

# Line Interface

## Modul AC

# LIM-AC



**FunkTronic**  
Kompetent für Elektroniksysteme

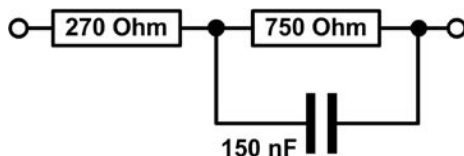
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## Terms and Shortcuts

LIM-AC	Line Interface Modul <b>AC</b>
Line	2-Wire Connection
Radio	2-Way Radio Base Station

$Z_R$  Reference Termination Impedance,  
equivalent to a real 2-Wire Connection according to german TBR 15



## Technical Data

### Power Supply

Voltage	+12 V DC +/- 30%
Current consumption	25 mA

### AF-Input Level

Factory default	500 mV
Input impedance	600 Ohm

### AF-Output Level

Factory default	500 mV
Adjustment range	- 24 dBm to - 5 dBm

### Input Level Line

Factory default	- 8 dBm ( 500 mV at AF-Output)
Input impedance	$Z_R$

### Output Level Line

Factory default	- 6 dBm, AF (500 mV at AF-Input) plus pilot tone
Output impedance	$Z_R$

**Weight** 77 g

**Dimensions** (with flange) 100 x 32 x 75 mm

# Common Characteristics

The LIM-AC (Line Interface Modul **AC**) connects a 2 way radio station to its operator device via leased line. It is certificated according to german TBR 15 and for this can be connected to private and public/leased lines.

The 2 wire connection is plugged into the connector Line. The operator device is connected to the plug named Major. The connection LIM-AC to the Major operator device is established through a one-to-one cable. Standard network patch cords can be used.

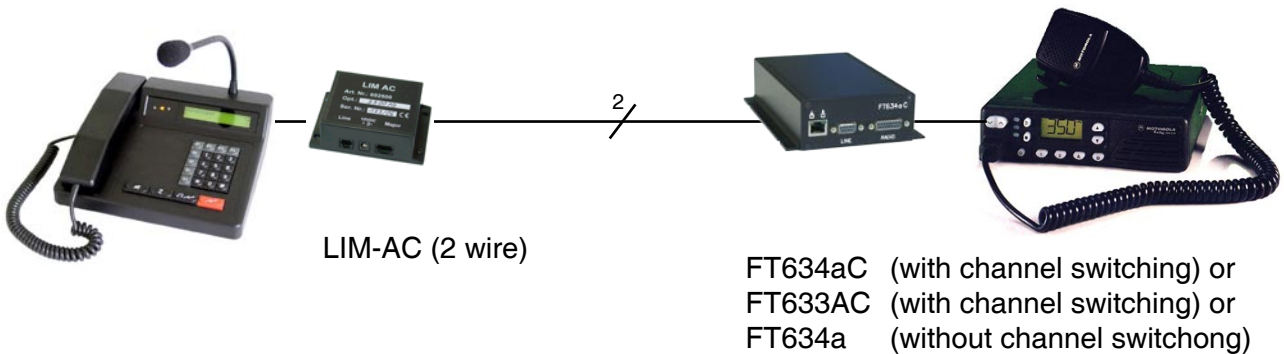
On the opposit side the devices FT634a, FT634aC or FT633AC can be used.

All operator devices of the Major series (e.g. Major 4a, 5a, 6) can be directly connected to the LIM-AC.

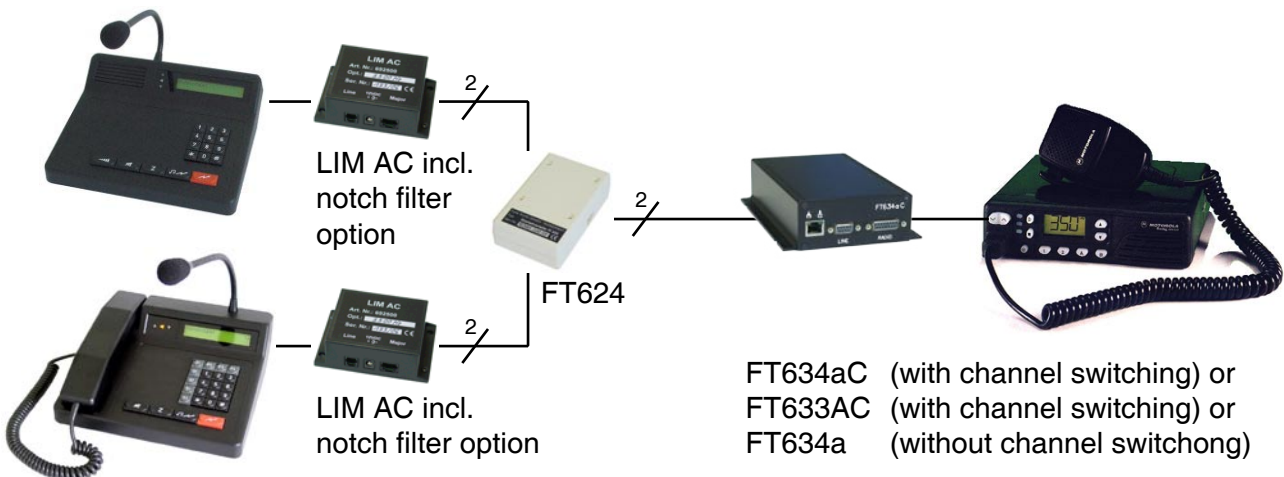
**Exception:**

The Major BOS 4 and Major BOS 8 feature a busy line instead of the 12V power supply on the 8 pole plug. In this case the LIM-AC has to be powered via the separate power supply plug.

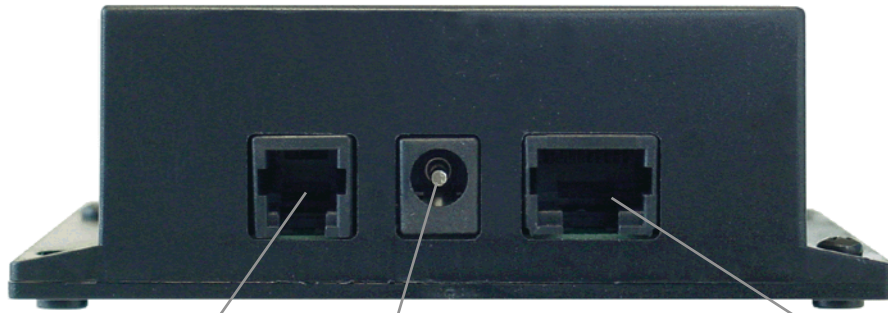
## Examples Major 4a (5a), AC coupled



Parallel operation of multiple operator devices --> LIM AC requires notch filter option for pilot tone

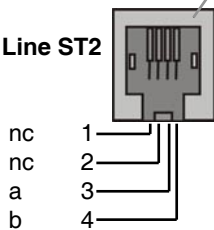


# Connector Layout LIM-AC



## 2-wire connection

Pin Layout Line ST2

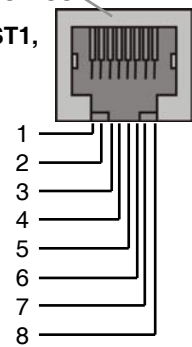
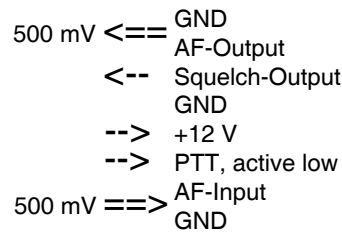


## Power Supply

12 Volt  
Tip Plus pole  
Ring Ground

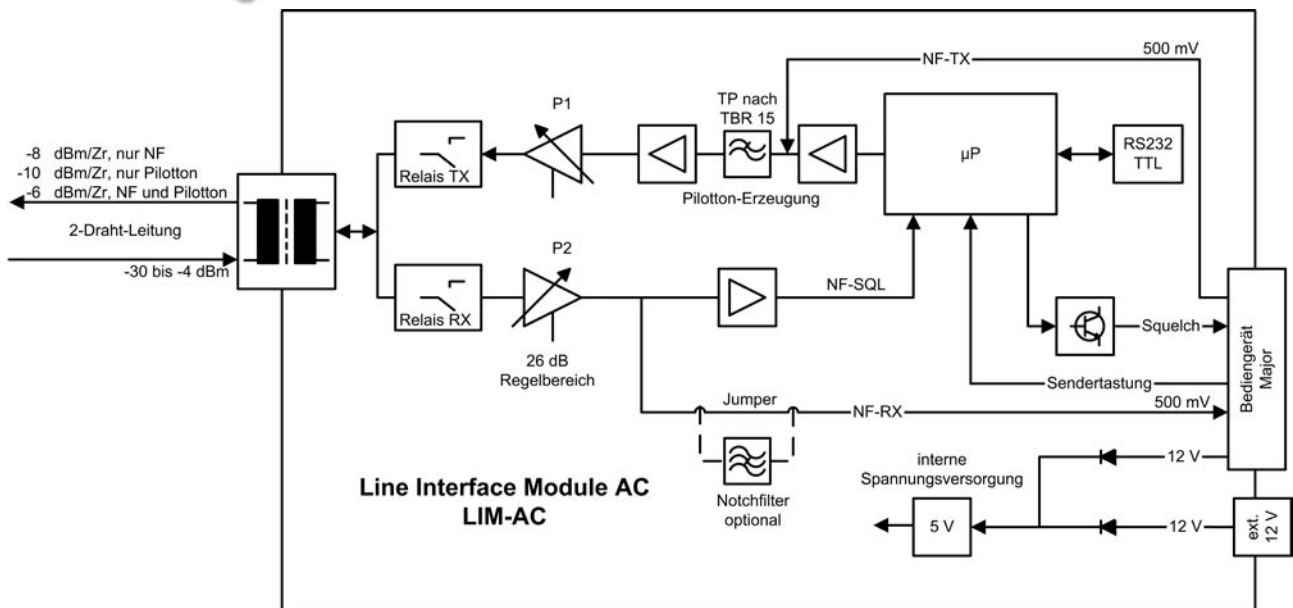
## Operator Device

Pin Layout Radio circuit ST1,

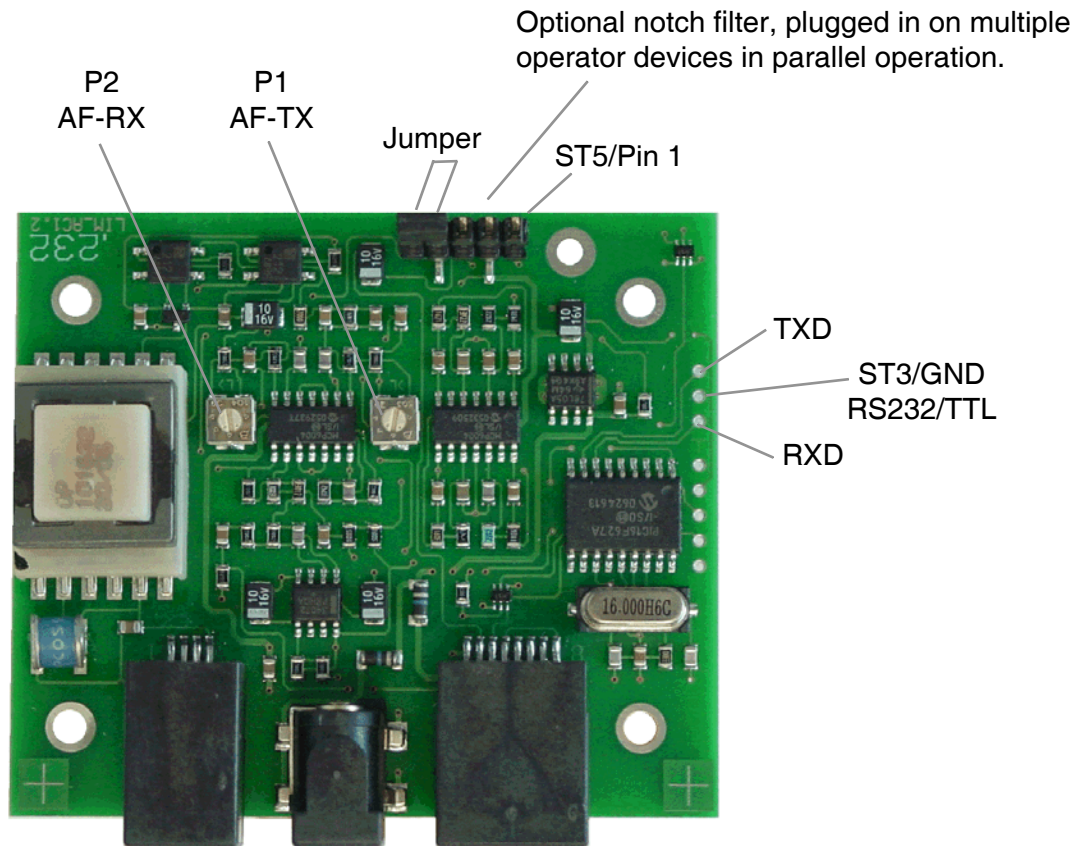


nc = not connected

# Block Diagram



# Adjustment



## **P1 (AF-TX)**

P1 sets the level of the pilot tone. The required AF level has to be set within the operator device. The factory default of P1 is set to the max. permitted level according to TBR 15.

Pilot tone without AF	-->	- 10 dBm on line
AF Input 500 mV	-->	- 8 dBm on line
AF plus pilot tone	-->	- 6 dBm on line

## **P2 (AF-RX)**

Feed line / 2 wire connection with required level and set AF-Output to 500 mV.

### Remark:

In public communication networks it is mandatory to terminate the line with the reference terminating impedance of  $Z_r$  while sending or receiving. Because of this the FT624 has to be used to connect multiple LIM-AC in parallel. This causes a higher insertion loss. Please consider the programming capabilities of pilot tone and relays.

# Programming Guide

Connect the plug ST3 of the LIM-AC to the serial interface of the PC via **adapter TTL/RS232** (e.g. FunkTronic RS232AD1). Start a terminal emulation program (e.g. Hyperterminal, minicom). The settings are 9600 baud, 8 data bits, no parity, one stop bit and no flow control protocol.

Hit the ENTER key and you will receive the following display message:

```
LIM_AC      (C) FunkTronic 02-03

Software:   `LIM_AC`      V1.1 vom 24.09.03
Pilotton:   3300 Hz

Rxx         Read EEPROM Register xx
Pxx yy      Program yy in EEPROM Register xx

X          Reset
```

If you enter R followed by a two digit register number and a final ENTER the setting of the corresponding register will be displayed.

Programming a register works the same way but with the P button instead of R. Enter P followed by the two digit register number followed by the register value and the final ENTER key.

Input of X resets the unit.

## Register description EEPROM LIM-AC

### Register Function

00	Vref for Squelch detection level (Factory default --> 0x0A = 280 mV)
01	Vref for Squelch turn off level (Factory --> 0x06 = 140 mV)
02	Number of consecutive slopes on start of Squelch A break of 3.6 ms without slope resets the counter Factory default --> 0x05 = 6 slopes without break longer than 3,6 ms is detected as Squelch
03	Follow-up time for Squelch detection x 10 ms Factory default --> 0x50 = 50 x 10 ms = 500 ms
04	Locking time past PTT for Squelch detection x 10 ms Factory default --> 0x10 = 10 x 10 ms = 100 ms
05	TX-Mode Low-Nibble --> Pilotton bei TX 1 = an, 0 = aus High-Nibble --> Relais bei TX 0 = TX-Relais on for TX, RX-Relais on for RX 1 = TX-Relais always on, RX-Relais on for RX - default 2 = TX-Relais an bei TX, RX-Relais immer an 3 = TX-Relais immer an, RX-Relais immer an

Factory default --> 0x11 = Relais and pilot tone on for TX

## AF level for the registers 00 snd 01

Register Value	ca . AF level/mV
00	1,0
01	20
02	45
03	60
04	95
05	125
06	140
07	160
08	185
09	230
0A	280
0B	325
0C	370
0D	415
0E	465
0F	no Squelch detection

## Ordering Information

Part No.	Description
692500	Line Interface Module AC, <b>LIM-AC</b>
901200	Option notch filter 3300 Hz

# General Safety Instructions

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Please read the operating instructions carefully before installation and setup.

The relevant regulations must be complied to when working with 230V line voltage, two-wire-lines, four-wire-lines and ISDN-lines. It is also very important to comply to the regulations and safety instructions of working with radio installations.

## **Please comply to the following safety rules:**

- All components may only be mounted and maintained when power is off.
- The modules may only be activated if they are built in a housing and are scoop-proof.
- Devices which are operated with external voltage - especially mains voltage - may only be opened when they have been disconnected from the voltage source or mains.
- All connecting cables of the electronic devices must be checked for damage regularly and must be exchanged if damaged.
- Absolutely comply to the regular inspections required by law according to VDE 0701 and 0702 for line-operated devices.
- Tools must not be used near or directly at concealed or visible power lines and conductor paths and also not at and in devices using external voltage – especially mains voltage - as long as the power supply voltage has not been turned off and all capacitors have been discharged. Electrolytic capacitors can be still charged for a long time after turning off.
- When using components, modules, devices or circuits and equipment the threshold values of voltage, current and power consumption specified in the technical data must absolutely be complied to. Exceeding these threshold values (even if only briefly) can lead to significant damage.
- The devices, components or circuits described in this manual are only adapted for the specified usage. If you are not sure about the purpose of the product, please ask your specialized dealer.
- The installation and setup have to be carried out by professional personnel.

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## **Factory returning of old equipment**

According to German law concerning electronic devices old devices cannot be disposed off as regular waste. Our devices are classified for commercial use only. According to § 11 of our general terms of payment and delivery, as of November 2005, the purchasers or users are obliged to return old equipment produced by us free of cost. FunkTronic GmbH will dispose of this old equipment at its own expense according to regulations.

Please send old equipment for disposal to:

**FunkTronic GmbH  
Breitwiesenstraße 4  
36381 Schlüchtern**

**>>> Important hint:** freight forward deliveries cannot be accepted by us.

February 2<sup>nd</sup> , 2006

**Subject to change, Errors excepted**