Major 4a

English 2.0

ENTWICKLUNG PRODUKTION SOFTWARE HARDWARE ELEKTRONIK BERATUNG

FunkTronic

Kompetent für Elektroniksysteme

Contents

Technical Data

Voltage of operation	12 V
Current	max. 800 mA
Weight	1,5 kg
Dimensions (without gooseneck microphone)	245 x 220 x 95 mm
Input impedance 2/4-wire	600 Ohm
Output impedance 2/4-wire	600 Ohm

Order Information

Ord.-No.	Description
681000	Major 4a
900012	Power Supply 230/12 Volt

Delivery

Major 4a with handset and gooseneck microphone
Power plug
Power Supply not delivert with

Control Elements Major 4a

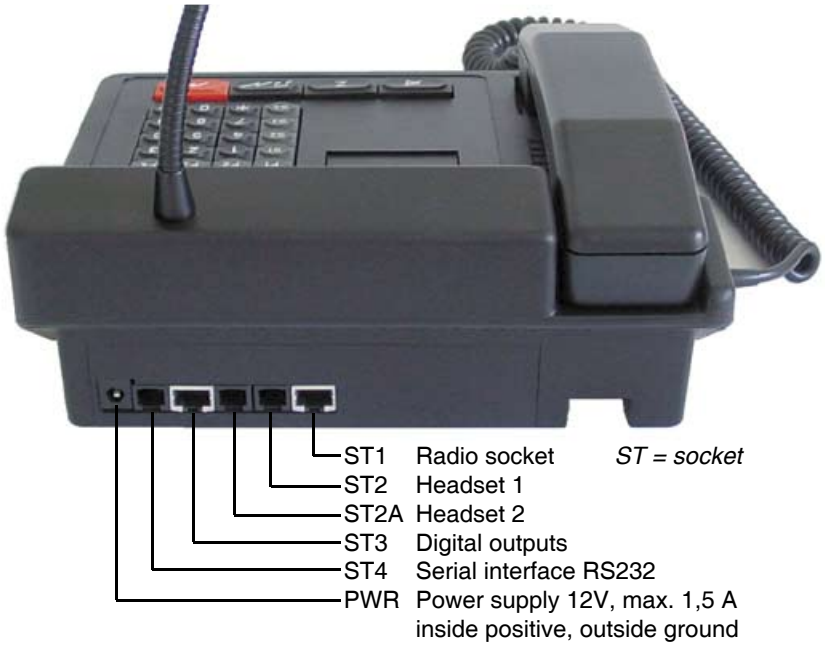
General features

The Major 4a is the newer design of the well kown Major 4. The Display was replaced by an alpha-numeric LC Display with background illumination. A gooseneck microphone with high dynamics has come to it. The programming possibilities were essentially widened and strongly simplified by clear text menu structure.

There are two sockets for headsets. One is normaly used for a PTT foot button. The 7 digital outputs are normaly used for channel switching or also other functions. For operation a 12 volt power supply is necessary.

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

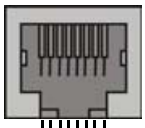
Rearview Major 4a



Sockets pinout Major 4a

All sockets shown from rear few.

Pinout Radio socket ST1, rearview



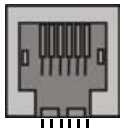
AF input B	1
AF input A	2
Squelch input	3
GND	4
+12 V, max. 200 mA	5
Transmit active low	6
AF output A	7
AF output B	8

All audio in/outputs equiped with transformers.

PIN 5 is for supply (+12V) of external devices (LIM-AC, FT634C, FT633AC).

Attention, not for supply of radio, because of only 200 mA output current.

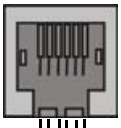
Pinout RS232 ST4



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

To the RS232 socket you can connect a printer for messages.

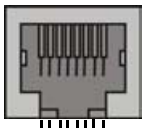
Pinout headset 1 + 2, ST2 and ST2A



GND	1
GND ST2, AF mic. ST2A	2
AF earphone	3
GND earphone	4
GND ST2A, AF mic. ST2	5
PTT, active GND	6

There are two sockets for connecting a headset. One is for connecting headset, the other for use of external PTT-Button.

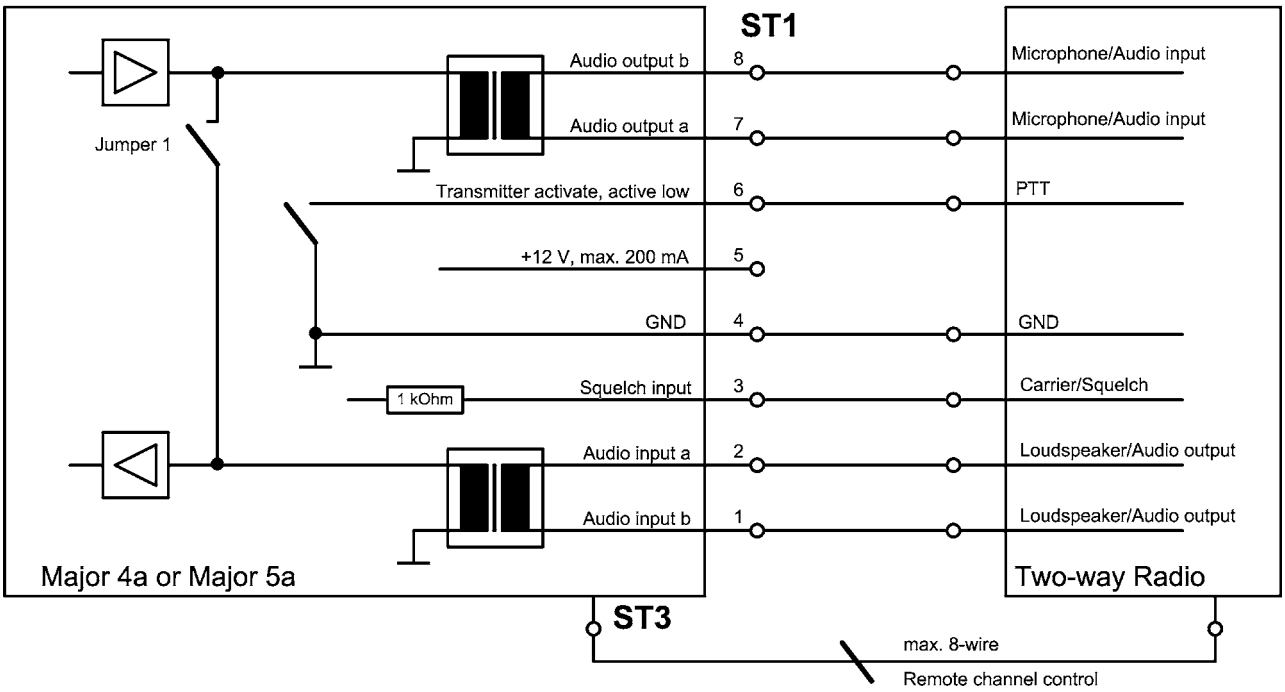
Pinout ST3 digital in/outputs



OUT0	1
OUT1	2
OUT2	3
OUT3	4
OUT4	5
OUT5	6
OUT6	7
GND	8

The digital PINs are for use as in- or outputs. Most they are used for remote control of channels.

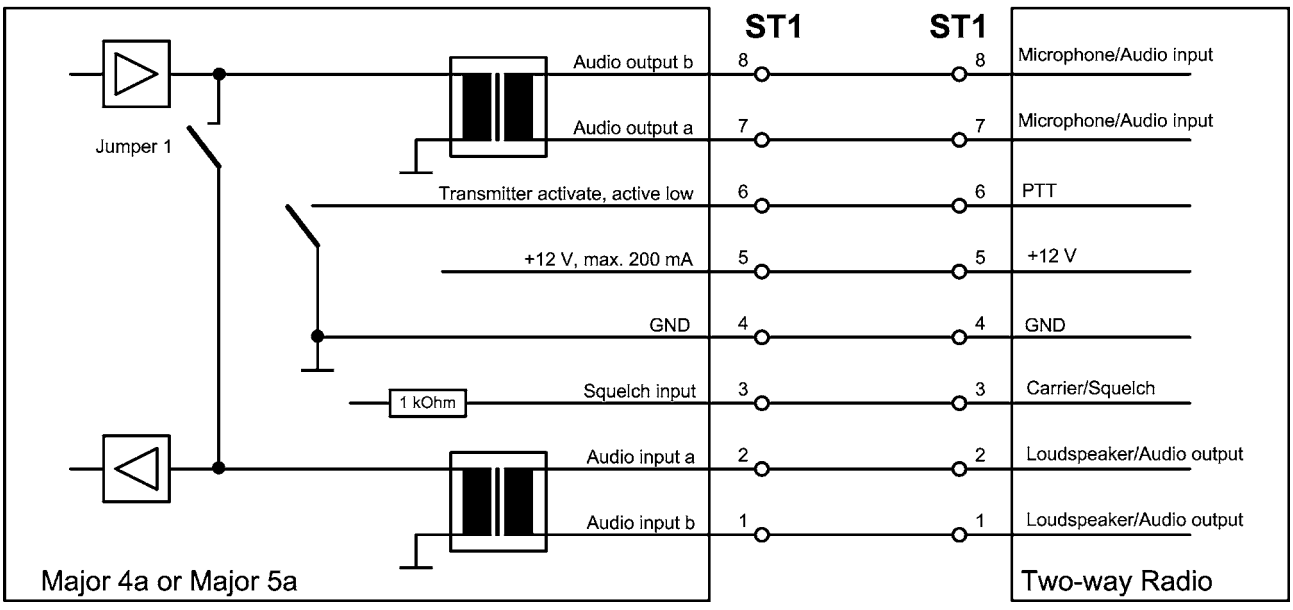
Connecting Major 4a (5a) --> Two-Way-Radio via multiwire



All audio in/outputs of Major 4a (5a) are equiped with transformers. No PINs are grounded, therefore one must be connected to ground at the two-way-radio. We suggest to ground PIN 1 and 8 at the radio.

PIN 5 is for supply (+12V) of external devices (LIM-AC, FT634C, FT633AC). **Attention**, not for supply of radio, because of only 200 mA output current.

Connecting Major 4a (5a) --> Line Interface LIM-AC

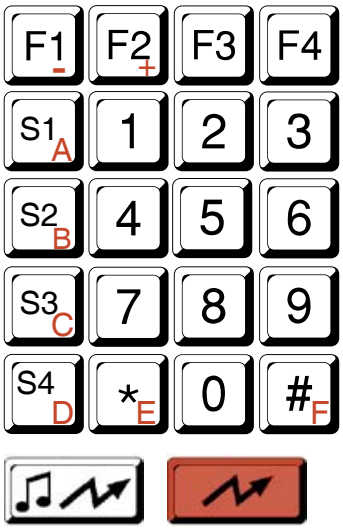


The line interface LIM-AC is simply connected via a 8-wire patch cable (like used for ethernet) to the Major 4a (5a).

Keypad layout in programming mode

The F1 button decrements and the F2 button increments.

The buttons S1 to S4, the * button and the # button are concerned with A to F.



Menu structure

Simultaneous pressing of the * button and the # button you get into the menu. With the F3 button you switch to the next menu point. With the F4 button the selected menu point is activated.

```
select number:
```

* simultaneously #

```
EEPROM programming  : F4
Next menu           : F3
```
F3 →
```
Software version    : F4
Next menu           : F3
```
F3 →
```
Level settings      : F4
Next menu           : F3
```

F4

```
Register:
```

- put in the register you want to program

- with 222 the factory default values are programmed

```
Register:   000
Code      12345
```

- overwrite the Code with your values

F3 = escape menu without change

F4 = store value, escape menu

F4

```
Software: Major 4a V1.24
Date    :       23.09.04
```

- displayed for 3 seconds

F4

```
Poti-Nr. (1-6):
```

1 = Input level
2 = Output level
3 = Gooseneck microphone level
4 = Handset microphone level
5 = Headset microphone level
6 = DTMF output level

- the adjustment area of the Pots is 0-63
- input direct via the keypad

or

F2 = value increment

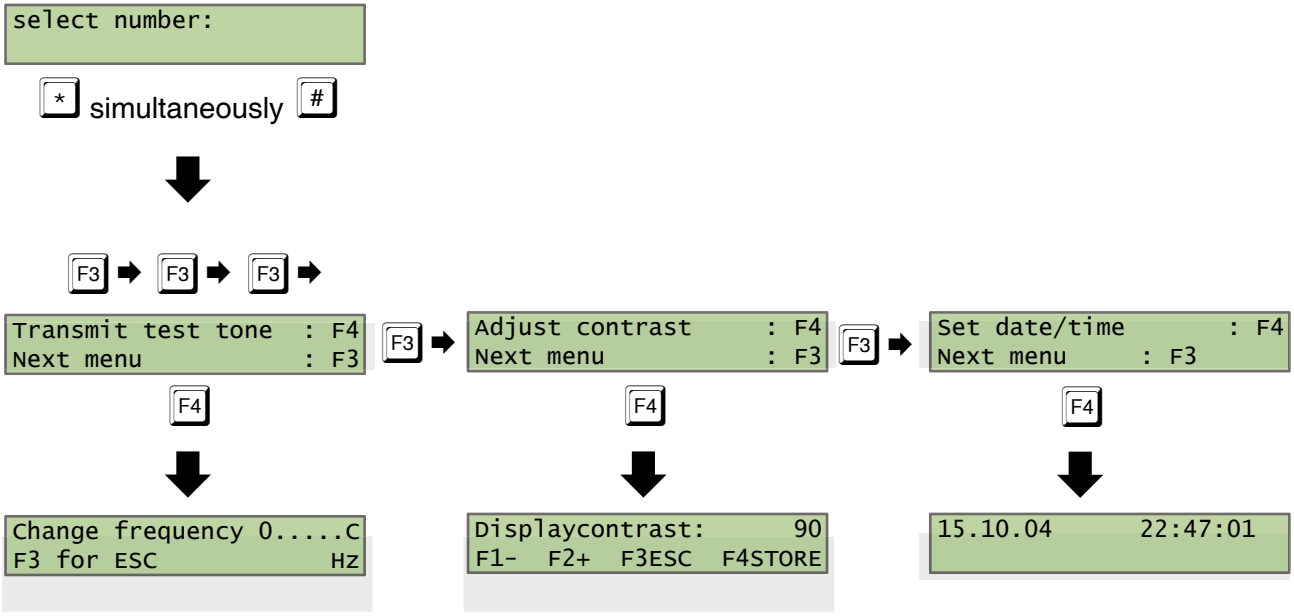
F1 = value decrement

F3 = escape menu without change

F4 = store value, escape menu

Menu structure

Continuation



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 = decrement contrast

F2 = increment contrast

F3 = escape menu without change

F4 = store value, escape menu

F1 = one digit left

F2 = one digit right

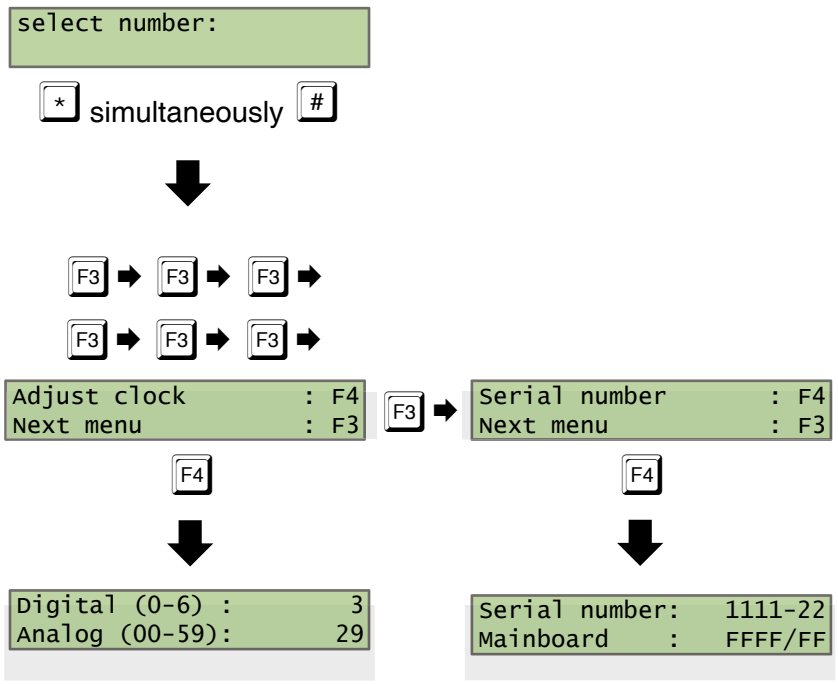
F3 = escape menu without change

F4 = store value, escape menu

Put in the values you want with the keypad 0 to 9.

Menu structure

Continuation



F1 = one digit left

F2 = one digit right

The clock is already adjusted in factory. Note down the values for digital and analog before changing. Biger values accelerate and smaller values slows down the clock.
Change in digital makes more alteration then in analog. Fine adjustment should be done in analog, step by step.

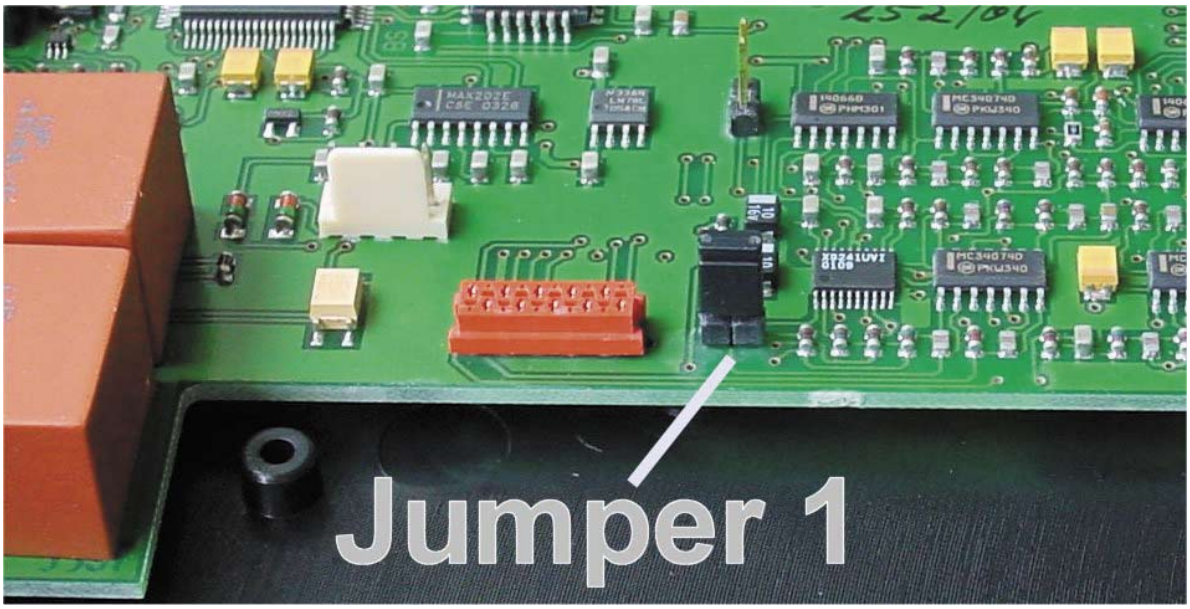
F3 = escape menu without change

F4 = store value, escape menu

- displayed for 3 seconds

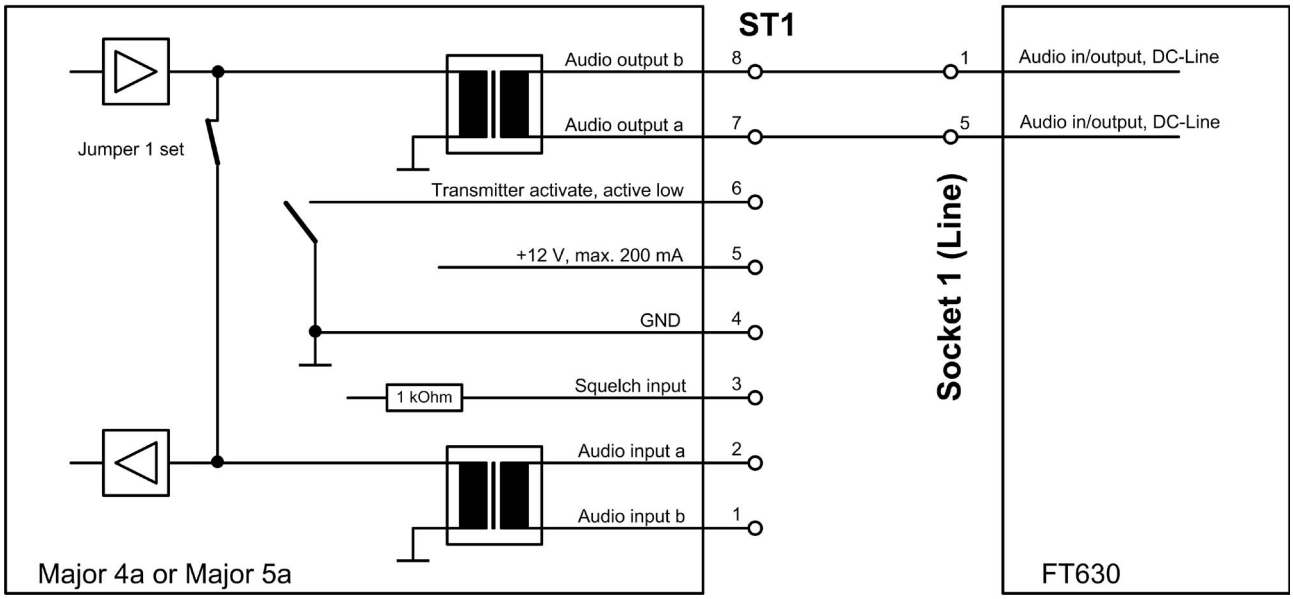
Hardware configuration

2/4-wire configuration



The Major 4a (5a) is for use on 2- or 4-wire line. For 2-wire line jumper 1 have to be set. Remove jumper 1 for 4-wire line.

2-wire configuration with FT630

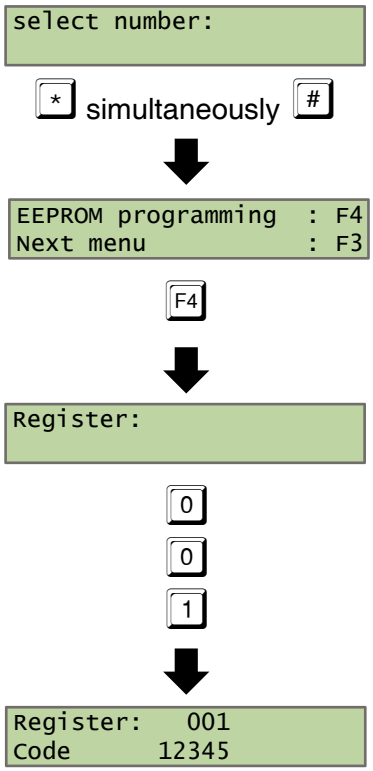


For remote control of radio over longer distance it is adviceable to use a 2-wire line with the FT630. The FT630 transmitts and receives the PTT and SQUELCH state via DC.

If there is no DC way on the line or also remote channel control necessary, we suggest to use FT634C or FT633AC.

Programming short call

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



The line „Code“ shows the current programming. Overwrite with your values.

Key **F3** escapes without any changes.

Key **F4** stores the displayed values.

Each button of the Major 4a can be programmed with any function. Register 174 and 175 has to be programmed with the appropriate values of the short call button (Z-Button).

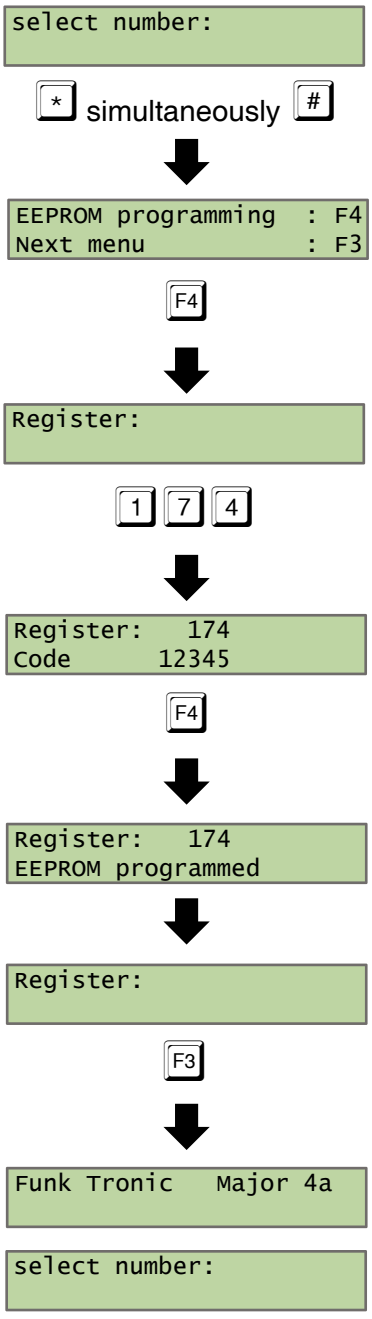
Register 174 is for the function after short activation of Z-Button and register 175 after longer activation.

Register 174 is coded with 22F01 and register 175 with 00000.
The leading zero in register 175 disables action after long pushing Z-Button.

The digits in register 174 activates the following functions:

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

Follow next steps to view or change the values in register 174 and 175.



Individual programming of the buttons

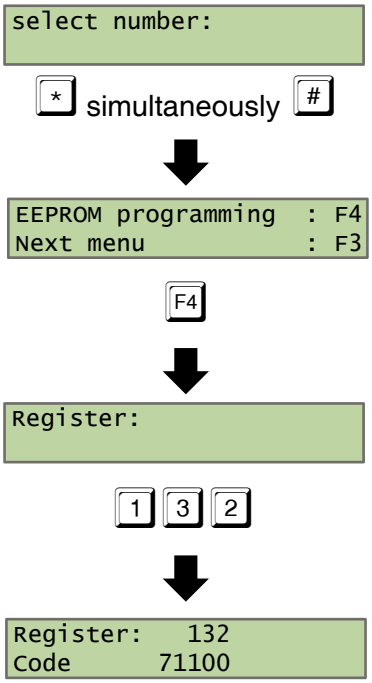
It is possible to program each button of the Major 4a with two different functions.
The key down time selects one of the two. Pushing the button shorter than one second activates the function listed for „short push“ and longer pushing activates the function listed for „long push“.

The action for short push is activated immediately, if nothing is programmed for long push.

Each register has 5 digits. The first digit selects the function. Digit 2 to 5 depends on the function programmed in first digit.

Sample for coding button - 1.

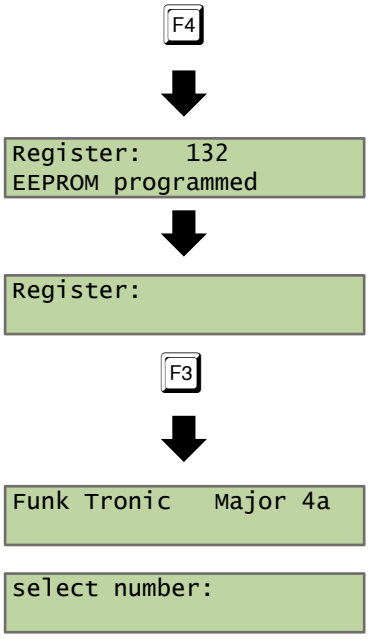
Programming „short bush“:



1. digit 7 = function --> enter select number
2. digit 1 = new input
3. digit 1 = delete only last input

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

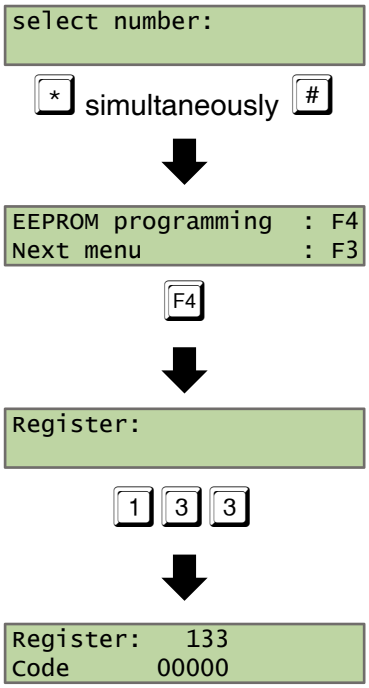
To store the inputs, follow the next steps.



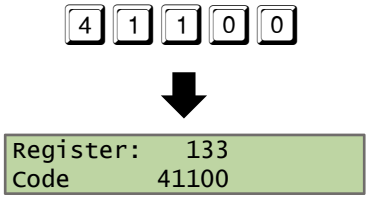
Normally there is no programming for long push of button 1 .

Next sample shows programming level 1 loudness for the speaker.

Programming „long bush“:



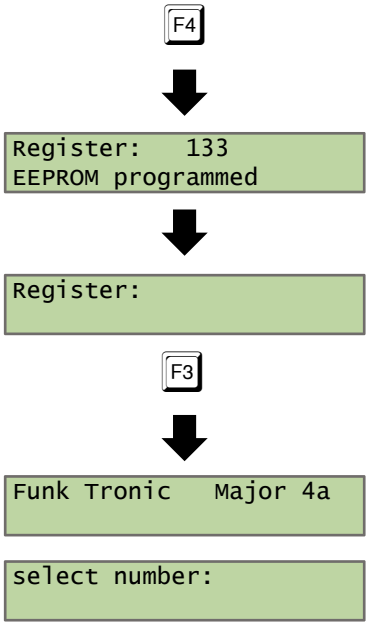
The value 00000 in register 133 hase to be changed in 41100.



1. digit 4 = function --> adjust volume
2. digit 1 = volume --> adjust
3. digit 1 = volume level 1

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

To store the inputs, follow the next steps.



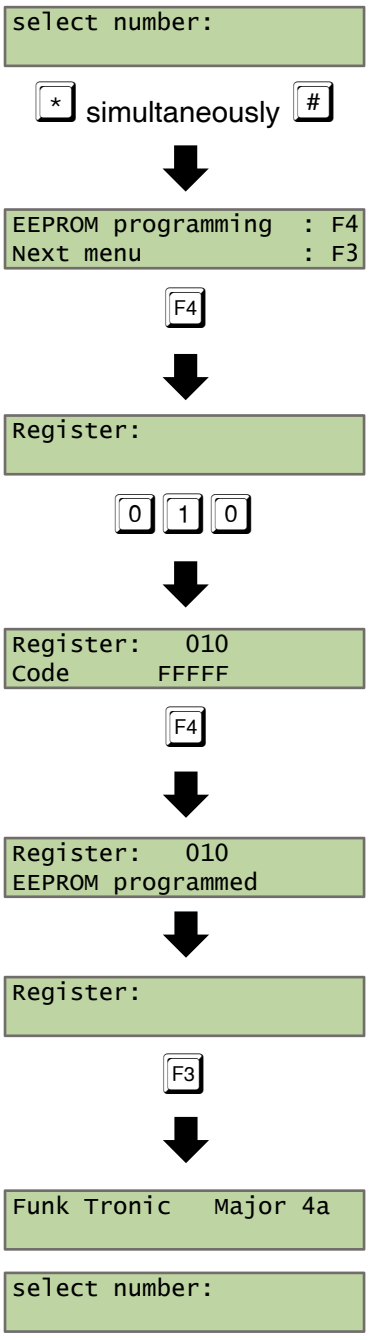
Now bush button 1 one times short and one long.
After short bushing the display shows 1. Long bushing activates volume level 1 at the loudspeaker.

Permanent digits of encoder

Register 010 defines the number of permanent coded digits of the encoder.
If „FFFFF“ is coded in register 010, all 5 digits has to be entered via keypad.

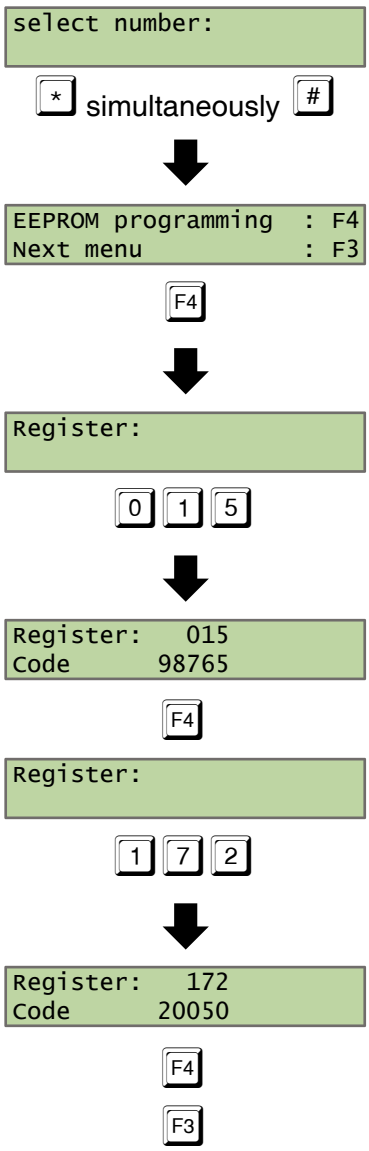
For example, if digit 1,2 and 4 are permanent and digit 3 and 5 entered via keypad, register 010 should be coded with 34F5F.

Sample, entering all 5 digits via keypad:



Transmitting 6/7/8-tone sequences

To transmit a 8-tone sequence, the following coding is necessary. The first 5 digits entered via keypad and the last 3 are used from register 015.



Register 172:

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

The 8-tone sequence are conglomerated from 5 entered via keypad and the last 3 from register 015 (Personaly identification code).

Channel scanning function

The channel scanning function is activated if the waiting time (register 067/5) is different from zero.
The scanner waits at least for the programmed waiting time on each channel. Just before the end of waiting time, channel is checked for a carrier. Scanning is going on if there is no carrier detected.
Scanner holds on carrier if scanner stop on carrier (register 068/1) is programmed. Otherwise the scanner is stopped for additionally 100 ms. During this period it is checked if a tone is detected. If it is true, the scanner waits for scan waiting time in register 068/2+3. Detecting a tone sequence stops scanning, otherwise scanning is continued.

The channels coded in register 067/1-4 are scanned or the channels in register 070-074, if register 067/1+2 is coded with E.
The prematurely end of table is coded with FF.

For example, if channels 1, 5 and 6 shout be scanned, register 070 is coded with 0105x and register 071 with 06FFx.

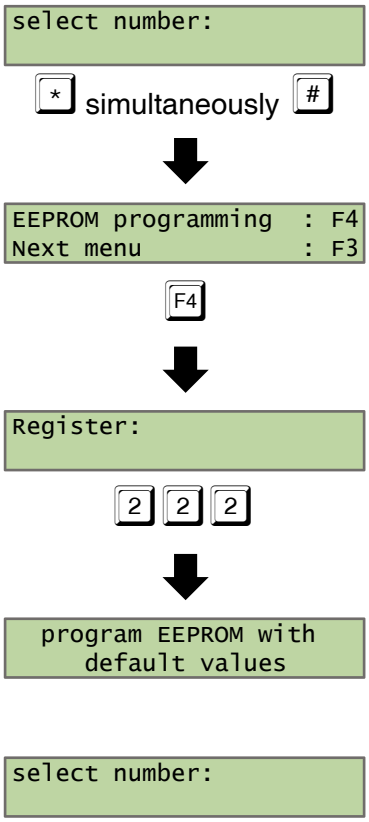
The scanner is triggered with carrier and PTT and stops for loudspeaker time (050/1-3) with decoding.
Scanning is going on after putting down the handset, if register 050/5 is coded accordingly.

The scanner is switched off, if the loudspeaker is switched on manually.

Reset to factory defaults

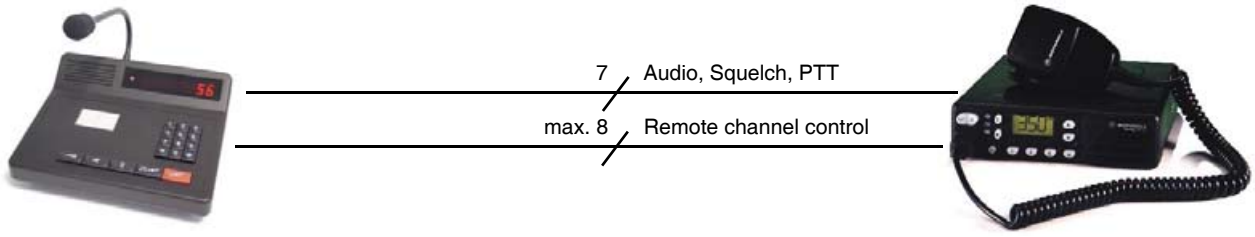
The following steps resets the Major to factory defaults.

Attention, all parameters reseted without acknowledgement.

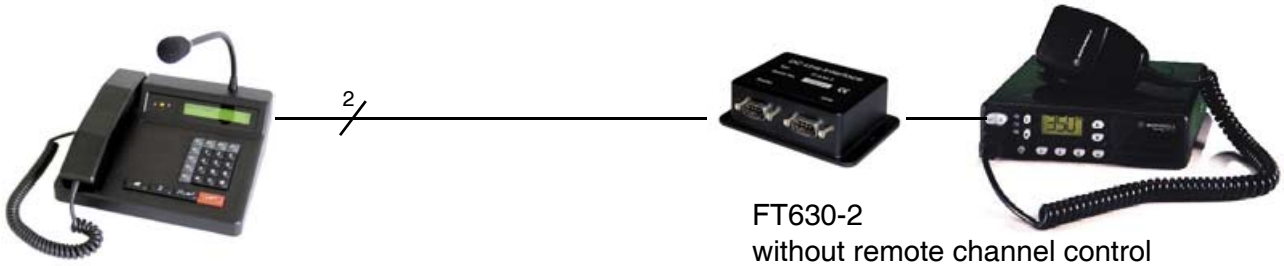


Sample configurations Major 4a (5a)

The next sketch shows a simple way for remote control a radio using Major 4a (5a). Only a 7-wire line (Audio, squelch, PTT) is needed if no remote channel control is necessary.

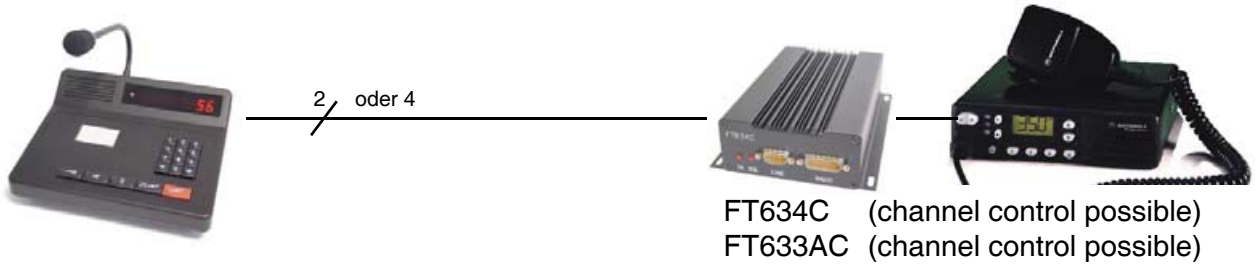


The next assembly is used, if there is only a 2-wire line available or for longer distance. Remote channel control and duplex mode is not possible.



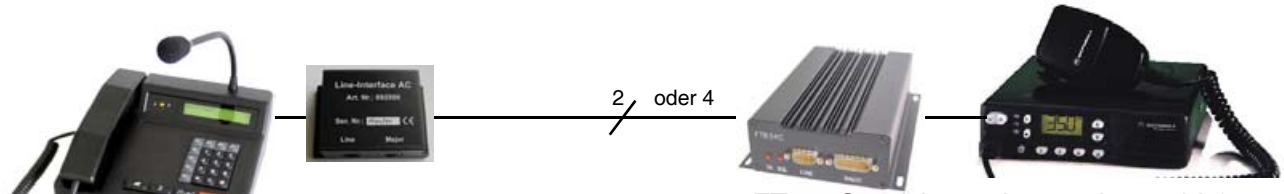
FT630-2
without remote channel control

Next sample shows assembly for duplex mode via 4-wire line or simplex mode via 2-wire line. Also remote channel control is possible.



FT634C (channel control possible)
FT633AC (channel control possible)
FT634 (channel control **not** possible)

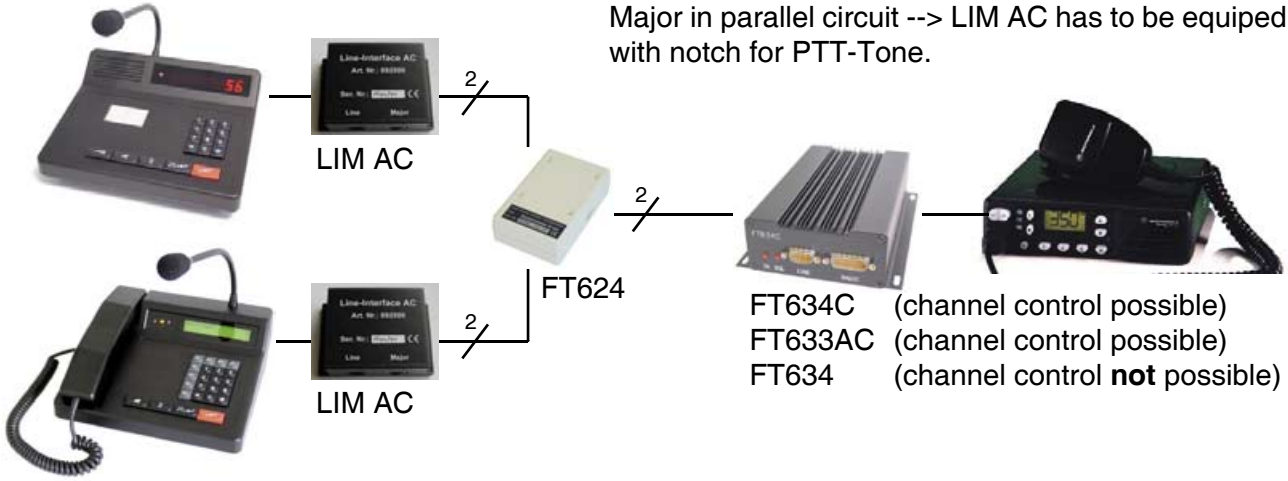
For assemblies not using private lines, the following configuration is suggested (PTT certificated).



FT634C
FT633AC
LIM-AC (only 2-wire)

FT634C (channel control possible)
FT633AC (channel control possible)
FT634 (channel control **not** possible)

Major in parallel circuit --> LIM AC has to be equiped with notch for PTT-Tone.



FT634C (channel control possible)
FT633AC (channel control possible)
FT634 (channel control **not** possible)

Table of registers Major 4a

Register	Function
000	Short call 0
001	Short call 1
002	Short call 2
003	Short call 3
004	Short call 4
005	Short call 5
006	Short call 6
007	Short call 7
008	Short call 8
009	Short call 9
010	Permanently coded positions of 5-tone encoder
011	Monitor after switch on 4. Digit 0 = off; 1 = on
014	Intercom-Tonesquence (DCBA) 5. Digit -> wake up on decoding with 1 sec. duration and act. loudness
015	Personaly identification code (= ID-code)
016	Key tones for decoding
017	Standard acknowledgement
019	Key tones 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

Register	Function
030	Setting 1 for decoder 1 1. Digit -> wake up tone type 0 = no wake up tone 1-A = wake up tone 1 to A B-F = wake up tone 1-5, 10 repetitions 2. Digit -> wake up tone length 0 = allways 1-F = n * 200 msec 3. Digit -> wake up tone volume 0-9 = volume 0-9 A-F = offset for current volume 4. Digit -> ringing volume length 0 = allways 1-F = n * 1 sec. 5. Digit -> ringing volume 0-9 = volume 0-9 A-F = offset for current volume
031	Setting 1 for decoder 2
032	Setting 1 for decoder 3
033	Setting 1 for decoder 4
034	Setting 1 for decoder 5
035	Setting 1 for decoder 6
036	Setting 1 for decoder 7
037	Setting 1 for decoder 8
038	Setting 1 for decoder 9
039	Setting 1 for decoder 10

Register	Function
040	Setting 2 for decoder 1 1. 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 2. Digit -> digital output number 0 = none 1-7 = digital output number 3. Digit -> digital output time 0 = off F = on 1-E = 1-14 sec 4. Digit -> acknowledgement 0 = no acknowledgement 1 = acknowledgement 2 = single tone 3 = Personaly ID-code 4 = received code
041	Setting 2 for decoder 2
042	Setting 2 for decoder 3
043	Setting 2 for decoder 4
044	Setting 2 for decoder 5
045	Setting 2 for decoder 6
046	Setting 2 for decoder 7
047	Setting 2 for decoder 8
048	Setting 2 for decoder 9
049	Setting 2 for decoder 10

Register	Function
050	Setting of loudspeaker timer 1. Digit = n * 100 sec 2. Digit = n * 10 sec 3. Digit = n * 1 sec 1.-3. Digit = 000 -> off 1.-3. Digit = 000 -> open mode 4. Digit -> loudspeaker at handset takeoff 0 = off 1 = on 2 = no change 5. Digit -> loudspeaker at handset touchdown 0 = off 1 = on 2 = no change
051	Transmit timeout 1. Digit = n * 100 sec 2. Digit = n * 10 sec 3. Digit = n * 1 sec 1.-3. Digit = 000 -> off 4. Digit operating mode 0 = simplex 1 = duplex 5. Digit -> loudspeaker after call 0 = off 1 = on Jumper 1 -> 2/4-wire line
052	Display background illumination 1. Digit = n * 100 sec 2. Digit = n * 10 sec 3. Digit = n * 1 sec 1.-3. Digit = 000 -> allways off 1.-3. Digit = 001 -> allways on
053	Blockade PTT on carrier 1. Digit 0 = off 1 = on

Register	Function
054	State 1. Digit 0 = no state 1 = state with one digit 2 = state with two digit 2.+3. Digit State after switch on
055	General settings 1.+2. Digit -> Transmitter pretime 1. Digit = n * 100 msec 2. Digit = n * 10 msec 3. Digit -> Key beep 0 = off 1 = on FFSK code 4. Digit -> Identification code just after PTT 0 = off 1 = on 5. Digit -> Identification code just after finish PTT 0 = off 1 = on
056	General settings 1. Digit -> Squelch mode 0 = active low 1 = active high 2 = Audio squelch 3 = aktiv low oder high
057	Printer setup 1. Digit -> print head 0 = off 1 = on 2.+3. Digit Number of lines per page (without head)
058	Printer setup 2 1. Digit -> print transmitted call 0 = off 1 = on 2. Digit -> print received call 0 = off 1 = on

Register	Function
063	Remote channel switching 1.-3. Digit Fixed digits remote tone sequence in BCD code
064	Channel register Channel after switch on 1. Digit 0= Reset channel 1= last channel 2.+3. Digit Reset channel 00-99
065	Channel range 1.+2. Digit lowest channel 2.+3. Digit highest channel
066	Setting for channel switching 1. Digit Channel select 0= no 1= one digit 2= two digit 5= one digit always 6= two digit always 2. Digit Channel output 0= TRC 1= decimal 2= binary-1 3= binary 4= 2 x BCD Remote channel control 5= with guard tone 6= without guard tone 7= without guard tone, without TX without DC 3. Digit Channel bits 0= usualy 1= inverted 4. Digit Number of channel bits 1 to 7 5. Digit Channel acknowledgement 0= usualy (BCDxy) 1= Major 6 (CBDxy)

Register	Function
067	Setup for channel scanner 1.+2. Digit=scan starts at channel EE = array reg. 070-074 3.+4. Digit=scan to channel 5. Digit -> Hold on time, n*10 ms
068	Setup for channel scanner 1. Digit 1 = scanner stops on carrier 2.+3. Digit = nn * 100 ms scan stop on carrier with decoding
069	Transmitter control 1. Digit -> mode 0 = stored keying tone 1 = TRC 2 = DC transmitter keying on 2.-5. Digit -> keying tone frequency or TRC guard tone 2. Digit = n * 1000 Hz 3. Digit = n * 100 Hz 4. Digit = n * 10 Hz 5. 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
080	General setting for decoder 1.-3. Digit -> maximum length of first tone 1. Digit = n * 500 msec 2. Digit = n * 50 msec 3. Digit = n * 5 msec max. value = 255 --> 1,275 s 4.+5. Digit -> minimum length of all tones 4. Digit = n * 50 msec 5. Digit = n * 5 msec

Register	Function
081	General setting for decoder 1.-3. Digit -> maximum length of remaining tones 1. Digit = n * 500 msec 2. Digit = n * 50 msec 3. Digit = n * 5 msec max. value = 255 --> 1,275 s 4. Digit - > decoder timeoff after transmitted tone sequence = n * 100 msec 5. Digit -> tone table for encoder and decoder 0 = ZVEI 1 = CCIR 2 = ZVEI 2 3 = EEA
082	General setting for encoder 1.+2. Digit -> length of first tone 1. Digit = n * 100 msec 2. Digit = n * 10 msec 3. Digit -> length of remaining tones 3. Digit = n * 10 msec 4.+5. Digit -> time between ID-code and call sequence 4. Digit = n * 100 msec 5. Digit = n * 10 msec

Register	Function
084	Group call decoder 1. Digit = Group call tone F = Group call off 2. Digit = external alarm 0 = off 1-7 = external alarm 8-F = special call tones (call 1/2) 3. Digit = external alarm 0 = off F = on 1-E = ajustable time, 1-14 sec. 4. Digit -> acknowledgement 0 = no acknowledgement 1 = acknowledgement 2 = single tone 3 = Personaly ID-code 4 = received code
086	Setting of ID-code memory 1. Digit -> updating 0 = off 1 = on 2. Digit -> FIFO 0 = off 1 = on 3. Digit -> immediately displayed 0 = off 1 = on 4. Digit -> display FFSK code 0 = off 1 = on
090	Setup FSK (ZVEI) 1...3. Digit -> edge number for FFSK tone sequence 4. Digit -> call 5. Digit -> #
091	Setup FSK (ZVEI) 1. Digit FFSK-Emergency call active 0 = off 1 = on 2. Digit BAK RX
092	Setup 1 for FFSK-Emergency call (Reg. 03x)
093	Setup 2 for FFSK-Emergency call (Reg. 03x)
097	Master password
099	General password
222	Reset to factory defaults **Attention**, without acknowledgement

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

Function registers 130-177

1. Digit -> Function

0 = none
1 = transmit single tone
2 = transmit call sequence
3 = PTT
4 = adjust volume
5 = channel select
6 = ID-code memory
7 = enter select number
8 = input state

2.-5. Digit -> depends on choosen function

Function 1 --> transmit single tone

2. Digit -> length of tone

length = n * 100 msec
0 = as long as button pushed

3.-5. Digit -> single tone frequency

3. Digit = n * 500 Hz
4. Digit = n * 50 Hz
5. Digit = n * 5 Hz

Function 2 --> transmit call sequence

2. Digit -> type of call
   - 0 = entered call
   - 1 = call back
   - 2 = short call
   - 3 = intercom

3. Digit -> Short call number
   - 0-9 = short call 0-9
   - F = input necessary

3. Digit -> intercom
   - 0 = intercom off
   - 1 = intercom on
   - E = intercom toggle
   - F = intercom input
     - 0 = off
     - 1 = on

4. Digit -> ID 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

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

4. Digit -> FFSK
   - 0 = only call
   - 1 = call + ID-code

5. Digit -> BAK on FFSK calls

Function 3 --> PTT

2. Digit -> choose microphone
   - 0 =PTT uses gooseneck microphone
   - 1 = PTT uses headset microphone
   - 2 = PTT uses handset microphone

Function 4 --> adjust volume

2. Digit
   - 0 = toggle loudspeaker
   - 1 = adjust volume

3. Digit -> only with volume
   - 0-9 = volume
   - F = input

3. Digit -> if state of loudspeaker changed, toggle
   - 1 = scanner on if loudspeaker off

Function 5 --> channel select

2.+3. Digit -> channel

2. Digit n * 10

3. Digit n * 1

value area = 00 - 99

FE = use working channel

FF = input via keypad

Function 6 --> ID-code memory 2. Digit
   - 0 = delete ID-code
   - 1 = display next ID-code
   - 2 = display newest ID-code

Function 7 --> enter select number

2. Digit
   - 0 = delete input
   - 1 = new input

3. Digit -> function delete input
   - 0 = delete complete call
   - 1 = delete only last input

3. Digit -> function new input
   - 0-F = input
   - F = break

Funtion 8 --> input state

2. Digit

0 = delete state

1 = set state

3.+4. Digit, new state

value area = 00 - 99

FF = input via keypad

Release Notes

Manual version 2.0 english released, 09.11.04

New Hard/Software Major 4a released, 16.11.04