Major 4a

Major 5a

ENTWICKLUNG PRODUKTION SOFTWARE HARDWARE ELEKTRONIK BERATUNG

FunkTronic
Kompetent für Elektroniksysteme

English 1.0

Inhalt

Order Information

Ord.-No.	Description
681000	Major 4a Major 4a with FMS option Major 4a with BOS option
714000	Major 5a Major 5a with FMS option Major 5a with BOS option
900012	Power supply unit (230/12 Volt), suitable for Major 4a and Major 5a

Attention: Power supply units for Major 4a/5a are not included!

General Features

The Major 4a/5a is the newer design of the well-known Major 4/5 An alphanumeric LC Display with background lighting has replaced the LED Display. A gooseneck microphone with a high dynamic range is part of the standard equipment of Major 5a as well as Major 4a. By using a plain text based menu structure the programmable features have been extended significantly and at the same time programming has become more straightforward. All buttons are freely programmable. Hence, each of the buttons can be assigned two different functions.

A radio set can be connected directly (multiwire) or via 2- or 4-wire line. All viable tone sequences can be transmitted and interpreted.

There are two sockets for headsets. One can be used for a remote PTT foot switch. The 7 digital outputs can be used for remote channel select or for other functions. For operation an external 12-volt power supply is necessary.

The Major 4a/5a can be programmed via the serial interface or keypad. It is also possible to connect a printer or a terminal to the serial interface. For printers with a parallel interface an additional interface is available.

Control Elements Major 4a

Control Elements Major 5a

Display Elements Major 4a/5a

LC Display

All alphanumeric readouts are presented by a LC display with background lighting.

Status LEDs

Carrier Display (Squelch)

The carrier display LED ▼ can be controlled by voice (2-wire connection) or via squelch input (using the radio set). If the light is on, the radio circuit is occupied, that is, a carrier signal (carrier is keyed) is present.

PTT Display (Push-to-Talk)

The PTT display LED ▲ is on, if the transmitter is keyed. Keying of the transmitter is achieved by pressing the PTT button during telephony or by sending a call.

Loudspeaker Display (Incoming Call)

The loudspeaker display LED is on, if the loudspeaker or the earphone capsule in the handpiece are switched on.

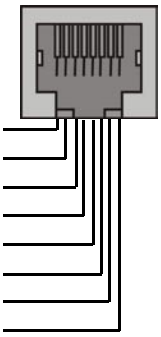
PWR **ST4** **ST3** **ST2** **ST2A** **ST1**

PWR operating voltage 12V, max. 1,5 A
inside: positive terminal, outside: earth

Sockets Pinout Major 4a/5a

All of the schemes show the sockets as viewed from the rear of the Major.

Pinout S/E
Radio Circuit (ST1)

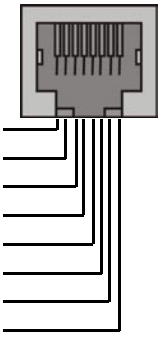


AF input B	1
AF input A	2
Squelch input	3
GND	4
output +12 V, max. 200 mA	5
sender keying active, low	6
AF output A	7
AF output B	8

All AF in/outputs are equipped with transformers and, hence, potential-free. PIN 5 is for supply (+12V) of external devices (LIM-AC, FT634C, FT633AC).

Attention: Do not use PIN 5 to supply a radio set. 200 mA output current is not sufficient.

Pinout I/O
Digital In/Outputs (ST3)

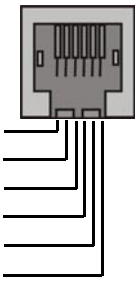


IN/OUT 0	1
IN/OUT 1	2
IN/OUT 2	3
IN/OUT 3	4
IN/OUT 4	5
IN/OUT 5	6
IN/OUT 6	7
GND	8

The digital connections can be configured as inputs or outputs, respectively. Usually, these are used as outputs for remote channel select.

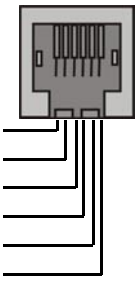
There are two sockets for connecting a headset. One is for connecting the headset, the other for the use of an external PTT button (e.g. foot switch)

Pinout HS
Headset (ST2A)



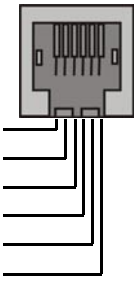
GND	1
AF input (mic. +)	2
AF earphone	3
GND earphone	4
GND AF input (mic. -)	5
PTT, active GND	6

Pinout PTT
Headset (ST2)



GND	1
GND AF input (mic. -)	2
NF earphone	3
GND earphone	4
AF input (mic. +)	5
PTT, active GND	6

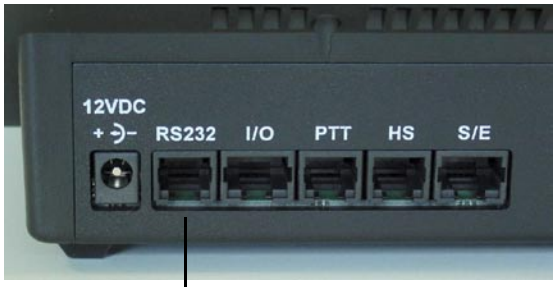
Pinout RS232
(ST4)



NC	1
NC	2
TxD	3
RxD	4
GND	5
NC	6

To socket RS232 a printer can be connected.

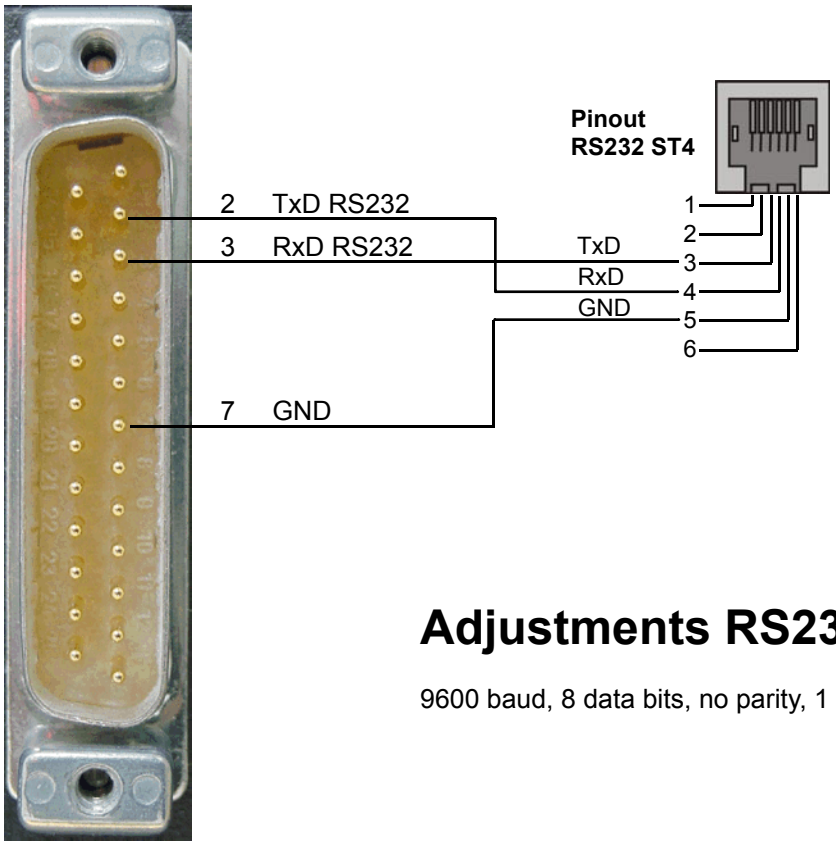
RS232 Interface



ST4 RS232 Interface

RS232 Cable for Flashing/Printing/Monitoring

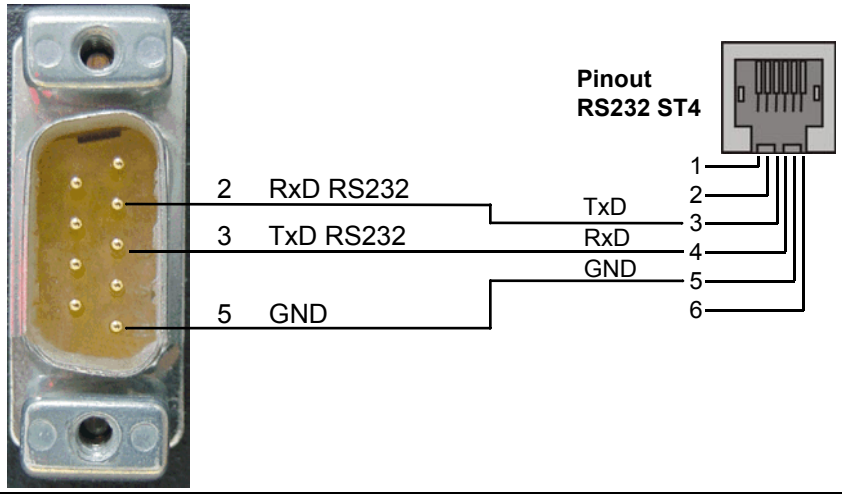
RS232 25-pin connector on computer **RS232 socket on Major**



Adjustments RS232 Interface

9600 baud, 8 data bits, no parity, 1 stop bit, no protocol

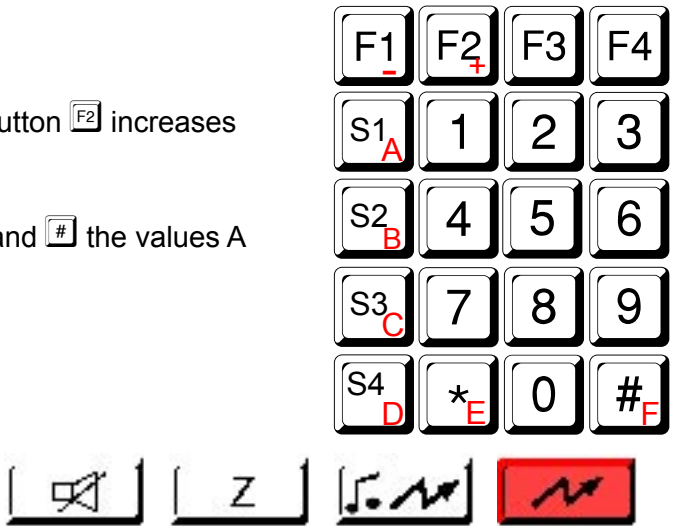
RS232 9-pin connector on computer **RS232 socket on Major**



Keypad Layout in Programming Mode Major 4a

Button F1 reduces by 1 and button F2 increases by 1.

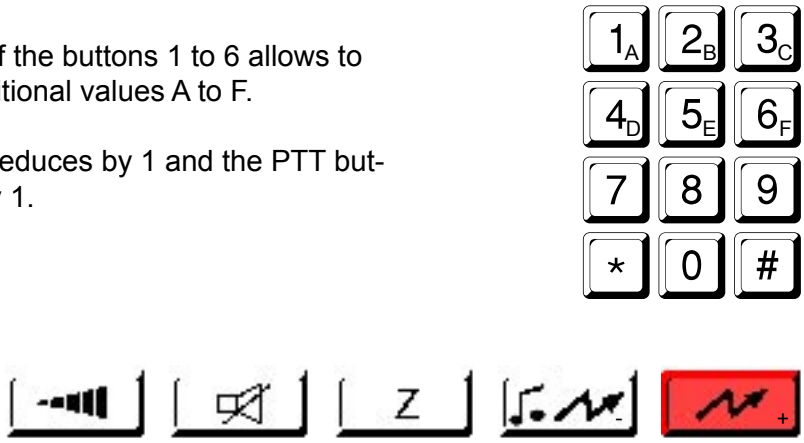
To the buttons S1 bis S4, * and # the values A to F are assigned.



Keypad Layout in Programming Mode Major 5a

Long pressing of the buttons 1 to 6 allows to achieve the additional values A to F.

The call button reduces by 1 and the PTT button increases by 1.



Differences between Major 4a and Major 5a

Major 4a and Major 5a show the following differences:

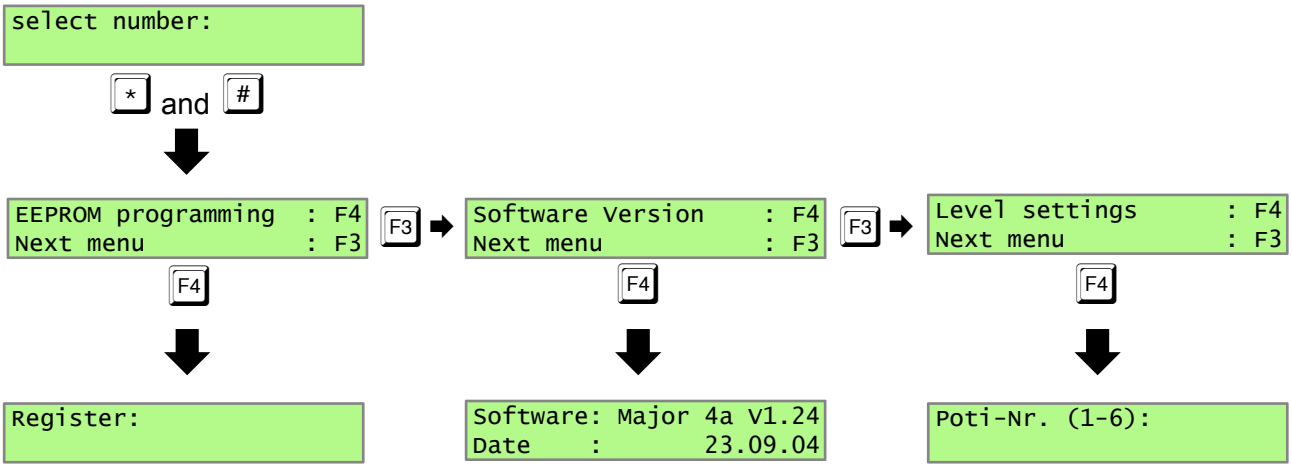
1. different keyboards
2. Major 4a includes a handset, Major 5a does not
3. minor differences in the software, resulting from 1. and 2.
4. optional telephone interface only for Major 4a

Menu Structure

Simultaneuos pressing of the buttons * and # opens the menu.

Due to the different keypad designs, for the same operations different keys are used in Major 4a and Major 5a. In the following, the handling of Major 4a is described. For the respective keys that have to be used in Major 5a please consider the table below.

Function	Major 4a	Major 5a
next menu	F3	*
select menu item	F4	#
escape discarding changes	F3	*
save changes and escape	F4	#
increase value by 1	F2	
reduce value by 1	F1	



- enter the register number to be programmed
- with 222 the factory default values are programmed

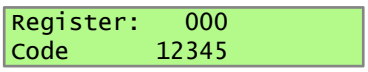
- displayed 3 seconds

1 = input level
nominal value: 300mV
indicated on the display
2 = output level
as required
3 = GN microphone level *

- the potis can be adjusted from 0 to 255
- input directly via keypad

or

F2 = increase value by 1
F1 = reduce value by 1



- overwrite the code with the desired values

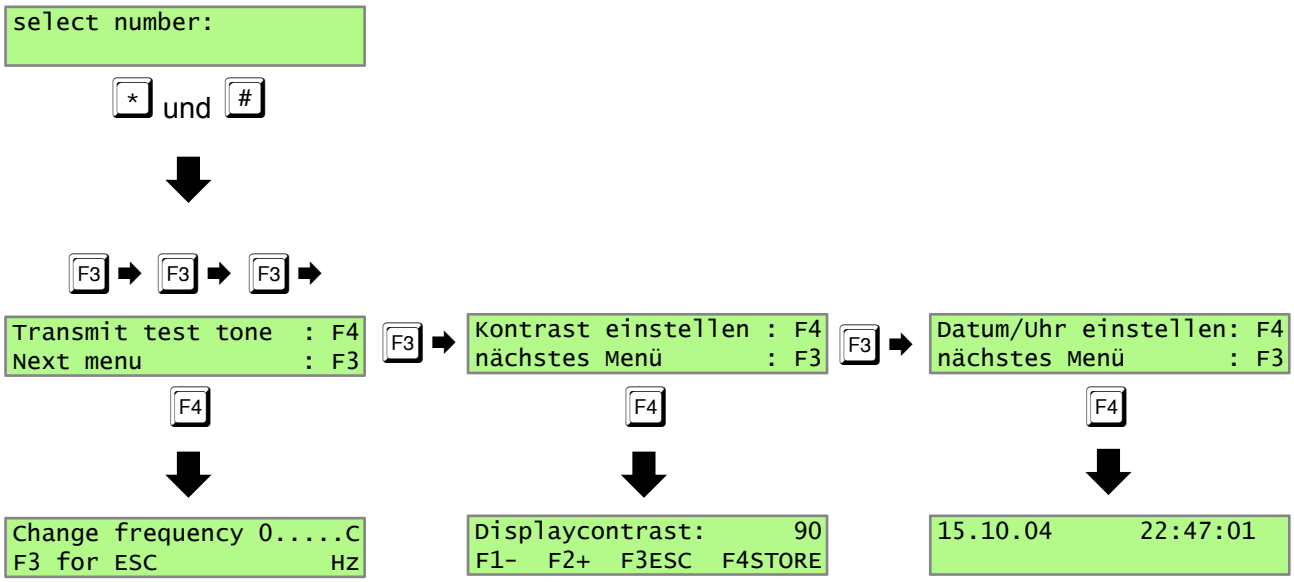
F3 = escape menu discarding changes
F4 = save changes, escape menu

*
GN = gooseneck
HA = Handapparat
HS = Headset

F3 = escape menu discarding changes
F4 = save changes, escape menu

Menu Structure

continued



0 = 200 Hz
1 = 300 Hz
2 = 400 Hz
3 = 600 Hz
4 = 800 Hz
5 = 1000 Hz
6 = 1600 Hz
7 = 2400 Hz
8 = 3400 Hz
9 = 4000 Hz
S1 = 2900 Hz
S2 = 3000 Hz
S3 = 3100 Hz
S4 = 3300 Hz
* = 1200 Hz
# = 1800 Hz

F3 = escape menu

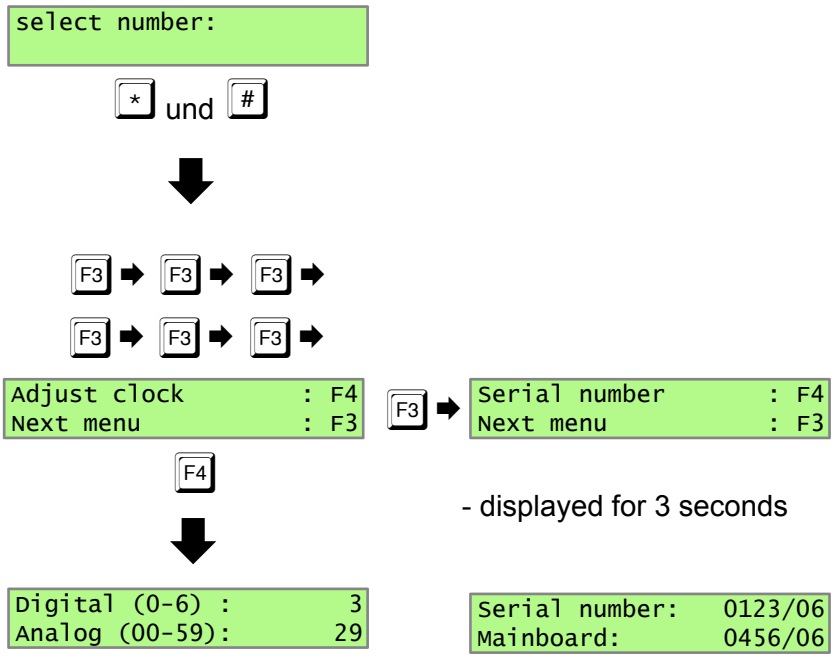
F1 = reduce contrast by 1
F2 = increase contrast by 1
F3 = escape menu discarding changes
F4 = save changes, escape menu

F1 = one digit to the left
F2 = one digit to the right
F3 = escape menu discarding changes
F4 = save changes, escape menu

The values can be changed directly using the buttons 0 to 9.

Menu Structure

continued



- displayed for 3 seconds

F1 = one digit to the left

F2 = one digit to the right

The onboard clock is factory calibrated. Before changing the values please note down the current values. Higher values accelerate the clock, while lower values slows it down. Changes made in digital have more effect than changes made in analog. Fine adjustment must be done in analog, step by step.

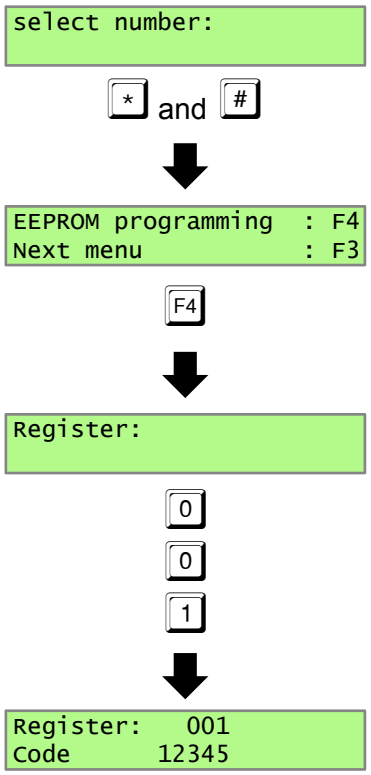
F3 = escape menu
discarding changes

F4 = save changes,
escape menu

Programming Short Call

The example below shows the programming of short dial 1 in register 001 with tone sequence 12345.

Please press the following buttons:



The line „Code“ shows the current programming. You can overwrite these with your own values.

The menu can be quit without changes at all times using button F3

Button F4 stores the displayed values.

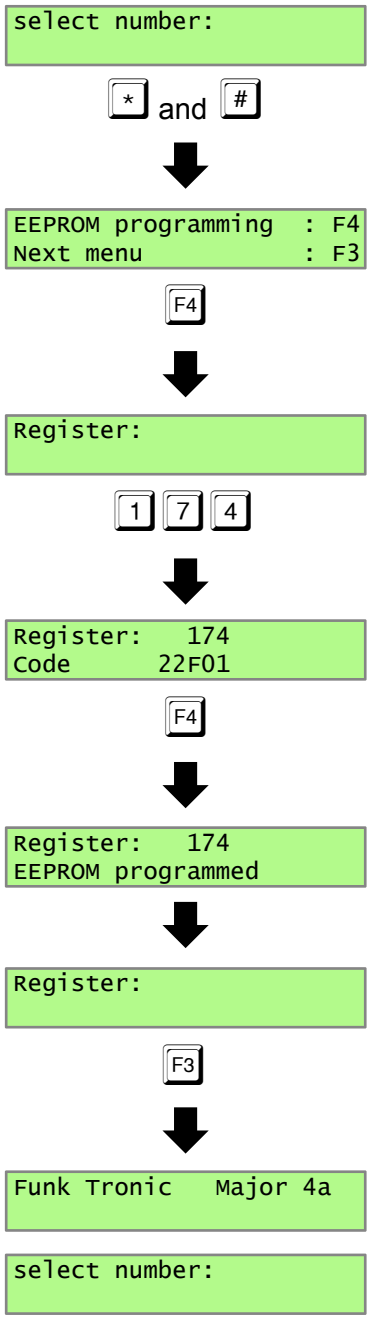
As every button of the Major 4a/5a is freely programmable, registers 174 and 175 have to be programmed with the appropriate values of the short call button (Z-button).

Commonly, reigister 174 (function of Z-button, short) is programmed with 22F01 and register 175 (function of Z-button, long) is programmed with 00000. The first zero in register 175 disables action after long pressing of the Z-button

The impacts of the single digits of register 174 are as follows:

1. digit = 2 --> function --> transmit call
2. digit = 2 --> transmit short call
3. digit = F --> input necessary
4. digit = 0 --> ID mode / 5 tone sequence
5. digit = 1 --> not applicable for 5 tone sequence

Programming of register 174 is achieved following the procedure below. Register 175 is programmed analogously.



Individual Programming of the Buttons

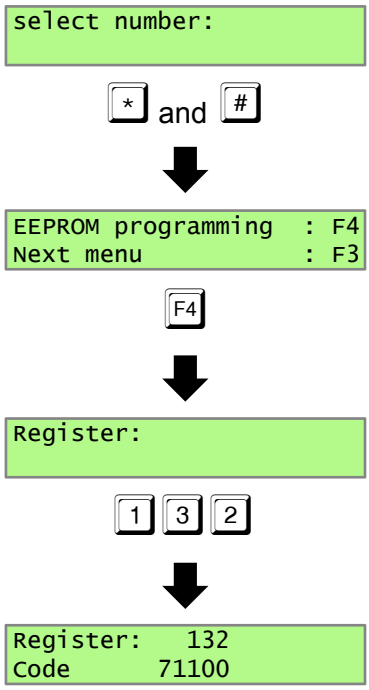
It is possible to program each button of the Major 4a with two different functions.

The duration of pressing the button (short or long pressing) decides, which of the functions is exercised. If a button is pressed shorter than a second, the function programmed as “button, short“ is exercised. Pressing it longer than a second triggers the function “button, long“. If no function is programmed for “button, long“, the function “button, short“ is exerciesed immediately.

Each register consists of 5 digits. The value of the first digit is important to define the function (see also: Keyboard Functions). The choices available for digits 2-5 depend on the function chosen by the first digit.

Below you can find an example for the programming of button 1.

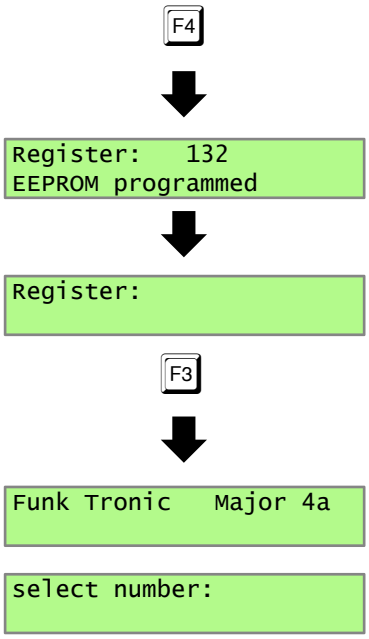
Programming “button, short“:
(short tapping)



1. digit 7 = function --> enter selected number
2. digit 1 = enter number --> new input
3. digit 1 = input value 0 bis F, here: 1

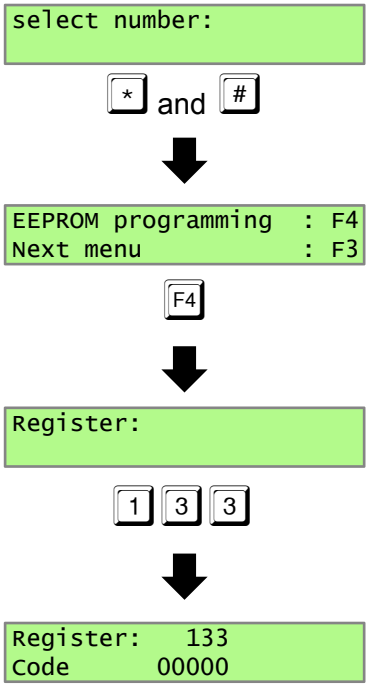
4. digit 0 = not applicable
5. digit 0 = not applicable

The following steps are necessary to save the changes made in the register.

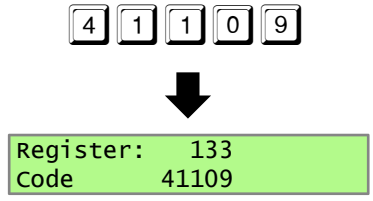


Usually, the function for long pressing of button 1 is not programmed. However, as an example the speaker volume is set to level 1.

Programming “button, long“:
(long pressing)

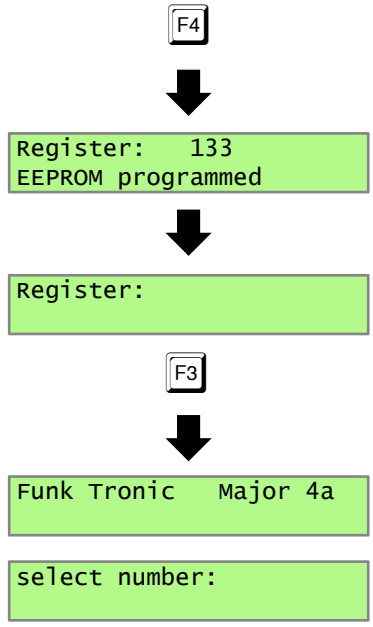


The value 00000 in register 133 must be set to 41109 and saved subsequently.



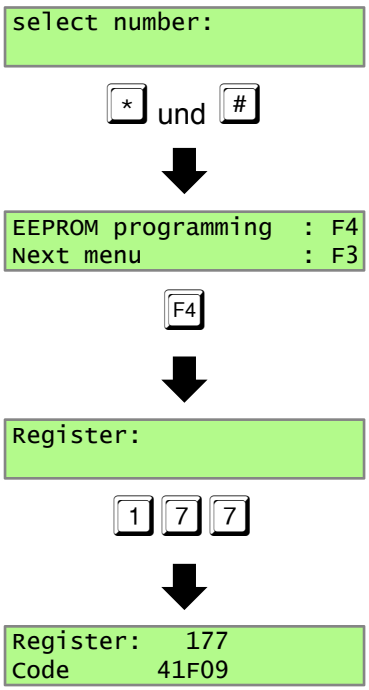
1. digit 4 = function --> volume
2. digit 1 = adjust volume
3. digit 1 = volume level: 0 bis F, here: 1
4. digit 0 = minimum volume
5. digit 9 = maximum volume

Again, the following steps are necessary to store the applied changes.



Now tap button 1 once short and once long (in menu “select number:“). After short pressing the display shows 1, long pressing activates volume level 1 of the loudspeaker.

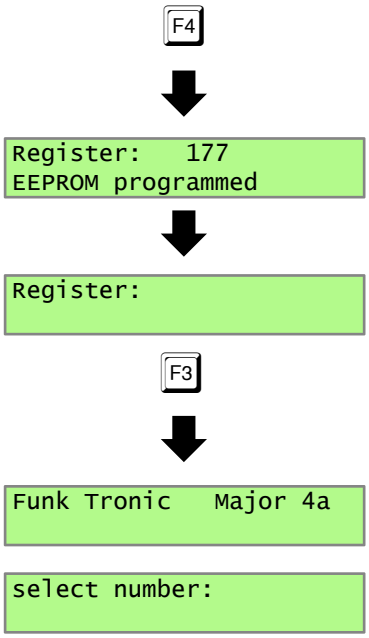
This example shows the coding of the loudspeaker (LS) button for adjusting the loudness when pressed for a longer time.



The parameters for pushing the LS button are coded in register 177.

1. digit 4 = function --> volume
2. digit 1 = adjust volume
3. digit F = manual input
4. digit 0 = minimum volume
5. digit 9 = maximum volume

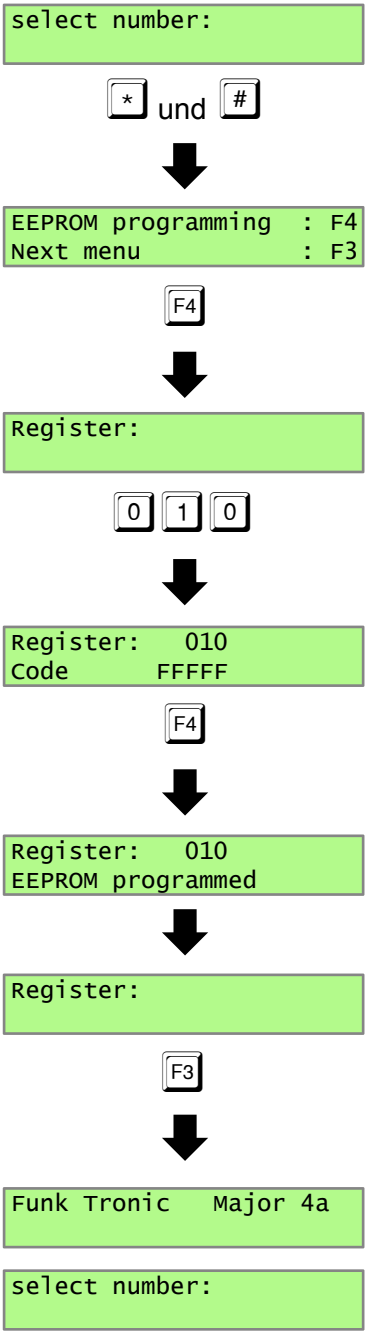
The following steps are necessary to save the changes made in the register.



Encoder Prefix

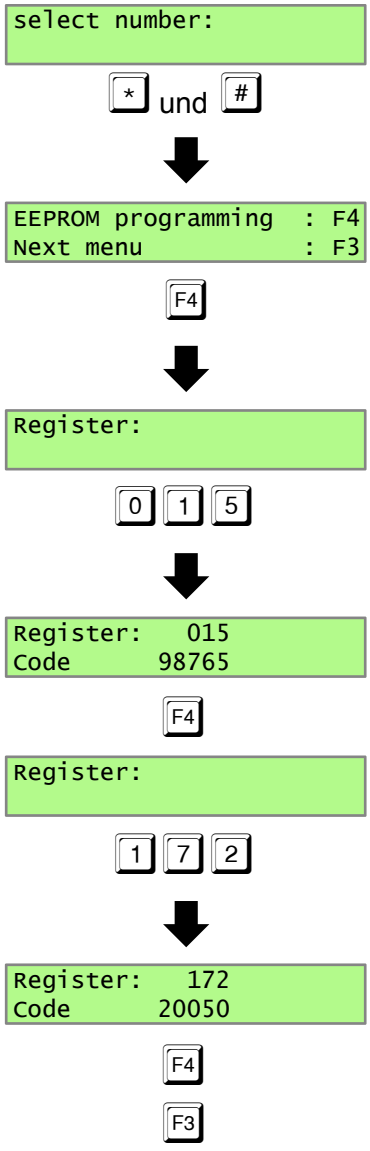
Register 010 defi nes the number of permanently programmed prefix digits and, hence, also the number of the arbitrary digits.
If „FFFFF“ is programmed in register 010, all 5 digits have to be entered via the keypad. For example, if digit 1, 2 and 4 are permanent (values 3, 4 and 5) and digit 3 and 5 have to be entered via the keypad, register 010 must be programmed with 34F5F.

EEEEE switches off the input prompt (“select number:“).



Transmitting 6/7/8-Tone Sequences

To transmit an 8-tone sequence upon pressing the call button, the following register entries are necessary. Here, the first 5 digits are entered via the keypad (or depend on the entry in register 010 --> Encoder Prefix) and the last 3 digits are attached from register 015.



Register 172:

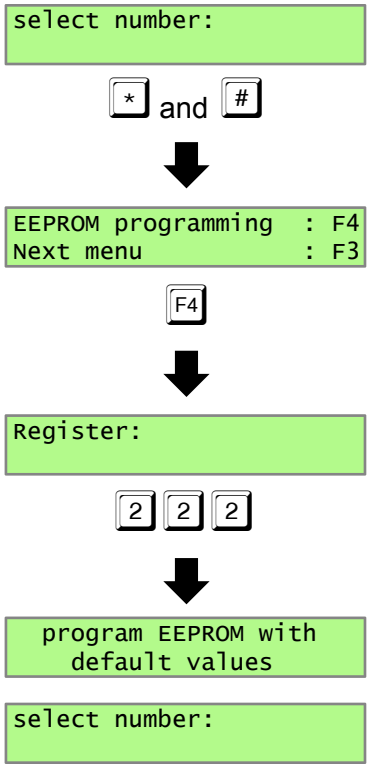
2 = function --> transmit call
0 = entered call
0 = not applicable
5 = 8 tone sequence
0 = not applicable

The 8-tone sequence consists of the 5 digits that are entered via the keypad followed by the last 3 digits from register 015 (personal identification code).

Reset to Factory Defaults

Using the following steps, Major 4a can be reset to factory defaults.

Attention! All parameters are reset to the default values without further confirmation.



By entering 223 instead, the potis are also reset.

Channel Scanning Function

The channel scanning function is activated if the waiting time in register 067/5 is programmed NOT to be zero. Zero deactivates this function.
The scanner will wait for at least the programmed waiting time per channel. Just before the end of the waiting time, the channel is checked for a carrier. If no carrier is detected the next channel will be scanned.
Scanning will stop when a carrier is detected if "scanner stops on carrier" (register 068/1) is programmed. If not the scanner will be stopped for an additional 100 ms. During this time the scanner will scan for a tone. If a tone is detected, the scanner will wait for the scan waiting time (068/2+3). If a call is decoded during that time the scanner stops. Otherwise the next channel is scanned.
The channel range programmed in register 067/1-4 will be scanned. If register 067/1+2 is programmed with 'EE' the specified channels programmed in register 070-074 (EEPROM table) will be scanned. Scanning the table can be aborted by pressing FF.
In order to scan channels 1, 5 and 6, register 070 is programmed with 0105x and register 071 with 06FFx.
After decoding a call the scanner stops for the programmed loudspkeaker time (050/1-3) which is retriggered by a carrier and/or PTT. Furthermore, the scanner can be switched off by activating the loudspeaker (LS button) manually.
Scanning can be initiated by hanging up the handpiece (050/5). The scanner can also be activated using the "loudspeaker off" function (function 4; second digit: 0).

FMS Option

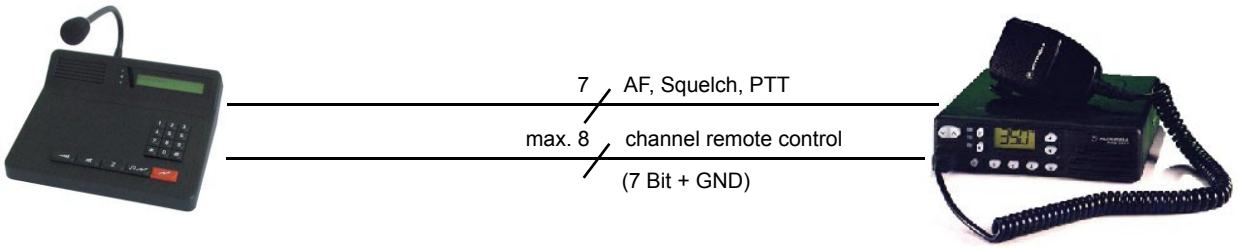
The FMS option allows for the status input and the reception of orders according to the German Funkmeldesystem (FMS).
As for this option buttons 0-9 are used as status buttons, manual selection of a 5-tone sequence is not possible.

Muting 5-Tone Sequence

Muting (Register 018) is triggered by the first two tones and lasts until the end of the tone sequence. The first tone must be a valid tone in terms of duration. As soon as the second tone is recognized, handpiece and loudspeaker are muted. For digits that are programmed with 'F', all tones are valid. To disable muting ‚EE' is programmed.

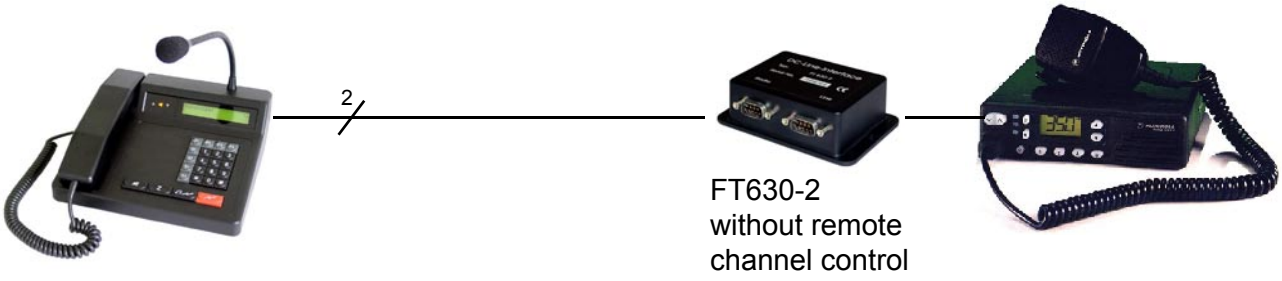
Sample Configurations 4a/5a

The following situation shows the easiest way for remote radio control using a Major 4a/5a. If a remote control is not required, a 7-wire line is sufficient for AF, squelch and PTT.

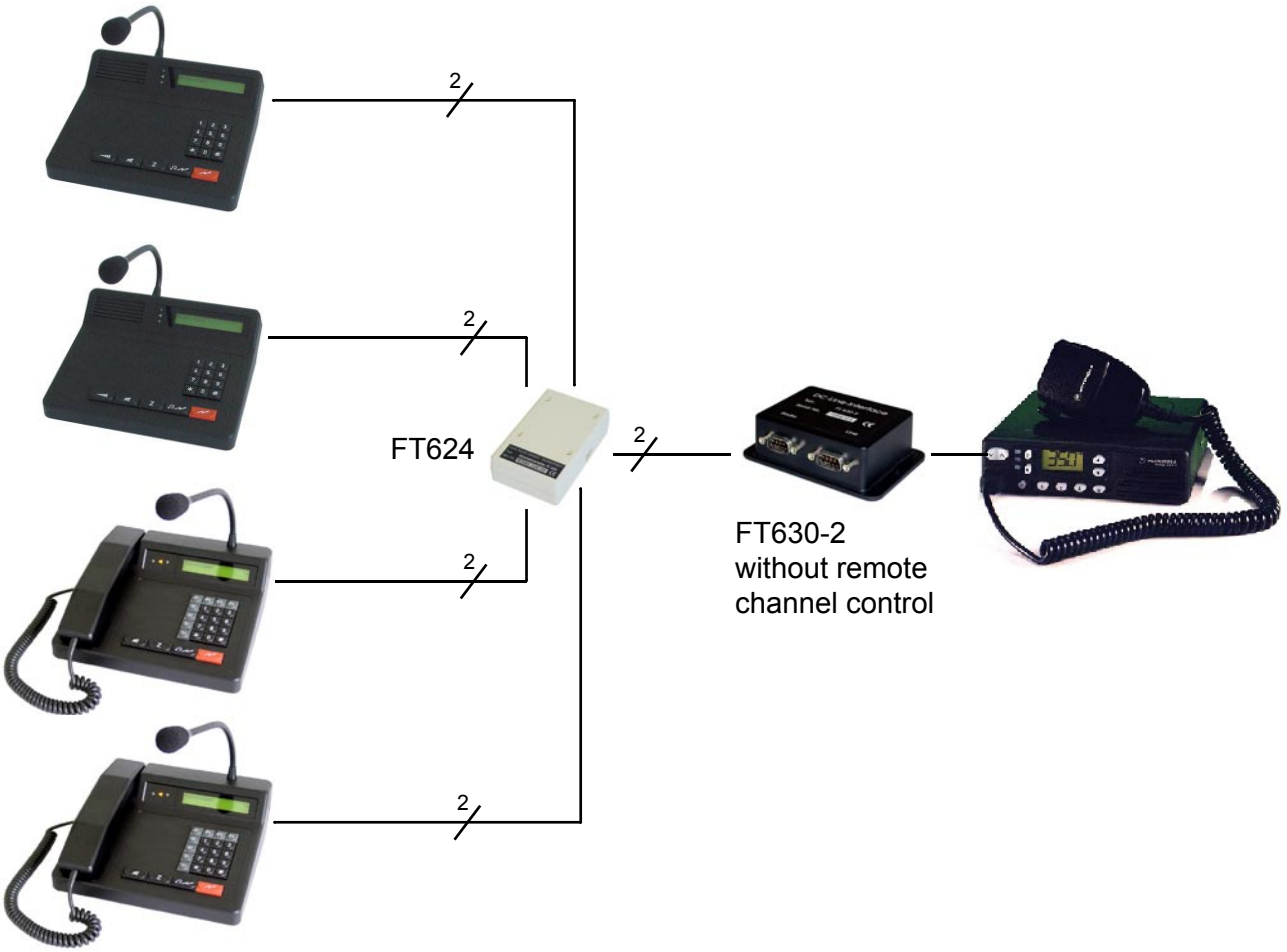


Sample Configurations 4a/5a, DC controlled

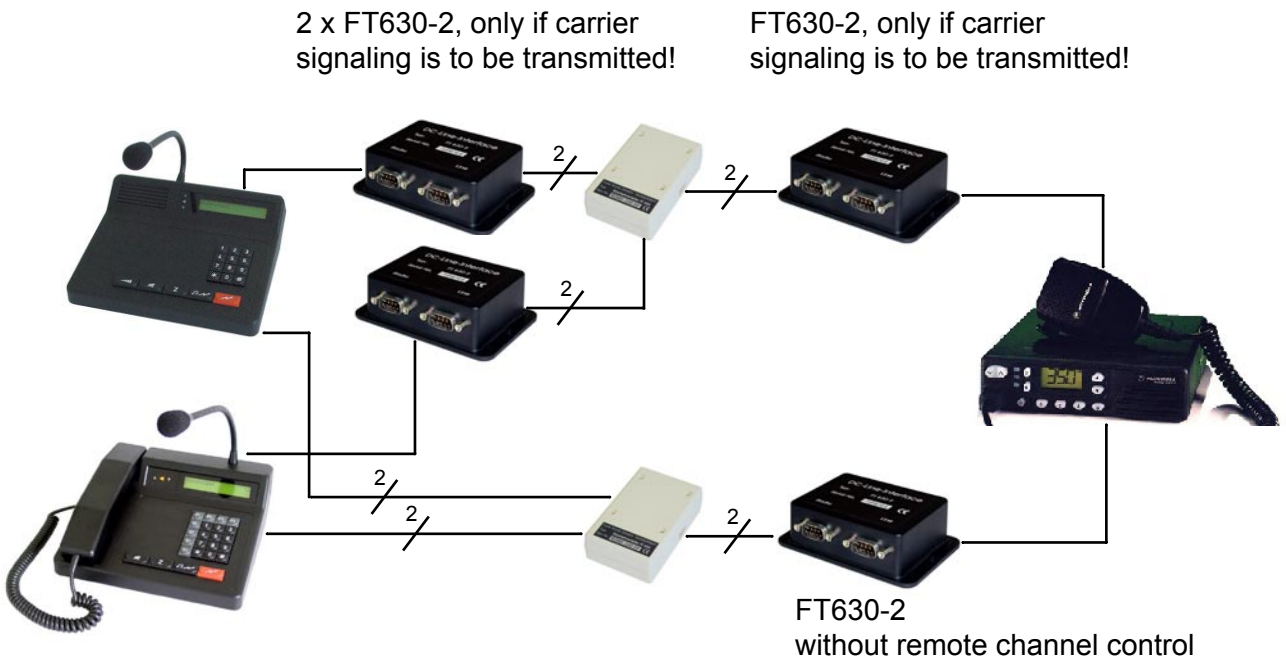
If only a local 2-wire line is available the following set-up using a DC line interface FT630-2 is highly recommended. In this configuration remote channel select and duplex mode are not possible.



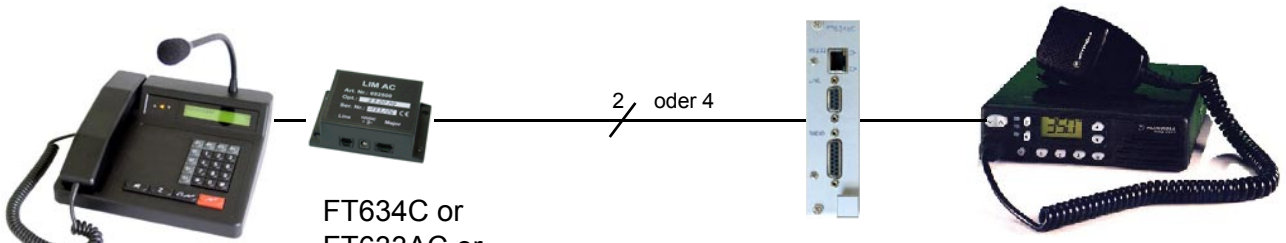
Several control panels in parallel circuit



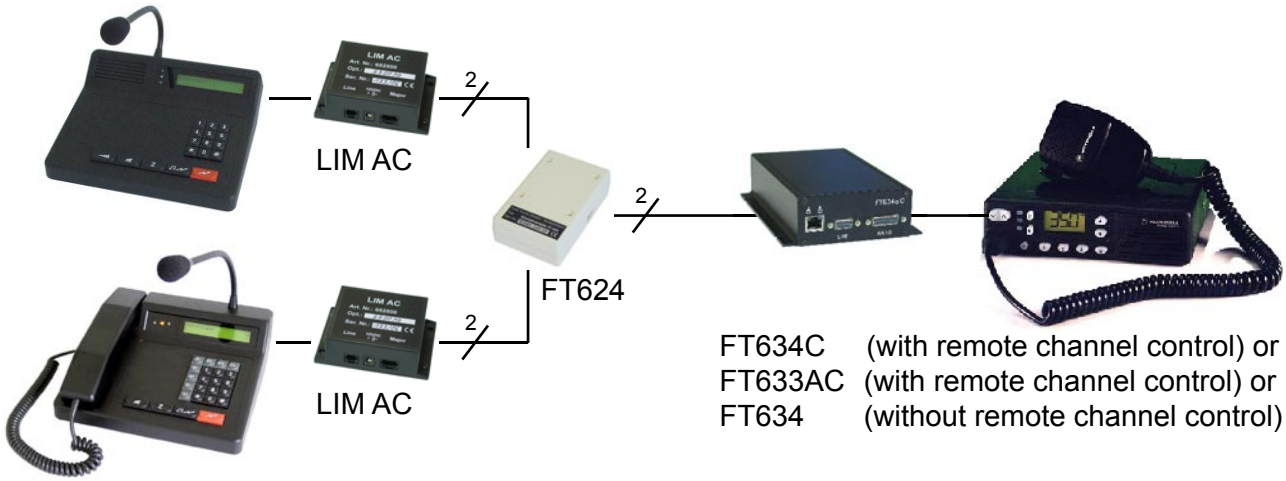
Example for duplex mode mit 4-wire transmission.



Sample Configurations Major 4a/5a, AC controlled



Several control panels in parallel circuit --> LIM AC has to be equipped with a notchfilter to suppress the PTT keying tone.

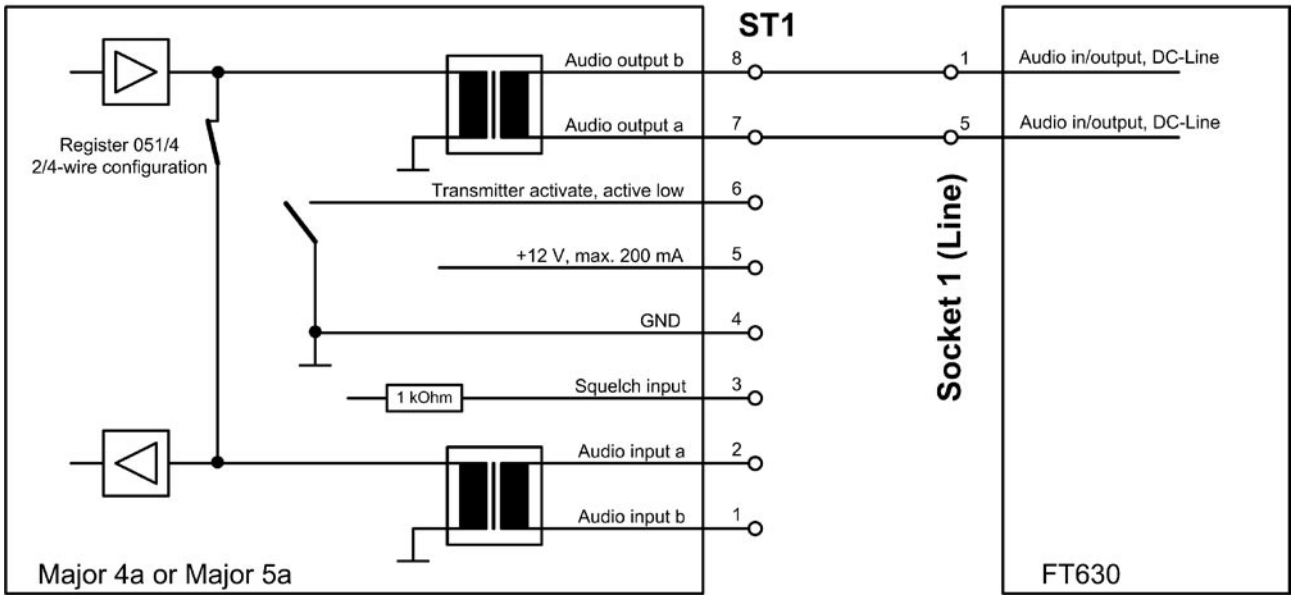


Hardware Configuration

Two/Four-Wire Configuration

The Major 4a/5a can be configured for 2-wire and 4-wire connection. Starting with software version 2.0 switching from 2-wire to 4-wire is done by programming register 051/4.

Two-Wire Connection using FT630



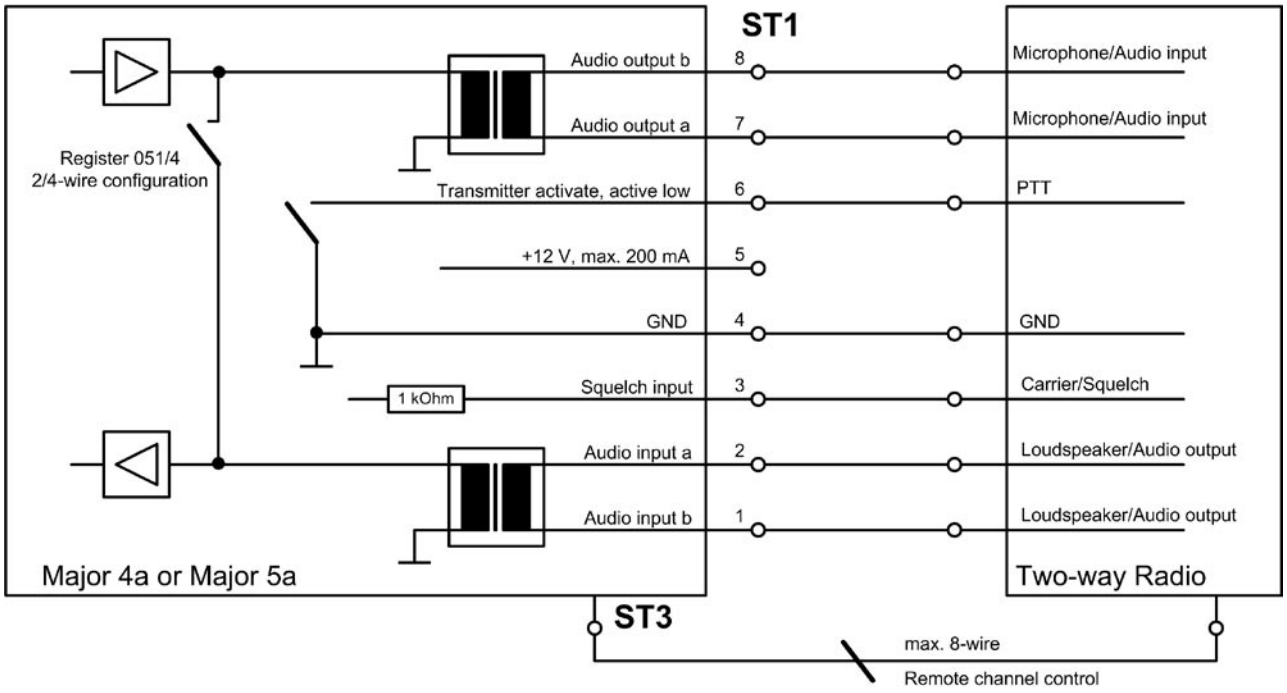
Over longer distances the radio set can be controlled via a 2-wire line. If PTT is keyed at the Major, a DC voltage is applied to the line in addition to the audio signal. This voltage is analyzed in the FT630-2 and the PTT relay turns on the transmitter. In the reverse situation the FT630-2 is able to apply a DC voltage to the line if an incoming signal (squelch) is present.

If the DC voltage is used for transmitter keying as well as for detection of an incoming signal, no transmission is possible while a squelch signal is detected.

Instead of the FT630-2 (DC) the line interfaces FT634C, FT634 oder FT633AC can also be used. For these no DC coupling is necessary and additional features are available, e.g. the transmission via digital in-/outputs (alarm in case of dysfunction, housebreaking, fire...) and remote channel control.

Register 069/1 defines if PTT keying is conducted by the PTT keying tone or by a DC voltage.

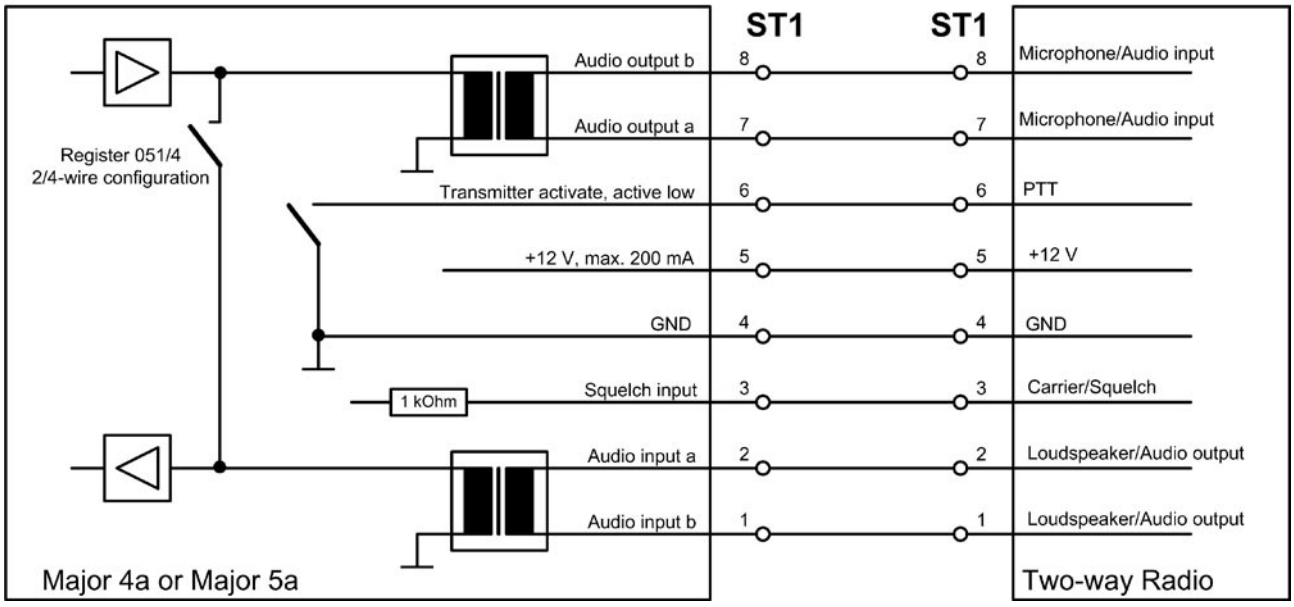
Connecting Major 4a/5a --> Two-Way-Radio via Multiwire



All audio in/outputs of the Major 4a/5a are equipped with transformers and hence are potential-free. If no potential-free in/outputs are available at the radio, in both cases one of the audio connections has to be grounded, preferably by connecting pins 1 and 8 to GND pin 4. Switching from 2- to 4-wire is carried out by programming register 051/4.

PIN 5 is for supply (+12V) of external devices (LIM-AC, FT634C, FT633AC).
Attention: Do not use PIN 5 to supply a radio set. 200 mA output current is not sufficient.

Connecting Major 4a/5a --> LIM-AC



The LIM-AC can be connected to Major 4a/5a with a 8-terminal line. Commercially available computer cables may be used.

Table of Registers Major 4a/5a

Reg.	Function
000	Short dial 0
001	Short dial 1
002	Short dial 2
003	Short dial 3
004	Short dial 4
005	Short dial 5
006	Short dial 6
007	Short dial 7
008	Short dial 8
009	Short dial 9
010	Permanently programmed prefix encoder digits EEEEE switches off „select number“
011	1st Digit -> Language 0 = German 1 = English 2 = French 3 = Dutch 4 = Italian Monitor after power on: 4th Digit 0 = off; 1 = on
014	Intercom tone sequence (DCBA) 5th Digit -> ringing on decoding with 1 sec. duration and current volume 0 = no ringing
015	Personal identification code (= ID-code), if activated
016	Prefix digits for decoding
017	Standard acknowledgement
019	Prefix digits for printer output
020	Decoder 1
021	Decoder 2
022	Decoder 3
023	Decoder 4
024	Decoder 5
025	Decoder 6
026	Decoder 7
027	Decoder 8
028	Decoder 9
029	Decoder 10

Reg.	Function
030	Configuration 1 for decoder 1 1st Digit -> ring tone type (alarm clock) 0 = no ring tone 1-A = ring tone 1 to A B-F = ring tone 1-5, 10 repetitions 2nd Digit -> ring tone length (alarm clock) 0 = permanent 1-F = n * 200 ms 3rd Digit -> ring tone volume(alarm clock) 0-9 = volume 0-9 A-F = offset against current volume 4th Digit -> ringing volume length 0 = permanent 1-F = n * 1 sec. 5th Digit -> ringing volume 0-9 = volume 0-9 A-F = offset for current volume
031	Configuration 1 for decoder 2
032	Configuration 1 for decoder 3
033	Configuration 1 for decoder 4
034	Configuration 1 for decoder 5
035	Configuration 1 for decoder 6
036	Configuration 1 for decoder 7
037	Configuration 1 for decoder 8
038	Configuration 1 for decoder 9
039	Configuration 1 for decoder 10
040	Configuration 2 for decoder 1 1st Digit -> ID mode 0 = 5-tone sequence 1 = call sequence -> ID-code dual sequence 2 = ID-code -> call sequence dual sequence 3 = 6-tone sequence 4 = 7-tone sequence 5 = 8-tone sequence 6 = not used 7 = no ID-code A = emergency call with 5-tone sequence B = emergency call with 5tone seq. (ZVEI-appending tone burst) C = emergency call with 6-tone sequence (NL-elongated 6th tone)

Reg.	Function
	For emergency call NL the 5th tone of the sequence is always the car's ID-code. Thus, the 6th tone is programmed as the 5th digit in the decoder (020-029). D = emergency call with 2x5-tone sequence (Forstfunk) 2nd Digit -> digital output number 0 = none 1-7 = digital output number 3rd Digit -> digital output time 0 = off F = on 1-E = 1-14 sec 4th Digit -> acknowledgement 0 = no acknowledgement 1 = acknowledgement 2 = single tone 3 = Personal ID-code 4 = received code 5th Digit -> LED/LS after decoding
041	Configuration 2 for decoder 2
042	Configuration 2 for decoder 3
043	Configuration 2 for decoder 4
044	Configuration 2 for decoder 5
045	Configuration 2 for decoder 6
046	Configuration 2 for decoder 7
047	Configuration 2 for decoder 8
048	Configuration 2 for decoder 9
049	Configuration 2 for decoder 10
050	Configuration of loudspeaker timer 1st Digit = n * 100 sec 2nd Digit = n * 10 sec 3rd Digit = n * 1 sec 1st to 3rd Digit = 000 -> off 1st to 3rd Digit = FFF -> open mode 4th Digit -> Loudspeaker after picking up the handpiece 0 = off 1 = on 2 = do not change 5th Digit ->Loudspeaker after hanging up 0 = off 1 = on 2 = do not change 3 = off and scanning on

Reg.	Function
051	Transmit timeout 1st Digit = n * 100 sec 2nd Digit = n * 10 sec 3rd Digit = n * 1 sec 1st to 3rd Digit = 000 -> off 4th Digit -> operating mode, 2/4-wire 0 = simplex**(4-wire)** 1 = duplex**(4-wire)** 2 = simplex**(2-wire)** 3 = duplex**(2-wire)** 5th Digit -> loudspeaker after call 0 = off (no monitoring) 1 = on (no monitoring) 2 = off (monitoring on) 3 = on (monitoring on)
052	Display background lighting 1st Digit = n * 100 sec 2nd Digit = n * 10 sec 3rd Digit = n * 1 sec 1st to 3rd Digit = 000 -> permanently off 1st to 3rd Digit = 001 -> permanently on
053	PTT block on carrier 1st Digit 0 = off 1 = on
054	Status 1st Digit 0 = no state 1 = state with one digit 2 = state with two digit 2nd+3rd Digit -> Status after switch on **only with FMS option** 4th Digit -> Dispay time for state 5 0 = permanent 1-F = 1-15 sec. 5th Digit -> Dispay time for state 9 0 = permanent 1-F = 1-15 sec.
055	General configurations 1st+2nd Digit -> TX pre-running time 1st Digit = n * 100 msec 2nd Digit = n * 10 msec

Reg.	Function
	3rd Digit -> Key beep 0 = off 1 = on
	FFSK code 4th Digit -> ID code after PTT start 0 = off 1 = on
	5th Digit -> ID code after PTT end 0 = off 1 = on
056	General configurations 1st Digit -> Squelch mode 0 = active low 1 = active high 2 = audio squelch 3 = active low oder high
057	Printer set-up 1 1st Digit -> print header 0 = off 1 = on
	2nd+3rd Digit -> Number of lines per page (without header)
058	Printer set-up 2 1st Digit -> print transmitted call 0 = off 1 = on
	2nd Digit -> print received call 0 = off 1 = on
	3rd Digit -> print received emergency call 0 = off 1 = on
063	Remote channel select 1st to 3rd Digit Fixed digits in remote tone sequence (BCD)
064	Channel register
	1st Digit -> Channel after power on 0 = reset channel 1 = previously used channel
	2nd+3rd Digit -> Reset channel 00-99

Reg.	Function
065	Channel range 1st+2nd Digit -> lowest channel 3rd+4th Digit -> highest channel
066	Set-up of channel select
	1st Digit -> Channel select 0 = no 1 = one digit 2 = two digits
	only with BOS option *3(7) = 3st. channel select BOS (4m) (with FT633-BOS)* *4(8) = 2st. channel select BOS (2m) (mit FT633-BOS)* 5 = one digit, permanent display 6 = two digits, permanent display
	2nd Digit -> Channel output 0 = TRC 1 = decimal 2 = binary-1 3 = binary 4 = 2 x BCD
	Remote channel select 5 = with guard tone 6 = without guard tone 7 = without guard tone, without TX, without DC
	3rd Digit -> Channel bits 0 = normal 1 = inverted
	4th Digit -> Number of channel bits 1 to 7
	5th Digit -> Channel acknowledgement 0 = normal (BCDxy) 1 = Major 6 (CBDxy)
067	Set-up of channel scanner 1st+2nd Digit -> scan starts at channel EE = array reg. 070-074
	3rd+4th Digit -> scan to channel
	5th Digit -> holding time (n*20 ms)

Reg. Function

068 Set-up of channel scanner
1st Digit
1 = scanner stops on carrier

2nd+3rd Digit -> scanner waiting time on carrier
nn * 100 ms

069 Transmitter control
1st Digit -> mode
0 = stored PTT keying tone
1 = TRC
2 = DC transmitter keying on

2nd-5th Digit -> keying tone frequency or TRC guard tone
2nd Digit -> n * 1000 Hz
3rd Digit -> n * 100 Hz
4th Digit -> n * 10 Hz
5th Digit -> n * 1 Hz

Keying tone 0000 = off
TRC 0000 = 2100 Hz

070 Scan channel 1 + 2
071 Scan channel 3 + 4
072 Scan channel 5 + 6
073 Scan channel 7 + 8
074 Scan channel 9 + 10

079 1st-3rd Digit -> max. length of 6th tone
4th+5th Digit -> min. length of 6th tone

080 Reference values for decoding
1st-3rd Digit -> max. length of first tone
1st Digit -> n * 500 ms
2nd Digit -> n * 50 ms
3rd Digit -> n * 5 ms
max. value = 255 --> 1,275 s

4th+5th Digit -> minimum length of all tones
4th Digit -> n * 50 ms
5th Digit -> n * 5 ms

Reg. Function

081 Reference values for decoding

1st-3rd Digit -> max. length of remaining tones
1st Digit -> n * 500 ms
2nd Digit -> n * 50 ms
3rd Digit -> n * 5 ms
max. value = 255 --> 1,275 s

4th Digit - > time-off decoder after transmitted tone sequence
= n * 100 msec

5th Digit -> tone table for encoder and decoder
0 = ZVEI
1 = CCIR
2 = ZVEI 2
3 = EEA

082 Reference values for encoding

1st+2nd Digit -> length of first tone
1st Digit -> n * 100 ms
2nd Digit -> n * 10 ms

3rd Digit -> length of remaining tones
= n * 10 ms

4th+5th Digit -> time-off between call sequence and ID-code
4th Digit -> n * 100 ms
5th Digit -> n * 10 ms

083 Radio Mute
1st Digit -> used digital output
0 = off
1-7 = OUT1-7
8 = TX

2nd Digit -> digital output is low at:
1 = RX
2 = TX
3 = RX+TX
Digital output is inverted (high) at:
5 = RX
6 = TX
7 = RX+TX

3rd Digit -> after-run time mute output:
= n * 1s

Digital output for hook
4th Digit -> 0-7

Reg. Function

084 Group call decoder
1st Digit -> group call tone
0-E = tone from tone sequence
F = group call off

2nd Digit -> digital output
0 = off
1-7 = digital output
8-F = special call tones (call 1/2)

3rd Digit -> external alarm
0 = off
F = on
1-D = ajustable time, 1-14 sec.

4th Digit -> acknowledgement
0 = no acknowledgement
1 = acknowledgement
2 = single tone
3 = personal ID-code
4 = received code

086 Set-up of ID-code memory
1st Digit -> updating
0 = off
1 = on
2nd Digit -> FIFO
0 = off
1 = on
3rd Digit -> immediate display
0 = off
1 = on
4th Digit -> display FFSK codes
0 = off
1 = on

090 Set-up FFSK (ZVEI)
1st-3rd Digit -> limit for FFSK tone sequence

4th Digit -> call
5th Digit -> #

091 Set-up FFSK (ZVEI)
1st Digit -> FFSK-Emergency call set-up
0 = off
1 = call for each BAK F
2 = call according to reg. 094

2nd Digit ->BAK RX

Reg. Function

092 Set-up 1 for FFSK emergency call (reg. 03x)

093 Set-up 2 for FFSK emergency call (reg. 04x)

094 Decoder for FFSK emergency call
F = variabel

095 1st Digit -> set-up I/O 1 (ST3/Pin1)
2nd Digit -> set-up I/O 2 (ST3/Pin2)
3rd Digit -> set-up I/O 3 (ST3/Pin3)
4th Digit -> set-up I/O 4 (ST3/Pin4)
5th Digit -> set-up I/O 5 (ST3/Pin5)

096 1st Digit -> set-up I/O 6 (ST3/Pin6)
2nd Digit -> set-up I/O 7 (ST3/Pin7)
3rd Digit -> set-up TX (ST1/Pin6)

Register 095-096:
0 = no in/output
1 = output low active
2 = input low active (<1,25V)
4 = input low active (<3,75V)
8 = output low active
+input low active at external keying
9 = output inverted

097 Master password
099 User password

The passwords protect the EEPROM programming and the level settings.

The **Master Password** cannot be read out. To change the password, it is necessary to type in the master password. Only the service technician can enter the programming mode, if the user has changed or forgotten his password.

The **User Password** is for the general user.

101 1st-3rd Digit -> volume of monitored tones (0-255)

The actual volume results from the volume deviation of the monitored tone sequence, the programmed volume of the monitored tones and the general volume setting.

Reg. Function

102 Digits 1-4
nn * 1s repeating time for
short call A-E

103 Short Call A
104 Short Call B
105 Short Call C
106 Short Call D
107 Short Call A
108 Function PTT2 passive ==> active
109 Function PTT2 active ==> passive
110 Function IN1 passive ==> active
111 Function IN1 active ==> passive
112 Function IN2 passive ==> active
113 Function IN2 active ==> passive
114 Function IN3 passive ==> active
115 Function IN3 active ==> passive
116 Function IN4 passive ==> active
117 Function IN4 active ==> passive
118 Function IN5 passive ==> active
119 Function IN5 active ==> passive
120 Function IN6 passive ==> active
121 Function IN6 active ==> passive
122 Function IN7 passive ==> active
123 Function IN7 active ==> passive
124 Function TX passive ==> active
125 Function TX active ==> passive
126 Function SQL passive ==> active
127 Function SQL active ==> passive

Keyboard Functions

130 Function 0 - button, short
131 Function 0 - button, long
132 Function 1 - button, short
133 Function 1 - button, long
134 Function 2 - button, short
135 Function 2 - button, long
136 Function 3 - button, short
137 Function 3 - button, long
138 Function 4 - button, short
139 Function 4 - button, long
140 Function 5 - button, short
141 Function 5 - button, long
142 Function 6 - button, short
143 Function 6 - button, long
144 Function 7 - button, short
145 Function 7 - button, long
146 Function 8 - button, short
147 Function 8 - button, long
148 Function 9 - button, short
149 Function 9 - button, long
150 Function S1 - button, short
151 Function S1 - button, long
152 Function S2 - button, short
153 Function S2 - button, long
154 Function S3 - button, short
155 Function S3 - button, long
156 Function S4 - button, short
157 Function S4 - button, long
158 Function * - button, short
159 Function * - button, long
160 Function # - button, short
161 Function # - button, long
162 Function F1 - button, short
163 Function F1 - button, long
164 Function F2 - button, short
165 Function F2 - button, long
166 Function F3 - button, short
167 Function F3 - button, long
168 Function F4 - button, short
169 Function F4 - button, long
170 Function PTT - button, short
171 Function PTT - button, long
172 Function RUF - button, short
173 Function RUF - button, long
174 Function Z - button, short
175 Function Z - button, long
176 Function LS - button, short
177 Function LS - button, long

only Major 5a

178 Function of volume button, short
179 Function of volume button, long

Function register for inputs (108-127)
Function register for buttons (130-179)

1st Digit -> Function

0 = none
1 = transmit single tone
2 = transmit call sequence
3 = PTT
4 = adjust volume
5 = channel select / digital outputs
6 = ID-code memory
7 = enter select number
8 = input of status
9 = ext. inputs
A = BOS functions
B = mode functions

2nd-5th Digit -> depends on chosen function

Function 1 -> transmit single tone
(1st Digit = 1)

2nd Digit -> length of tone
length = n * 100 ms
0 = as long as button is pushed

3rd-5th Digit -> single tone frequency
3rd Digit -> n * 500 Hz
4th Digit -> n * 50 Hz
5th Digit -> n * 5 Hz

Function 2 --> transmit call sequence
(1st Digit = 2)

2nd Digit -> type of call
0 = entered call
1 = call back
2 = short call
3 = intercom
4 = ext. short call
5 = remote channel control call

3rd Digit ->Short call number (2nd Digit: 2)
0-9 = short call 0-9 (reg. 000-009)
A-E = short call A-E (reg. 103-107)
F = input necessary

3rd Digit -> intercom (2nd Digit: 3)
0 = intercom off
1 = intercom on
E = toggle intercom (on/off)
F = intercom input
0 = off
1 = on

3rd Digit -> ext. short call (2nd Digit: 4)
0-E = short call n

3rd Digit -> remote channel control call (2nd Digit: 4)
0 = send remote channel control call
1 = send channel request

4th Digit -> ID mode / tone call mode
0 = 5-tone sequence
1 = call sequence -> ID-code dual sequence
2 = ID-code -> call sequence dual sequence
ID-code from register 015

3 = 6-tone sequence
5 tones and last digit
ID-code from register 015

4 = 7-tone sequence
5 tones and last two digits
ID-code from register 015

5 = 8-tone sequence
5 tones and last three digits
ID-code from register 015

6 = paging call (OPTION)
7 = free
8 = 4-tone sequence

4th Digit -> ID mode / FFSK mode (except for intercom and remote channel control)
0 = only call
1 = call + ID-code

4th Digit -> only intercom
0 = transmit intercom tone call off
1 = transmit intercom tone call on

5th Digit -> coupling tone in tone call mode
0-E = coupling tone for 2x5-tone sequence
F = no tone, break

5th Digit -> BAK on FFSK calls
0-F = BAK

Function 3 --> PTT (1st Digit = 3)

2nd Digit -> choose microphone
0-3 = PTT started with button (ends when button is no longer pushed)
4-7 = PTT started via input (ends with function PTT off)
0,4 = gooseneck microphone
1,5 = headset microphone
2,6 = handpiece microphone
3,7 = GN or HS microphone
8 = switch GN/HS microphone
F = PTT off (if started via input)

3rd Digit -> only for GN/HS switching
0 = SH microphone on
1 = HS microphone on
E = toggle SH/HS
F = input

4th Digit -> only for GN/HS switching
0 = no text display
1-F = display text for n * 100 ms

3rd Digit -> for PTT via button
0 = no ID code at PTT start
4 = short call (5th Digit)

4th Digit -> for PTT via button
0 = no ID code at PTT start
4 = short call (5th Digit)

5th Digit -> 0-9 = short call number

Function 4 --> volume (1st Digit = 4)

2nd Digit
0 = toggle loudspeaker (on/off)
1 = adjust volume

3rd Digit -> only for adjust volume
0-9 = volume
A = 1 level up
B = 1 level down
F = input

3rd Digit -> only for toggle loudspeaker (on/off)
0 = scanner off
1 = scanner is on, if loudspeaker is off

4th Digit -> only for adjust volume
0-9 = minimum volume

5th Digit -> only for adjust volume
0-9 = maximum volume

Function 5 --> channel select / digital outputs (1st Digit = 5)

2nd+3rd Digit -> for usual channel select
2nd Digit -> n * 10
3rd Digit -> n * 1
value range = 00-99
FE = use working channel
FF = input via keypad

only with BOS option

2nd-4th Digit -> for channel select BOS
001-092 = BOS channel 2m
347-519 = BOS channel 4m
FFF = input

5th Digit -> mode of operation / band location (for BOS)
0 = one-way radio, lower band
1 = one-way radio, upper band
2 = two-way radio, lower band
3 = two-way radio, upper band

2nd Digit -> E = set digital outputs

3rd Digit -> 1-7 = number of digital output
F = manual number select

4th Digit
0 = digital output off (passive, high)
1 = digital output on (active low)

Function 6 --> ID-code memory (1st Digit = 6)

2nd Digit
0 = delete ID-code
1 = display next ID-code
2 = display newest ID-code

Function 7 --> enter select number (1st Digit = 7)

2nd Digit
0 = delete input
1 = new input
3rd Digit -> function delete input
0 = delete complete call
1 = delete only last input
2 = call +1
3 = call -1

3rd Digit -> function new input
0-F = calling tone 0-E
F = break

Function 8 --> enter status (1st Digit = 8)

2nd Digit
0 = delete status
1 = define status
2 = input of FMS status

3rd+4th Digit -> new status
value range = 00-99
FF = input via keypad

3rd Digit -> 0-9 = FMS status (for FMS)

Function 9 --> enter status (1st Digit = 9)

2nd Digit -> 0 = squelch input
1 = external muting

3rd Digit -> for squelch input
0 = squelch off
1 = squelch on

3rd Digit -> for muting
0 = muting off
1 = muting on

4th Digit -> for squelch input
0 = muting off
1 = muting on

4th Digit -> for muting
0 = TX-LED off when idle
1 = TX-LED flashes when idle

only with option BOS
Function A --> BOS functions (1st Digit = A)

2nd Digit -> 0 = band location (BL)
1 = mode of operation (MO)

3rd Digit -> 0 = lower band, one-way
1 = upper band, two-way
E = toggle mode of operation / band location

4th Digit -> 0 = toggle locally, do not send
1 = toggle locally and send (remote control)

Function B --> MODE Functions (1st Digit = B)

2nd Digit -> 0 = normal mode
1 = telephone mode

Reg.	Function

only with BOS option

180 *1st Digit*
0 = no function
1 = display digital output status
2 = display channel (BOS)
3 = display telephone mode

2nd Digit (1st Digit = 1)
1-7 = digital output number

3rd Digit (1st Digit = 1)
0 = display if active low (normal)
1 = display if passive high (inverted)

2nd+3rd Digit (1st Digit = 2)
channel 00-99

2nd-4th Digit (1st Digit = 2)
BOS channel 001-092, 347-510

5th Digit (1st Digit = 2)

2nd-4th Digit (1st Digit = 2)
channel for LED F1: e.g. 401

5th Digit (1st Digit = 2) BL/MO for LED F1
0 = one-way radio, lower band
1 = one-way radio, upper band
2 = two-way radio, lower band
3 = two-way radio, upper band

181-183 *like register 180, for LED F2-F4*

Reg.	Function

only with FMS option

185 *1st Digit -> acknowledgement-independent frame repetition*
1 = yes
0 = no

2nd Digit -> number of emergency call cycles

3rd Digit -> tone of attention
1 = yes
0 = no

4th Digit ->
0 = stop bit 0 + improved first running
1 = stop bit 1 + improved first running
2 = stop bit 0 + first running according to TR-BOS
3 = stop bit 1 + first running according to TR-BOS
5th Digit -> 0 = general messages for status and commands
1 = messages for DRK (German Red Cross)
2 = messages for fire brigade
3 = messages for police

186 *4th Digit -> construction stage*
0-2

5th Digit -> BOS frame repetition time
0 = standard BOS 640 ms raster
7-F = 0,7 - 1,3 s break

187 *1st Digit -> FMS-code at PTT*
1 = ja
0 = nein

2. Stelle -> BOS-code
3. Stelle -> state code
4. Stelle -> community code (tens)
5. Stelle -> community code (units)

188 *1. Stelle -> car code (thousands)*
2. Stelle -> car code (hundreds)
3. Stelle -> car code (tens)
4. Stelle -> car code (units)

Reset to Factory Defaults

Reg. Function

222 reset to factory defaults

223 reset to factory defaults, including poti settings

Attention!
Reset is carried out without further confirmation!

Technical Data

Operating voltage	12 V
Current consumption	max. 800 mA
Weight	1,5 kg
Dimensions W x D x H (without gooseneck)	245 x 220 x 95 mm
Input impedance 2-wire/4-wire	600 ohm
Input level 4-wire	50 mV (-24 dBm) to 775 mV (0 dBm)
Input level 2-wire	70 mV (-21 dBm) to 1050 mV (+2,5 dBm)
Ouput impedance 2-wire/4-wire	600 ohm
Output level at 600 Ohm	
Audio without additional PTT keying tone	30 mV (-28 dBm) to 550 mV (-3 dBm)
Audio with additional PTT keying tone	30 mV (-28 dBm) to 450 mV (-5 dBm)
Set by default to	450 mV

Table of Tones				
Ton	ZVEI 1	CCIR	ZVEI 2	EEA
0	2400 Hz	1981 Hz	2400 Hz	1981 Hz
1	1060 Hz	1124 Hz	1060 Hz	1124 Hz
2	1160 Hz	1197 Hz	1160 Hz	1197 Hz
3	1270 Hz	1275 Hz	1270 Hz	1275 Hz
4	1400 Hz	1358 Hz	1400 Hz	1358 Hz
5	1530 Hz	1446 Hz	1530 Hz	1446 Hz
6	1670 Hz	1540 Hz	1670 Hz	1540 Hz
7	1830 Hz	1640 Hz	1830 Hz	1640 Hz
8	2000 Hz	1747 Hz	2000 Hz	1747 Hz
9	2200 Hz	1860 Hz	2200 Hz	1860 Hz
A	2800 Hz	2400 Hz	886 Hz	1055 Hz
B	810 Hz	930 Hz	810 Hz	930 Hz
C	970 Hz	2247 Hz	740 Hz	2247 Hz
D	886 Hz	991 Hz	680 Hz	991 Hz
E	2600 Hz	2110 Hz	970 Hz	2110 Hz
Dauer	ZVEI 1	CCIR	ZVEI 2	EEA
min.	52.5 ms	75 ms	52.5 ms	30 ms
typ.	70 ms	100 ms	70 ms	40 ms
max.	87.5 ms	125 ms	87.5 ms	50 ms

General Safety Information

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.

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 2nd , 2006

Subject to change, Errors excepted

Release Notes

06.08.12 - Version Major 4a/5a English 1.0 released. Translation of Major4a/5a German V 3.05.