Data positive. *Note***) (if *Port2* selection is RS-485)
3	Pin 3 has alternative functions depending on the *Port2* configuration, see below.			
	RD2	OUT	RS-232	*Port2* Receive Data (if *Port2* selection is RS-232)
	B'	OUT	RS-422	*Port2* Receive Data negative (if *Port2* selection is RS-422)
	B	IN/OUT	RS-485	*Port2* Data negative. *Note***) (if *Port2* selection is RS-485)
4	Pin 4 has alternative functions depending on the configuration, see below.			
	TD2	IN	RS-232	*Port2* Transmit Data (if *Port2* selection is RS-232)
	A	IN	RS-422	*Port2* Transmit Data positive (if *Port2* selection is RS-422)
5	Pin 5 has alternative functions depending on the hardware assembly, see below.			
	B	IN	RS-422	*Port2* 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. *Note**)
7, 8	**GND**	-		Operating voltage and Signal Ground
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 Note****)
13	**RTS**	IN	RS-232	Request To Send from DTE. *Note**)
14, 15	**V_b**	-	See above	Operating Voltage. +11.8...30 VDC for 3AS Epic NMS +9...30 VDC for 3AS NMS

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*.

3 SATELLINE-2ASxE and SATELLINE-2ASc

3.1 Technical specifications for SATELLINE-2ASxE (YM0236)

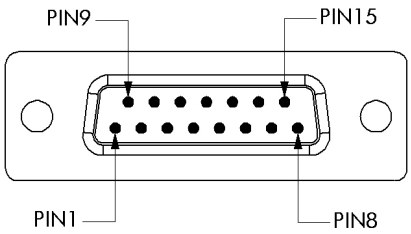
Subject	Value
Frequency range	380 … 470 MHz
Tuning range	± 1 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	RS-232
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	1.7 W / 6 W
Data speed radio max. / serial	9600 / 9600 bps
Connectors	D15 / TNC female
Size H x W x D	137 x 67 x 29 mm
Weight	250 g

3.2 Technical specifications for SATELLINE-2ASc (YM0246)

Subject	Value
Frequency range	380 … 470 MHz
Tuning range	± 1 MHz from central freq.
Channel spacing	20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	RS-232
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	2.5 W / 6.6 W
Data speed radio max. / serial	4800 / 4800 bps
Connectors	D15 / TNC female
Size H x W x D	137 x 67 x 29 mm
Weight	250 g

3.3 Pinning order

D15 female connector in radio modem.



PIN	NAME	DIRECTION	EXPLANATION
1	DTR	IN	Data Terminal Ready, ON/OFF switch of the modem
2	CD	OUT	Carrier Detect, indicates a signal or interference on the radio channel exceeding the sensitivity level of the modem
3	-	-	Reserved for future usage
4	NC		NC
5	RSSI	OUT	Receiving signal strength indicator (starts approximately from 0.5 V and goes up to 5 V)
6	CTS	OUT	Clear to send, indicates when the radio modem is clear to receive data via the RS-interface
7, 8	GND	-	Power Ground, the negative pole of the operating voltage and the signal ground
9	RD	OUT	Receive Data
10	DSR	OUT	Data Set Ready, indicates that the radio modem is switched ON
11	TD	IN	Transmit Data
12	PROG	IN	Data (NC) / Programming mode by connecting the modem to the ground (GND)
13	RTS	IN	Request to Send, gives radio modem a request to send, starts the transmitter (answer by CTS line)
14, 15	VB	IN	Supply Voltage positive pole +9 … +30 Vdc
DIR = Signal direction from radio data modem IN = Input OUT= Output NC= No Connection			

4 SATELLINE-3AS and SATELLINE-3AS Epic

4.1 Technical specifications for SATELLINE-3AS (YM1011) and -3ASd (YM1016)

Special Dual Band version available of both models. Dual Band offers 2 x 2 MHz tuning range with maximum 15 MHz separation between the highest and lowest frequency.

The model SATELLINE-3ASd (YM1016) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	1.1 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	250 g

4.2 Technical specifications for SATELLINE-3AS Epic (YM3000) and -3ASd Epic (YM3001)

Both models are with diversity reception.

Special Dual Band version available of both models.

The model SATELLINE-3ASd Epic NMS (YM3011) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 10 W
Interface	RS-232, 422, 485
Operating voltage	+11.8 … +30 Vdc
Power consumption RX / TX	1.6 W / 32 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	154 x 123 x 29 mm
Weight	580 g

4.3 Technical specifications for SATELLINE-3AS Epic C (YM3002) and -3ASd Epic C (YM3003)

Both models are with diversity reception.

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

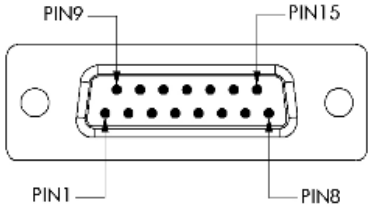
Special Dual Band version available of both models. Dual Band offers 2 x 2 MHz tuning range with maximum 15 MHz separation between the highest and lowest frequency.

The model SATELLINE-3ASd Epic C NMS (YM3013) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 10 W
Interface	RS-232, 422, 485
Operating voltage	+11.8 … +30 Vdc
Power consumption RX / TX	1.6 W / 32 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	D15 / TNC female
Size H x W x D	154 x 151 x 77 mm
Weight	1480 g

4.4 Pinning order

D15 female connector in radio modem.



PORT AND TYPE	PIN	DIRECTION	NAME	EXPLANATION
PORT1, both models	6	OUT	CTS	*
	9	OUT	RD1	Receive data (Port1)
	11	IN	TD1	Transmit data (Port1)
	13	IN	RTS	*
PORT2 RS-232 model	2	OUT	CD	
	3	OUT	RD2	Receive data (Port2)
	4	IN	TD2	Transmit data (Port2)
	5	OUT	RSSI	Analog RSSI (Optional HW)
PORT2 RS-422 model	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 RS-485 model	2	IN / OUT	A	Data positive **)
	3	IN / OUT	B	Data negative **)
COMMON PINS	1	IN	DTR	ON (V_b) / STANDBY (NC)
	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 from the radio modem to the DTE.
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.

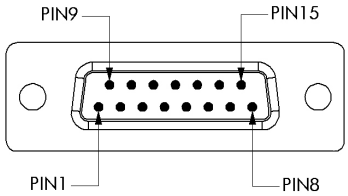
5 SATELLINE-EASy

5.1 Technical specifications for SATELLINE-EASy (YM6500 without display and YM6550 with display)

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 / 1 W
Interface	Port1: RS-232 fixed Port2: LVTTL, TTL or RS-232 / 422
Operating voltage	+3 … +9 / +6 … +30 Vdc
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	137 x 67 x 29 mm
Weight	250 g

5.2 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: LVTTL	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.

6 SATELLINE-3AS 869

6.1 Technical specifications for SATELLINE-3AS 869 (YM1021) and -3ASd 869 (YM1023)

The model SATELLINE-3ASd 869 (YM1023) is equipped with LCD and push-buttons.

Subject	Value
Frequency range	869.4125 … 869.6375 MHz
Tuning range	10 channels
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-108 dBm / 500 mW
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	1.2 W / 3.6 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	250 g

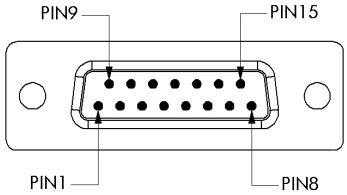
According to a recommendation of ETSI, the frequencies range 869.4…869.65 MHz is reserved for use of license free radio appliances. The application of this recommendation varies in each country, and for this reason local regulations concerning this frequency range must always be checked.

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.

6.2 Pinning order

D15 female connector in radio modem.



PORT AND TYPE	PIN	DIRECTION	NAME	EXPLANATION
PORT1, both models	6	OUT	CTS	*
	9	OUT	RD1	Receive data (Port1)
	11	IN	TD1	Transmit data (Port1)
	13	IN	RTS	*
PORT2 RS-232 model	2	OUT	CD	
	3	OUT	RD2	Receive data (Port2)
	4	IN	TD2	Transmit data (Port2)
	5	OUT	RSSI	Analog RSSI (Optional HW)
PORT2 RS-422 model	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 RS-485 model	2	IN / OUT	A	Data positive **)
	3	IN / OUT	B	Data negative **)
COMMON PINS	1	IN	DTR	ON (V_b) / STANDBY (NC)
	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 from the radio modem to the DTE.
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.

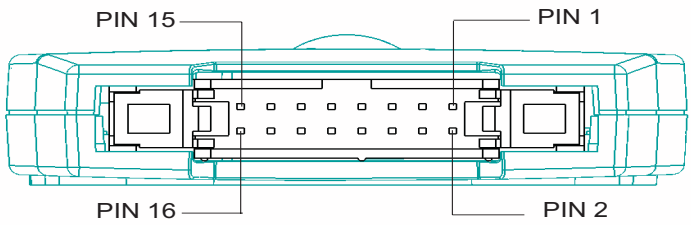
7 SATELLINE-1915

7.1 Technical specifications for SATELLINE-1915 (YM1915)

Subject	Value
Frequency range	902 … 928 MHz
Tuning range / Channel spacing	FHSS, 10 hop sequences share 50 frequencies
RX Sensitivity / TX power max.	-110 dBm / 1 W
Interface	RS-232
Operating voltage	+8 … +30 Vdc
Power consumption RX / TX	0.72 W / 1.1 W @ 10 mW, 5 W @ 1 W
Data speed radio max. / serial	115200 / 230400 bps
Connectors	DIN41651-16pin male / RPSMA male
Size H x W x D	125 x 57 x 19 mm
Weight	115 g

7.2 Pinning order

DIN41651-16 pin male connector of the radio modem (the modem DTE-connector facing the viewer).



PORT	PIN	DIR.	NAME	EXPLANATION
PORT RS-232	9	OUT	DSR	Data set ready (internally connected to DTR)
	10	OUT	RD	Receive data
	11	IN	CMD	Binary Command Mode
	12	IN	TD	Transmit data
	13	OUT	CTS	Clear to send
	14	IN	DTR	Data terminal ready (modem ON / OFF, internal pull-up)
COMMON PINS	1	DC	Vb	DC supply voltage
	2	GND	GND	DC ground
	3	-	AUX IO1	Do not connect
	4	-	AUX IO2	Do not connect
	5	-	AUX IO3	Do not connect
	6	IN	\SHDN	Modem power down, active low (internal pull-up)
	7	IN	\PROG	AT Command Mode back-up method (internal pull-up)
	8	-	NC	Not connected
	15	-	NC	Not connected
	16	SGND	SGND	Signal ground

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

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

8 SATELLINE-1870 and SATELLINE-1870E

8.1 Technical specifications for SATELLINE-1870 (YM4000) and SATELLINE-1870E (YM4010)

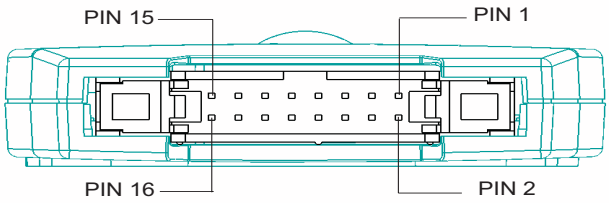
Subject	Value
Frequency range	868 … 870 MHz
Tuning range	2 MHz
Channel spacing	25 kHz fixed
RX Sensitivity / TX power max.	-108 dBm / 100 mW (SATELLINE-1870)
	-108 dBm / 500 mW (SATELLINE-1870E)
Interface	RS-232
Operating voltage	+8 … +30 Vdc
Data speed radio max. / serial	9600 / 19200 bps
Connectors	DIN41650-16 pin male / SMA female
Size H x W x D	125 x 57 x 16 mm
Weight	125 g

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.

8.2 Power consumption for SATELLINE-1870 and -1870E

Input Voltage (V)	Operating Mode (typical values)					
	Receive (mA)	Transmit on different power levels (mA) 500 mW	100 mW	5 mW	Power save (mA)	Standby (µA)
8	136	444	244	168	25	55
12	89	296	166	105	19	62
30	40	128	76	47	13	1717

8.3 Pinning order



DIN41651-16 pin male connector of the radio modem (the modem DTE-connector facing the viewer).

PIN	DIR.	NAME	EXPLANATION
RS-232 PINS			
9	OUT	DSR	Data set ready Instruction: Indicates that the radio modem is switched ON (internally connected to the DTR pin). Connecting a load to DSR without connecting a driving source to DTR cause the modem to enter the STBY mode.
10	OUT	RD	Receive Data, Output of the data received over radio. Data from the radio modem to the DTE.
11	IN	RTS	Request to send, Handshake signal.
12	IN	TD	Transmit Data, input of the data to be transmitted by radio. Data from the DTE to the radio modem.
13	OUT	CTS	Clear to send, Handshake signal can be used to drive external interface converters.
14	IN	DTR	Data Terminal Ready, modem ON/OFF, active low. Instruction: When left unconnected the radio modem is ON (weak pull-up) *. When connected to GND or SGND the radio modem will enter the Standby Mode.
COMMON PINS			
1,3	DC	Vb	DC supply voltage, positive
2,4	DC	GND	DC return, negative DC input, internally connected to SGND
5	IN	NC	Do not connect
6	IN	SHDN	Modem power down, active low, weak pull-up. *
7	IN	PROG	Operational mode, active low, weak pull-up. * Instruction: When the connected to ground (GND/SGND), the radio modem enters the Programming Mode which is for changing the settings of the radio modem (i.e. configuration, set-up). If the PROG-line is not connected, the radio modem will enter the Data Transfer Mode, in which data can be transmitted and received. The Programming Mode is used only when installing a radio modem and changing the parameters of a modem.
8	OUT	VDD_ AUX	Regulated 5.5 V (5.3….5.7 V) DC output. Max load 100 mA. Intended to power external devices made by SATEL (e.g RS-LINK, i-LINK).
15	-	NC	Not connected
16	IN	SGND	Signal ground, internally connected to GND.

*) NOTE! For cables > 1m the DTR should not be left unconnected in order to prevent disturbances from pulling DTR low and thus shutting down the modem.

9 SATELLINE-3ASd Epic Pro and –EASy Pro 35W

9.1 Technical specification for SATELLINE-3ASd Epic Pro (YM3040)

Special Dual Band version available. Dual Band offers 2 x 2 MHz tuning range with maximum 15 MHz separation between the highest and lowest frequency.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 10 W
Interface	RS-232
Operating voltage	+11.8 … +30 Vdc
Power consumption RX / TX	1.6 W / 32 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU female / TNC female
Size H x W x D	165 x 138 x 57 mm
Weight	1300 g
IP classification	IP67 (NEMA6)

9.2 Technical specifications for SATELLINE-EASy Pro 35W (YM6803)

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	+9 … +16 Vdc (≥ +12 Vdc @ 35 W)
Power consumption RX TX	 1.8 W 100 W @ 25 W / 120 W @ 35 W
Data speed radio max. / serial	19200 / 38400 bps
Connectors	8-pin ODU f / 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.

9.3 Duty cycle for SATELLINE-EASy Pro 35W

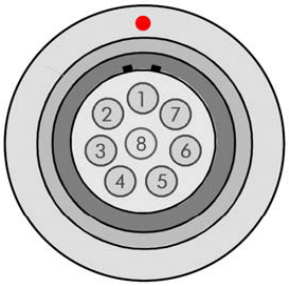
If high output power is used continuously or with a high cycle, the equipment generates excess heat. The output power is automatically decreased when necessary to prevent overheating.

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

9.4 Pinning orders

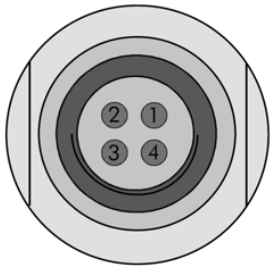
a) SATELLINE-3ASd Epic Pro and –EASy Pro 35W, 8-pin
Connector: 8 pin ODU, MINI-SNAP

	SATELLINE-3ASd Epic Pro	SATELLINE-EASy Pro 35W
1	RTS	RTS
2	CTS	CTS
3	SGND	SGND
4	RXD	RXD
5	TXD	TXD
6	PROG	PROG
7	+VDC	Not connected
8	Not connected	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



NOTE! SATELLINE-3ASd Epic Pro does not have a separate power connector. Power is fed via data connector.

10 CUSTOMIZED SATELLINE RADIO MODEMS

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

10.1 SATELLINE-M3 UHF TNC (YM1015) and –M3 UHF SMA (YM1019) technical specifications

Both models are in a stainless steel housing.

Subject	Value
Frequency range	330 … 470 MHz
Tuning range	± 2 MHz from central freq.
Channel spacing	12.5 / 20 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 1 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
Power consumption RX / TX	1.1 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	250 g

Pinning order is the same than for SATELLINE-3AS, see page 16.

10.2 SATELLINE-M3 VHF (YM6000) technical specifications

In an aluminum housing.

Subject	Value
Frequency range	135 … 174 / 218 … 238 MHz
Tuning range	135 … 155, 138 … 160 MHz 155 … 174, 218 … 238 MHz
Channel spacing	12.5 / 25 kHz fixed
RX Sensitivity / TX power max.	-115 dBm / 5 W
Interface	RS-232, 422, 485
Operating voltage	+9 … +30 Vdc
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 8.

10.3 SATELLINE-M3-TR1 (YM6300) transceiver module

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

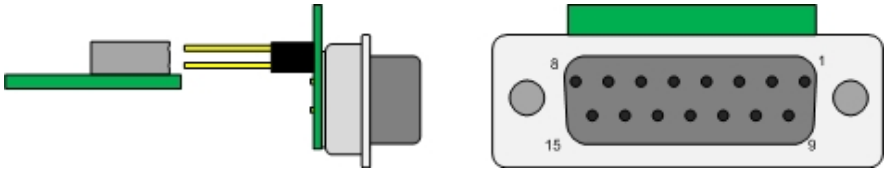
In PCB format the module is available with TNC, MCX, SMA or MMCX antenna connector.
Stainless steel housing is equipped either with TNC or MCX antenna connector.
Aluminum housing is available with TNC, SMA, MCX or MMCX antenna connector.

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	403 … 473 MHz
Tuning range	70 MHz
Channel spacing	12.5 / 20 / 25 kHz selectable
RX Sensitivity / TX power max.	-114 dBm / 1 W
Interface	RS-232, 422, LVTTL, TTL
Operating voltage	+3 … +9 /+6 … +30 Vdc
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 9 mm PCB format
Weight	50 g PCB format

10.4 Pinning order for SATELLINE-M3-TR1



D15 female connector adapter of the radio modem.

Pin out of the D15 connector.

PORT	PIN	DIR	NAME
PORT 1 RS-232	6	OUT	CTS*
	9	OUT	RD1
	11	IN	TD1
	13	IN	RTS*
PORT 2 TTL/LVTTL	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

11 ADDITIONAL EQUIPMENT

SATEL can offer following additional equipments for SATELLINE radio modems.

11.1 SATELLINK I/O-converters

	I-LINK 100	C-LINK 100	i-LINK	I-LINK 200	I-LINK 300
Order code	YI0007	YI0015	YI0090	YI0009	YI0010
Digital I/Os	4	4	2	4	6
Analogue I/Os	2	-	-	2	-
Pulse counter	-	Yes	Yes	-	-
Modbus compatibility *)	Yes	Yes	Yes	Yes	Yes
Modem compatibility **)	G1, G2	G1, G2	G2	G1, G2	G1, G2
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-3AS NMS, -3ASd NMS
- SATELLINE-3AS Epic NMS, -3ASd Epic NMS, -3AS Epic NMS C, -3ASd Epic NMS C
- SATELLINE-2ASxE
- SATELLINE-2ASc
- SATELLINE-3AS, -3ASd
- SATELLINE-3AS Epic, -3ASd Epic, -3AS Epic C, -3ASd Epic C
- SATELLINE-EASy
- SATELLINE-3AS 869, -3ASd 869
- SATELLINE-M3 UHF, -M3 SMA
- SATELLINE-M3 VHF
- SATELLINE-M3-TR1

Following modems belong to the group G2:

- SATELLINE-1915
- SATELLINE-1870
- SATELLINE-1870E

***) I-LINK 200 and I-LINK 300 are extension units for I-LINK 100 and C-LINK 100. A maximum of three extension modules can be added to each I-LINK or C-LINK converters.

11.2 Other equipment

	SATEL RS-LINK 100	SATEL IP-LINK	SATEL-321
Order code	YI0485	YI0020	YP0321
Description	RS-232 to RS-485/422 converter	IP router	Battery package
Modem compatibility *)	G3	G4	G5

*) Following modems belong to the group G3:

- SATELLINE-1870
- SATELLINE-1870E

Following modems belong to the group G4:

- SATELLINE-3AS VHF, -3ASd VHF, -3AS VHF C, -3ASd VHF C
- SATELLINE-3AS NMS, -3ASd NMS
- SATELLINE-3AS Epic NMS, -3ASd Epic NMS, -3AS Epic NMS C, -3ASd Epic NMS C
- SATELLINE-3AS, -3ASd
- SATELLINE-3AS Epic, -3ASd Epic, -3AS Epic C, -3ASd Epic C
- SATELLINE-EASy
- SATELLINE-3AS 869, -3ASd 869
- SATELLINE-M3 UHF, -M3 SMA
- SATELLINE-M3 VHF
- SATELLINE-M3-TR1

Following modems belong to the group G5:

- SATELLINE-3AS VHF, -3ASd VHF
- SATELLINE-3AS NMS, -3ASd NMS
- SATELLINE-2ASxE
- SATELLINE-2ASc
- SATELLINE-3AS, -3ASd
- SATELLINE-EASy
- SATELLINE-3AS 869, -3ASd 869

Please note that some of the functionalities are not supported when using the battery package SATEL-321 together with SATELLINE-3AS VHF or -3AS NMS modems.

12 ACCESSORIES

SATEL can offer following accessories for SATELLINE radio modems.

12.1 Interface cables and adapters for RS-232 interface

Type	Description	Lenght	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 Epic, Epic Pro, EASy, VHF modems
CRS-9 (YC0201)	Cable D9 m / D9 f	2 m	-
CRS-1M (YC0101)	Cable D15 m / D25 m	2 m	Inc. power supply wires
CRS-1F (YC0102)	Cable D15 m / D25 f	2 m	Inc. power supply wires
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 Epic Pro and EASy Pro 35W 8-pin
CRS-18F (YC0187)	Cable DIN41650-16 / D9 f	1.5 m	Inc. power supply wires. For 1870, 1870E, 1915 modems
CRS-18IF (YC0190)	Cable DIN41650-16 / D15 f	0.4 m	From 1870, 1870E or 1915 to I- or C-LINK
CRS-35W 8-pin (YC0368)	Cable ODU 8-pin m / D9 f	2 m	For EASy Pro 35W
CRS-35W 8-/7-pin (YC0369)	Cable ODU 8-pin m / 7-pin m	2 m	For EASy Pro 35W
CRS-35W 8-/10-pin (YC0370)	Cable ODU 8-pin m / 10-pin m	2 m	For EASy Pro 35W
CRS-35W 8-/8-pin (YC0359)	Cable ODU 8-pin m / 8-pin m	2 m	For EASy Pro 35W

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

Type	Description	Lenght	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 Epic, Epic Pro, EASy, VHF modems
CRS-PB (YC0501)	Cable D15 m / D9 m	2 m	Inc. power supply wires

12.3 NMS cable

Type	Description	Lenght	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

12.4 Programming cable

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

12.5 RF cables

Type	Description	Lenght	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-15 (YC1115)	TNC f / TNC m right-angle connector	15 cm	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)
RG-213 (YC1000)	Low loss cable	X	1.6 dB / 10m
ECOFLEX 10 (YC1004)	Low loss cable	X	0.9 dB / 10m
AIRCOM+ (YC1001)	Low loss cable	X	0.8 dB / 10m
ECOFLEX 15 (YC1005)	Low loss cable	X	0.6 dB / 10m

12.6 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
CA420O CA450O	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

Examples of antennas for other SATELLINE modems:

Type	Description
Antenna 1870 (YA1869)	Half-wave antenna for 1870 and 1870E modems
Antenna 1915 (YA0915)	Half-wave antenna for 1915 modems
Antenna 869 (YA0869)	Half-wave antenna for 3AS 869 modems
Miniflex 150 (YA0302)	Helix antenna for 3AS VHF modems

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

12.7 Power supplies and power cables

Type	Description
PS-DIN-2 (YP0118)	230 Vac/12 Vdc/1A, power supply for DIN rail mounting
C-P-35W 2m (YC0355)	2 m cable, ODU 4-pin male / 4mm lab plugs for EASy Pro 35W
C-P-35W 3m (YC0353)	3 m cable, ODU 4-pin male / Alligator clip for EASy Pro 35W
C-P-SAE 35W-4pin (YC0352)	2 m cable, ODU 4-pin male / SAE connector for EASy Pro 35W

12.8 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 recommend inserting a lightning protector to the feed-line outside the protected zone. SATEL technical support can give guidance in the selection of suitable products.

13 SOFTWARE (MS WINDOWS COMPATIBLE)

Following software are available for SATELLINE radio modems:

13.1 SaTerm

SaTerm is software, which is used to configuration, testing, reprogramming and for updating the firmware of the SATELLINE-2ASc, -2ASxE, -3AS, -3ASd, -EASy, -3AS Epic, -3ASd Epic, -3ASd Epic Pro and -EASy Pro 35W radio modems.

13.2 SaTerm Lite

SaTerm Lite is software for configuration, testing and reprogramming of the SATELLINE-3AS, -3ASd, -3AS NMS, -3ASd NMS, -3AS Epic NMS, -3ASd Epic NMS, 3AS VHF and -3ASd VHF radio modems.

13.3 SaTerm 1915

SaTerm 1915 is software is a configuration, testing and reprogramming software for SATELLINE-1915 radio modem.

13.4 SATEL NMS PC

Network Management System software for creating and managing SATELLINE-3AS NMS, -3ASd NMS, -3AS Epic NMS, 3ASd Epic NMS, -3AS VHF and 3ASd VHF networks, including the graphical design of topology and message routing or repeater functions, remote modification of settings, and logging and trending of field data.

13.5 Configuration Manager

SATEL Configuration Manager (CM) is configuration software for SATELLINE- M3-TR1, SATELLINE-EASy and -EASy Pro 35W radio modems. The program makes it possible to edit the modem settings and update the firmware.

13.6 FCS Monitor

Free Channel Scanning Monitor program is used to set the FCS parameters and for loading them to SATELLINE radio modems and for monitoring the channels for noise or interference.

13.7 Channel list editor

Channel list editor program is used to create the channel list for SATELLINE-3ASd Epic Pro and -EASy Pro 35W modems.

In order to get more information of software contact your local distributor or us. The software can be downloaded from SATEL web site www.satel.com

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.

14 HOW TO ESTABLISH A WIRELESS DATA LINK

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

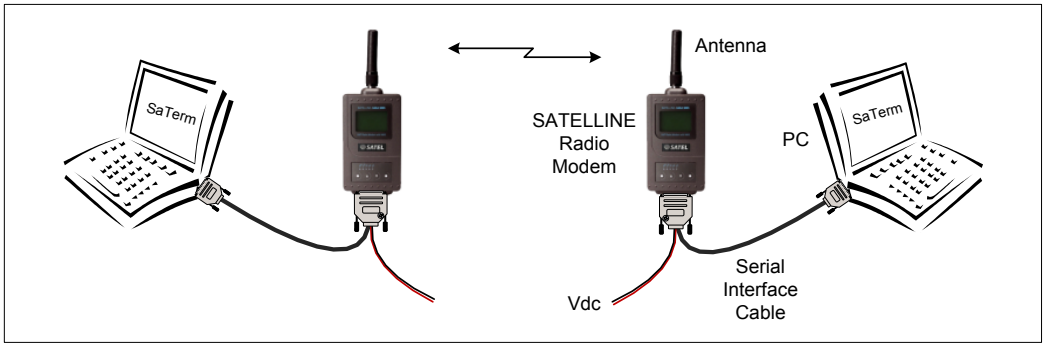
14.1 List of equipment

- two SATELLINE 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-2ASc, -2ASxE, -3AS, -3AS NMS, -3AS Epic and -EASy	MINIFLEX 400-435 (YA0104) or MINIFLEX 435-470 (YA0102)	CRS-2F (YC0104) or NARS-1F (YC0200) & CRS-9 (YC0201)
SATELLINE-3AS VHF	MINIFLEX 140 (YA0302)	CRS-2F (YC0104) or NARS-1F (YC0200) & CRS-9 (YC0201)
SATELLINE-3AS 869	ANTENNA 869 (YA0869)	CRS-2F (YC0104) or NARS-1F (YC0200) & CRS-9 (YC0201)
SATELLINE-1870, -1870E	ANTENNA 1870 (YA1869)	CRS-18F (YC0187)
SATELLINE-1915	ANTENNA 1915 (YA0915)	CRS-18F (YC0187)

14.2 Equipment setup



14.3 Parameter setups

The following parameters shall be set equally in the 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

14.4 Communication test over the link

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.

15 SETTINGS

The configuration of SATELLINE 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 "13 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.

16 ERROR CORRECTION (FEC)

SATELLINE radio modems (except SATELLINE-2ASc and -2ASxE) 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 pour 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.

17 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