Major BOS 2a2

Serial number 3799 or higher

ENTWICKLUNG PRODUKTION SOFTWARE HARDWARE ELEKTRONIK BERATUNG

FunkTronic

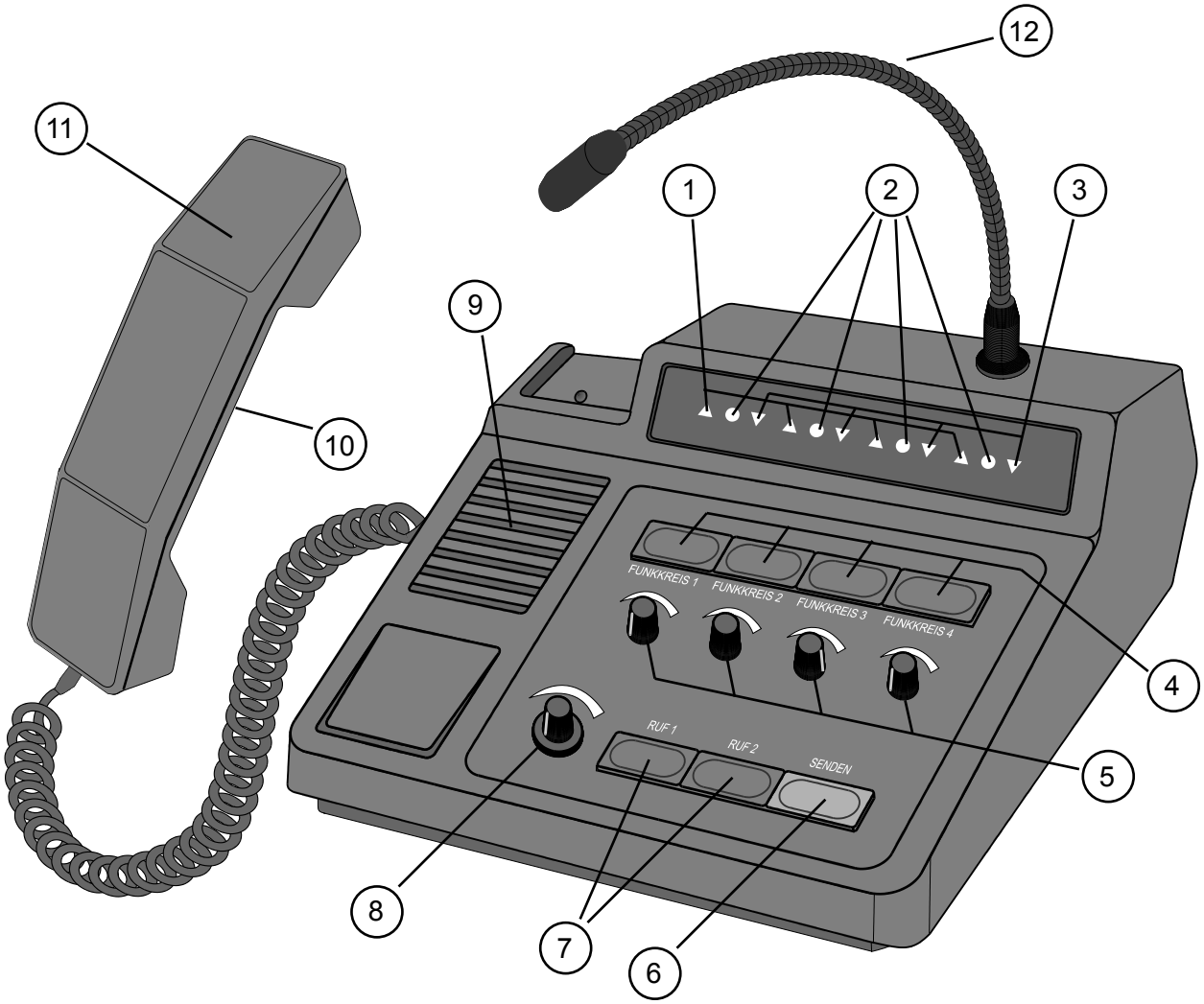
Kompetent für Elektroniksysteme

Table of Contents

Technical Data

Operating voltage	+12V DC -15% +25%
Current consumption	max. 1000 mA
AF input level	
empfohlener Wert für Hörer-NF	500 mV (at 10 kohm)
Input impedance	approx. 10 kohm
AF output level	
Factory default	500 mV at 200 ohm
Setting range	300mV to 700mV
Output impedance (sending)	approx. 200 ohm
Output impedance (receiving)	high-impedance (disconnected)
Tape recorder output level	
Factory default	- 6 dBm (at 600 ohm)
Setting range (Potentiometer P8)	- 14 dBm to - 2 dBm (at 600 ohm)
Output impedance	approx. 600 ohm
Weight (without cable)	approx. 1650 g
Size (without gooseneck microphone)	
B x T x H	245 x 220 x 90 mm

Controls of Major BOS 2a2



1	-	Transmitter indication (TX)
2	-	Selection indication
3	-	Receiver indication (Squelch, SQL)
4	-	Selection key
5	-	Monitoring volume
6	-	PTT key
7	-	Tone call key (Call 1 and Call 2)
8	-	Master volume
9	-	Loudspeaker (LS)
10	-	PTT key handset
11	-	Handset
12	-	Gooseneck (GN) microphone

Major BOS 2a2

Major BOS 2a2 is a desktop radio controller intended to control radio systems with up to 4 radio circuits. Operating parameters can be prgrammed from a computer using the configuration software.

Regarding functionality and connector pin assignment, Major BOS 2a2 compatible to Major BOS 2a.

Of course, there are several changes and new features:
- electrical, programmable potentiometers have replaced the analogous potentiometers
- programmable registers instead of jumpers
- programmable headset volume
- programmable amplification of the audio inputs from radio
- noise suppression for the inputs from radio
- tunable minimum volume for single radio circuits and tunable minimum overall volume
- AF settings (mute, listening, max. volume) can be adjusted separately for earpiece, loudspeaker, and tape
- software option "NF-Squelch" (AF squelch)
- software option "Encoder/Decoder" permitted for up to four radio circuits
- flashing squelch LED and alarm tone on decoding of a call (call 1, call 2)

Programming

The Major BOS 2a2 can be configured using the Major BOS 2a2/2b2 programming software (download at www.funktronic.de -> Service). Alternatively, the functions can be programmed directly in the respective registers using a terminal program (e.g. hyper terminal).

The adjustment of the potentiometers, in general, is done using the terminal program.

Connectivity

The Major BOS 2a2 is connected to a 12V DC power supply unit. The control set is connected to a junction box (MBOS2AB1/6), to which up to four radios can be connected. For each of the radios a squelch input, a PTT output, a busy line as well as AF in- and output are available.
Depending on the version, up to 6 Major BOS 2a2 or Commander BOS2 can be connected to the junction box.

Via a 25-pin D-Sub connector a headset or a FMS hand set can be connected.

For the recording of conversations a 6-pin DIN socket is available. As the AF outputs are only cut in during transmission, i.e. are disconnected in idle or receiving mode, it is possible to operate several Major BOS 2a2 in parallel circuit.

Keypad

The keypad consists of four selection keys for the different radio circuits, two tone call keys and the red PTT key.

Carrier Indication (Squelch)

Every one of the four radio circuits provides its own carrier indicator (Squelch), which is located above the corresponding selection key. If using junction box MBOS2AB1, for activation the squelch input needs a voltage between 5V and 14V. If MBOS2AB6 is used, the logic of the carrier indication is configurable. The polarity of the carrier indication and the AF muting when no carrier is present can be programmed.

Transmitter Indication (PTT)

Every radio circuit has its own transmitter indication, which is lit when the transmitter is activated. This happens upon pushing the PTT button or one of the two tone call buttons. The LED blinks if a parallel Major BOS 2a2 is on transmission.

Selection Indication

The selection indicator is permanentely luminous if the corresponding radio circiut is selected and active. If it is in blinking state this circuit is busy and cannot be selected.

Selection of Base Stations / Radio Circuits

To connect to one of the four radio circuits the corresponding selection key is to be pressed. A subsequent button press sets the circuit to inactive. To activate more than one channel hold the first pressed button down and select further circuits. Programming the Major BOS2a2 can disable this feature. Acitve circuits are indicated by a luminous selection indication LED. A busy radio cuircuit is idicated by a blinking LED. Radio circuits can be disabled, active radio circuits on power on can be programmed.

Loudspeaker and Volume Control

On transmission the loudspeaker is turned off automatically. If it is off, when the handset ist lifted, can be programmed. Loudspeaker volume can be adjusted with the master volume control.

Microphone Selection

The Major BOS2a2 has three microphone routings available. The PTT button in the handset turns on the handset's microphone. The red PTT button and the headset's PTT input can be configured independently. Possible associations are gooseneck microphone, headset microphone or automatic selection. If automatic selection is on, the headset microphone is used if a headset is detected otherwise the gooseneck microphone is used.

Tone Call Decoder

The optional software "Encoder/Decoder" allows the Major BOS2b2 to decode Tone Call1 and Tone Call2 on any radio circuit and to activate the corresponding circuit automatically.

Tone Call Encoder

The Major BOS 2b2 includes a encoder for Tone Call 1 and Tone Call 2. The tone calls are sent with the corresponding keys of the keypad. The tone is sent as long as the button is pushed.

Recording Conversations

Via the installed tape recorder output the recording of conversations is possible. The interface comprises a potential-free AF output as well as a potential-free contact (electronic relay) to control a recording device.

Several Control Sets in Parallel Circuit

As the AF outputs are only cut in during transmission and the NF inputs are high-impedance, several Major BOS 2a2 can be connected in parallel. To achieve this two configurations are possible:

a) If the junction box MBOS2AB1 is used, every Major BOS 2a2 is connected with his own box. Subsequently, all connections to the radios (TX-AF, RX-AF, squelch and PTT keying) are connected in parallel between the junction boxes.
b) If the junction box MBOS2AB6 is used, up to 6 control sets (Major BOS 2a2) can be connected via one juction box.

Here, the busy-lines for the four radio circuits, that are only connected between the control sets, fulfil a special task:
Every control set, that is connected to the busy-line, is able to recognize if the respective circuit is already occupied by another control set (flashing of the selection indicator). An occupied circuit is blocked and cannot be addressed by other control panels. All Majors can be muted while a busy-line is active in order to avoid feedback.

Operating in FMS mode

With the software option "Encoder/Decoder" Major BOS 2a2 can be extended to a FMS control panel. Possible FMS functions are the ID transmission at PTT keying and the transmission of up to two arbitrary, programmed FMS telegrams (e.g. conversation request) using the two call buttons. in this case, these are, of course, no longer available to transmit call 1 or call 2.
By conneting our FMS handset Commander 5 FMS to the D-Sub connector for external conversation devices (handpiece or headset), the Major becomes ready for FMS use.
Here, the FMS handset can also be used as an alternative to the usual handpiece of the Major. Therefor, the PTT output of the Commander 5 FMS must be configured to GND.

Functions for TETRA digital radios (SW version 1.02 or higher)

For application in digital radio monitoring of the conversation request tone is necessary. As the Major mutes its loudspeaker (LS) during transmission, this function has not been available if transmission is conducted using the gooseneck (GN) microphone.

Thus, in version V1.02 and higher the LS can also stay active during a transmission with the GN microphone. Circuits, on which no transmission takes place, are muted. Listening to active circuits (current transmissions) is still possible during transmission. Here, the volume can be reduced.

This function can also be active if the LS would be muted because the handset is taken off.

For transmission using a different microphone (headset, handset or via external input) this option is not available.

New registers:

270: Circuit 1
271: Circuit 2
272: Circuit 3
273: Circuit 4

Description for all 4 registers:

1st digit: 0 = if SH-PTT is keyed and handpiece is taken off, the LS status depends on register 016/2
1 = if SH-PTT is keyed and handpiece is taken off, the LS is always active

4th-8th digit: max. volume for SH-PTT: 00000 (LS aus) to 32767 (max. volume)
Here, the listening volume for the circuit is set, the total volume depends on the overall volume settings

Potentiometers

Using the manual potentiometers located the volume of the different radio circuits can be set individually. Furthermore, the overall volume of the Major can be controlled.

The functions can be extracted from the table below:

Poti	Function / Volume Level
P1	RX-AF (Listening) Circuit 1
P2	RX-AF (Listening) Circuit 2
P3	RX-AF (Listening) Circuit 3
P4	RX-AF (Listening) Circuit 4
P5	AF of loudspeaker, (total)

Service Program

For Major BOS 2a2 the programming of the registers and the calibration of the electronic potentiometers is accomplished using the service program. This program is accessible via the serial interface (for pin assignment see section **Cable Connection to PC**). For this purpose a suitable terminal program can be used: e.g. HyperTerminal (Windows), minicom (Linux).

The configuration of the serial interface is as follows:

data transfer rate	9600 bit/s
start bit	1
data bits	8
parity	none
stop bit	1
flow control	none

If the Major BOS 2a2 is switched on and the terminal program is started, the service program starts after pressing ENTER ↵. showing the following menu:

```
Online - Monitor MBOS2a2
------------------------

Software: MBOS2a2
Version : V1.00
SW-Datum: 07.04.10
Option  : Encoder/Decoder + AF-Squelch

Rxxx..............read register xxx
Pxxx yyyyyyyy.......program register xxx with yyyyyyyy
A..................potentiometer calibration
Tx.................TX-output off/on (0/1)
Ixxxx..............switch on tone generator with xxxxHz (0000=off)
H..................detection of a headset
Q..................software reset
X..................exit monitor
```

Registers of Major BOS 2a2

Register		Function
000		Radio circuit configuration 1
	1st digit	circuit 1 enabled, y = 1, n = 0
	2nd digit	circuit 2 enabled, y = 1, n = 0
	3rd digit	circuit 3 enabled, y = 1, n = 0
	4th digit	circuit 4 enabled, y = 1, n = 0
	5th digit	several active circuits possible y = 1, n = 0
	6th digit	on PTT if no circuit is active: use previous circuit = 0, error = 1
	7th digit	default "previous" circuit after power-on (binary sum of circuits = 0 - F)
001		Radio circuit configuration 2
	1st digit	circuit 1 enabled at power-on, j = 1, n = 0
	2nd digit	circuit 2 enabled at power-on, j = 1, n = 0
	3rd digit	circuit 3 enabled at power-on, j = 1, n = 0
	4th digit	circuit 4 enabled at power-on, j = 1, n = 0
	5th digit	circuits at power-on according to digits 1 - 4 = 0, previously enabled circuits = 1
002		Squelch configuration 1
	1st digit	circuit 1
	2nd digit	circuit 2
	3rd digit	circuit 3
	4th digit	circuit 4
	1st - 4th digit	SQL active: AF = 2 (only with option AF-squelch) high = 1 low = 0
003		Squelch configuration 2
	1st digit	circuit 1 AF is on: on squelch = 1, always = 0
	2nd digit	circuit 2 AF is on: on squelch = 1, always = 0
	3rd digit	circuit 3 AF is on: on squelch = 1, always = 0
	4th digit	circuit 4 AF is on: on squelch = 1, always = 0
004		Busy Out configuration
	1st digit	Busy Out circuit 1
	2nd digit	Busy Out circuit 2
	3rd digit	Busy Out circuit 3
	4th digit	Busy Out circuit 4
	1st - 4th digit	Busy Out Busy always off = 0 Busy active if TX is active = 1 Busy active if circuit is on = 2
005		Busy In LED configuration
	1st digit	Busy In circuit 1
	2nd digit	Busy In circuit 2
	3rd digit	Busy In circuit 3
	4. digit	Busy In circuit 4
	1st - 4th digit	Busy LED no function = 0 Busy active: TX-LED flashes = 1 Busy active: circuit-LED flashes = 2

Register		Function	
006		Busy In, configuration of functions	
	1st digit	Busy In circuit 1	
	2nd digit	Busy In circuit 2	
	3rd digit	Busy In circuit 3	
	4th digit	Busy In circuit 4	
	1st - 4th Stelle	Busy In	no function = 0
			active, mutes circuit = 1
			active, disables PTT keying =2
			active, disables PTT keying and mutes circuit = 3
			active, disables circuit activation = 4
			active, disables circuit activation and mutes circuit = 5
			active, disables activation of any circuit = 6
			active, disables activation of any circuit and mutes circuit = 7
007		TX In LED configuration	
	1st digit	TX In circuit 1	
	2nd digit	TX In circuit 2	
	3rd digit	TX In circuit 3	
	4th digit	TX In circuit 4	
	1st - 4th digit	TX In	no function = 0
			active, TX-LED flashes = 1
008		TX In Funktionskonfiguration	
	1st digit	TX In circuit 1	
	2nd digit	TX In circuit 2	
	3rd digit	TX In circuit 3	
	4th digit	TX In circuit 4	
	1st - 4th digit	TX In	no function = 0
			active, mutes circuit = 1
			active, disables PTT keying = 2
			active, disables PTT keying and mutes circuit = 3
009		Duplex configuration	
	1st digit	TX In circuit 1	
	2nd digit	TX In circuit 2	
	3rd digit	TX In circuit 3	
	4th digit	TX In circuit 4	
	1st - 4th digit		simplex = 0
			duplex = 1
010		AF input configuration of deactivated circuits	
011		AF input configuration of activated circuits	
	1st digit	circuit 1 to loudspeaker	
	2nd digit	circuit 2 to loudspeaker	
	3rd digit	circuit 3 to loudspeaker	
	4th digit	circuit 4 to loudspeaker	
	5th digit	circuit 1 to earpiece	
	6th digit	circuit 2 to earpiece	
	7th digit	circuit 3 to earpiece	
	8th digit	circuit 4 to earpiece	
	1st - 8th digit	circuit is muted = 0	
		listening volume = 1	
		maximum volume = 2 or 3	

Register		Function
012		Tape relay configuration 1
	1st digit	relay on: at TX, y = 1, n = 0
	2nd digit	relay on: at every SQL, y = 1, n = 0
	3rd digit	relay on: at SQL on an activated circuit, y = 1, n = 0
013		Tape relay configuration 2
	1st - 3rd digit	overrun time of tape relay: nnn * 1 s (0 - 655 s)
012		AF input configuration of deactivated circuits
013		AF input configuration of activated circuits
	5th digit	circuit 1 to tape
	6th digit	circuit 2 to tape
	7th digit	circuit 3 to tape
	8th digit	circuit 4 to tape
	5th - 8th digit	circuit is muted = 0 listening volume = 1 maximum volume = 2 or 3
014		Headset configuration 1
	1st digit	microphone for red PTT-button
	2nd digit	microphone for external PTT-button
	1st - 2nd digit	gooseneck (GN) microphone = 0 headset (HS) microphone = 1 automatically switch to HS = 2 (no HS => GN microphone; headset present => HS microphone)
015		Headset configuration 2
	1st digit	threshold value for headset detection nnn (000 - 999) * 5 mV if voltage is lower than threshold => headset is considered connected
016		Configuration of earpiece and loudspeaker
	1st digit	earpiece is off, if hung up = 0, earpiece is always on = 1
	2nd digit	loudspeaker is off, if earpiece taken off = 0, louspeaker is always on = 1
019		Functions of buttons CALL1, CALL2, PTT
	1st digit	function FMS ID code on PTT, y = 1, n = 0
	2nd digit	function CALL1-button
	3rd digit	function CALL2-button
	2nd - 3rd digit	no function = 0 CALL1/2 transmits as long as button is pushed = 1 send FMS 1/2 telegram = 2 (option Encoder/Decoder) send tone sequence 1/2 = 3 (option Encoder/Decoder)
	6th digit	circuit(s) for CALL1-button, current = 0, binary sum of circuits = 1 - F
	7th digit	circuit(s) for CALL1-button, current = 0, binary sum of circuits = 1 - F
020		FMS telegram for PTT buttons
	1st - 8th digit	FMS ID-code (BLOOFFFF)
021		FMS telegram for CALL1 button
	1st - 8th digit	FMS 1 telegram (BLOOFFFF)
022		FMS telegram for CALL2 button
	1st - 8th digit	FMS 2 telegram (BLOOFFFF)

Register		Function
023		Digits 9 and 10 in all of the 3 FMS telegrams
	1st digit	circuits where a FMS ID-code may be sent (binary sum of circuits = 0 - F)
	2nd - 3rd digit	digits 9 and 10 for ID-code (register 020)
	4th - 5th digit	digits 9 and 10 for FMS 1 (register 021)
	6th - 7th digit	digits 9 and 10 for FMS 2 (register 022)
	8th digit	improved forerun and final bit 0 = 0 improved forerun and final bit 1 = 1 forerun according to standard procedure and final bit 0 = 2 forerun according to standard procedure and final bit 1 = 3
031		Tone sequence 1 for CALL1-button
032		Tone sequence 2 for CALL2-button
	1st - 5th digit	5-tone sequence
041		Tone call decoder circuit 1
042		Tone call decoder circuit 2
043		Tone call decoder circuit 3
044		Tone call decoder circuit 4
	1st digit	decode tone calls: none = 0, call1 = 1, call 2 = 2, both calls = 3
	2nd digit	activation of circuit upon decoded call no activation = 0 activate new circuit, if no TX and handset lies on Major = 1 activate new circuit, if no TX = 2 activate new circuit = 3 no activation of additional circuit = 4 activate additional circuit, if no TX and handset lies on Major = 5 activate additional circuit, if no TX = 6 activate additional circuit = 7
	3rd digit	SQL-LED does not flash, no ring tone = 0 SQL-LED does not flash, ring tone = 1 SQL-LED flashes, no ring tone = 2 SQL-LED flashes, ring tone = 3
051	1st - 3rd digit	Time limit for transmission (nnn * 1 s)
055		Configuration of forerun / overrun
	1st - 2nd digit	nn * 10 ms forerun time before tone sequence / FMS
	3rd - 4th digit	nn * 10 ms overrun time after tone sequence / FMS
	5th - 6th digit	nn * 10 ms time of advance PTT keying without AF (may be no larger than 1st - 2nd digit)
080		Reference for tone sequence decoder 1
	1st - 3rd digit	max. duration of 1st tone = nnn * 5 ms
	4th - 5th digit	min. duration for all tones = nn * 5 ms
081		Reference for tone sequence decoder 2
	1st - 3rd digit	max. tone duration beginning with 2nd tone = nnn * 5 ms
	5th digit	tone call system : ZVEI = 0 CCIR = 1 ZVEI2 = 2 EEA = 3 ZVEI3 = 4

Register		Function
082		Reference for tone sequence encoder
	1st - 2nd digit	duration of 1st tone = nn * 10 ms
	3rd digit	duration of other tones = n * 10 ms
	4th - 5th digit	pause between call and ID-code = nn * 10 ms
083		Reference for group call decoder circuit 1
084		Reference for group call decoder circuit 2
085		Reference for group call decoder circuit 3
086		Reference for group call decoder circuit 4
	1st - 2nd digit	min. tone duration for single tone decoder = nn * 100 ms
	3rd - 4th digit	max. tone duration for single tone decoder = nn * 100 ms (00 = decode as soon as min. duration is reached)
	5th - 6th digit	min. tone duration for special tone decoder (Ruf 1 / 2) = nn * 100ms
	7th - 8th digit	max. tone duration for special tone decoder (Ruf 1 / 2) = nn * 100ms (00 = decode as soon as min. duration is reached)
089		Tone recognition
	4th - 8th digit	min. level for tone recognition from circuit 1 - 4 (0 - 32768)
210		noise suppression (AF mute) circuit 1
211		noise suppression (AF mute) circuit 2
212		noise suppression (AF mute) circuit 3
213		noise suppression (AF mute) circuit 4
	1st - 2nd digit	threshold value for activation of AF mute = nn * 0.9 mV
	3rd - 4th digit	threshold value for deactivation of AF mute = nn * 0.9 mV
214		AF squelch configuration circuit 1
215		AF squelch configuration circuit 2
216		AF squelch configuration circuit 3
217		AF squelch configuration circuit 4
	1st - 2nd digit	nn * 5 ms above threshold value until SQL
	3rd - 4th digit	threshold value (AF present) = approx. nn * 1.8 mV
	5th - 6th digit	nn * 5 ms below threshold value until SQL is gone
	7th - 8th digit	threshold value (AF gone) = approx. nn * 1,8 mV
220		Output level radio AF -> LS
221		Output level poti test tone -> LS
222		Output level call -> LS
223		Output level ringtone -> LS
230		Output level radio AF -> earpiece / headset
231		Output level poti test tone -> earpiece / headset
232		Output level call -> earpiece / headset
233		Output level ringtone -> earpiece / headset
240		Output level radio AF -> tape
241		Output level poti test tone -> tape
242		Output level call -> tape
243		Output level ringtone -> tape
250		Output level radio AF -> radio
251		Output level poti test tone -> radio
252		Output level call -> radio
253		Output level ringtone -> radio
	4th - 8th digit	00000 = off - 32768 = maximum

Register		Function
260		Input level adjustment and min. volume for circuit 1
261		Input level adjustment and min. volume for circuit 2
262		Input level adjustment and min. volume for circuit 3
263		Input level adjustment and min. volume for circuit 4
	1st - 3rd digit	input level -6,0 dB (000) ... 0dB (060) ... +19,5 dB (255)
	4th - 8th digit	min. volume level (00000 - 32768)
264	4th - 8th digit	Min. overall volume level (00000 - 32768)
270		TETRA function for circuit 1
271		TETRA function for circuit 2
272		TETRA function for circuit 3
273		TETRA function for circuit 4
	1st digit	0 = if SH-PTT is keyed and handpiece is taken off, the LS status depends on register 016/2 1 = if SH-PTT is keyed and handpiece is taken off, the LS is always active
	4th - 8th digit	max. volume for SH-PTT: 00000 (LS aus) to 32767 (max. volume) Here, the listening volume for the circuit is set, the total volume depends on the overall volume settings

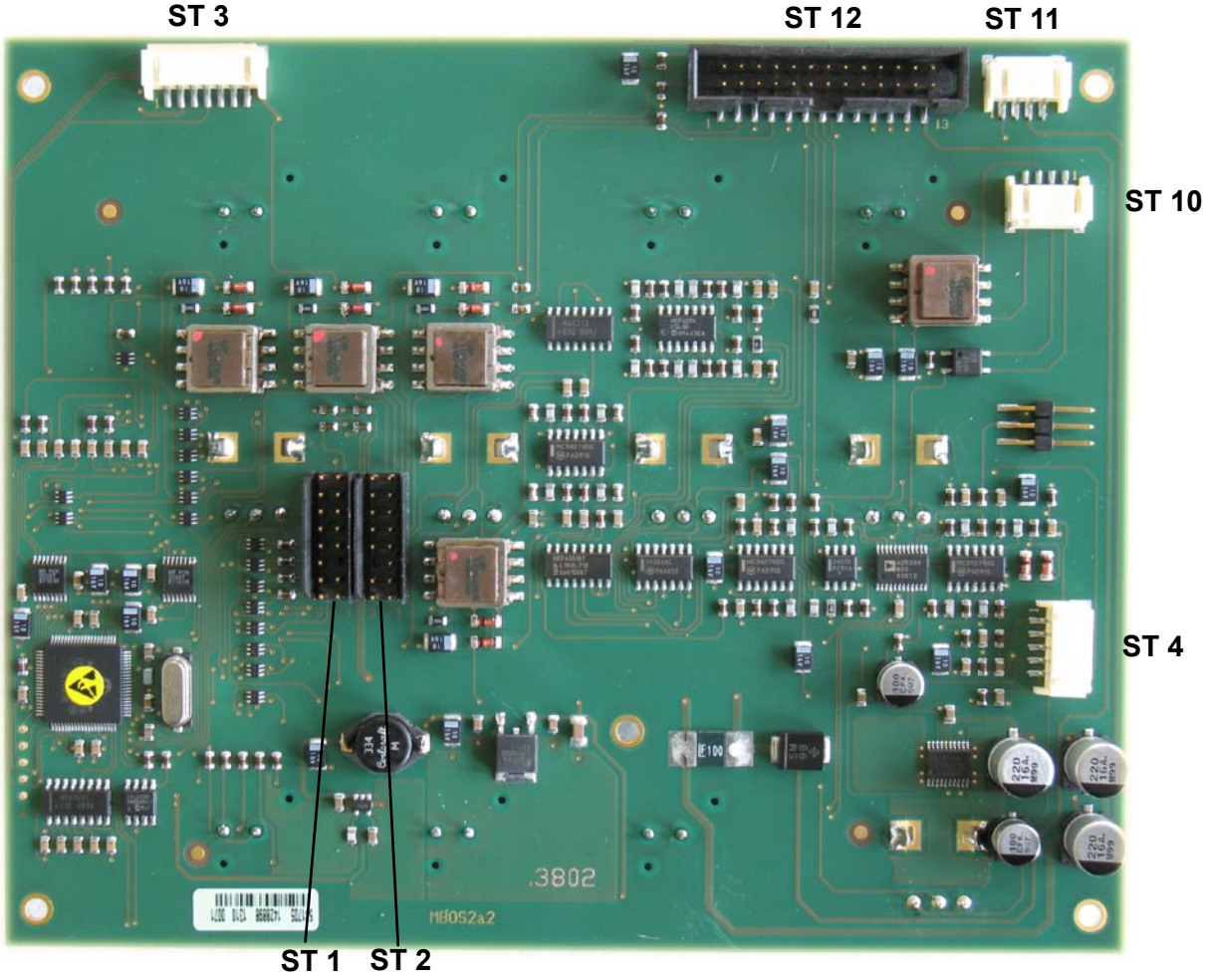
Reset to Factory Defaults

Register 999	Factory defaults are programmed
Register 998	reset to factory defaults, including poti settings

Attention! Reset is carried out without further confirmation!

Board Layout

The connection cable MBOS2Kx to junction box MBOS2AB1 or MBOS2AB6 is connected to sockets ST1 and ST2.



Sockets ST1 + ST2 for Junction Box

Radio 1

ST2	Pin10	AF-input
ST2	Pin14	GND
ST2	Pin 7	AF-output
ST2	Pin 8	AF-output
ST1	Pin13	squelch input
ST1	Pin 9	busy line
ST1	Pin 8	PTT keying
ST2	Pin13	+12V, external DC from radio

Radio 2

ST2	Pin 9	AF-input
ST1	Pin 4	GND
ST2	Pin 5	AF-output
ST2	Pin 6	AF-output
ST1	Pin14	squelch input
ST1	Pin10	busy line
ST1	Pin 5	PTT keying
ST1	Pin 3	+12V, external DC from radio

Radio 3

ST1	Pin 2	AF-input
ST2	Pin16	GND
ST2	Pin 3	AF-output
ST2	Pin 4	AF-output
ST1	Pin15	squelch input
ST1	Pin11	busy line
ST1	Pin 6	PTT keying
ST2	Pin11	+12V, external DC from radio

Radio 4

ST1	Pin 1	AF-input
ST2	Pin15	GND
ST2	Pin 1	AF-output
ST2	Pin 2	AF-output
ST1	Pin16	squelch input
ST1	Pin12	busy line
ST1	Pin 7	PTT keying
ST2	Pin12	+12V, external DC from radio

All GND-pins are connected on the main board and can thus be switched.

Assignment of further Sockets

Sockets ST1 + ST2 (16-pin plug connectors inside the control set) are connected to the junction box MBOS2AB1 (socket ST1) or MBOS2AB6 (sockets ST1...ST6) using the connection cables MBOS2K1 (2m) or MBOS2K2 (6m).

a) With junction box MBOS2AB1 up to 4 radios (radio circuits) can be connected via terminal strips. Connection in parallel to additional Major BOS 2a2 (or rather MBOS2AB1) can also be achieved over these terminal strips, if necessary.

b) With junction box MBOS2AB6 up to 4 radios (radio circuits) can be connected via 9-pin D-Sub connectors.
Connection in parallel to additional Major BOS 2a2 (max. 6) is carried out directly via the 32-pin sockets ST1...ST6 using connection cables MBOS2K1 (2m) or MBOS2K2 (6m) as needed.

Socket ST12 for ext. headset or handset (25-pin D-Sub)

Pin	1	PTT for ext. AF (Pin 6), active low
Pin	2	AF input headset microphone (electret)
Pin	3	AF input GND for headset microphone
Pin	4	PTT for headset, active low
Pin	5	+battery output (+12V_{DC}, e.g. for Commander 5 FMS, max. 300mA)
Pin	6	ext. AF input, ca. 500mV in countercurrent with GND, high-resistance
Pin	7	PTT keying indicator (PTT sum)
Pin	8/9	free (- not used -)
Pin	10/12	GND
Pin	13	+battery (input for supply voltage +12V/1A) alternatively the MBOS2a2 can also be supplied via the junction box
Pin	14	AF-output (earpiece of headset)
Pin	15	GND (earpiece of headset)
Pin	16	GND for headset-PTT
Pin	17	free (- not used -)
Pin	18	GND, PTT for ext. AF
Pin	19-23	free (- not used -)
Pin	24	TXD RS232
Pin	25	RXD RS232
Pin	26	free (pin exists on the board only)

Socket ST10 for tape connection (Monitoring) (6-pin DIN)

Pin	1	switching contact relay
Pin	2	switching contact relay
Pin	3	AF output (tape, +)
Pin	4	AF output (tape, –)

Socket ST3 --> display
Socket ST4 --> handpiece
Socket ST9 --> gooseneck microphone

Socket ST11 --> hook and loudspeaker

Pin	1	hook switch
Pin	2	GND
Pin	3	AF output loudspeaker
Pin	4	GND

Connection Cable to PC

25pin at MBOS2a2	9pin COM at PC
12	GND 5
24	TXD 2
25	RXD 3

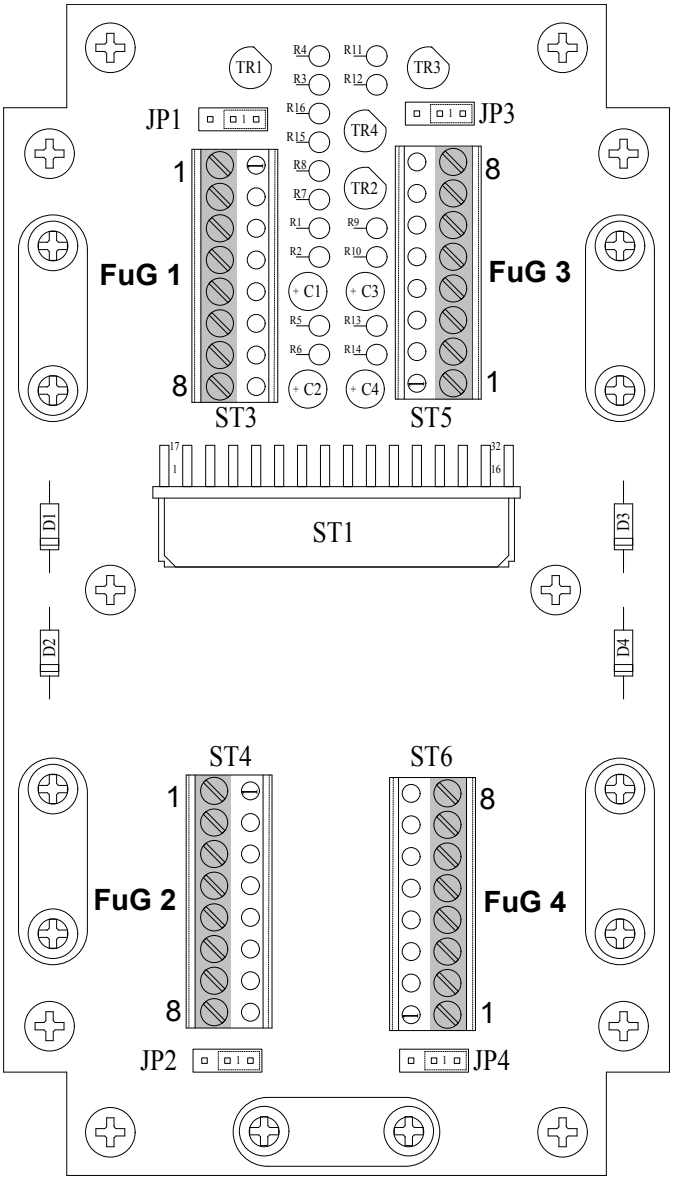
Jumpers (Junction Box MBOS2AB1)

The polarity of PTT keying can be configured separately for every radio using jumpers JP1 to JP4 (position "1" (as in the scheme below) = +batt; position "2" = GND).

Jumper	Function	Pos. 1	Pos. 2
JP1	PTT keying of circuit 1 to	+Batt	GND
JP2	PTT keying of circuit 2 to	+Batt	GND
JP3	PTT keying of circuit 3 to	+Batt	GND
JP4	PTT keying of circuit 4 to	+Batt	GND

Board Layout (Junction Box MBOS2AB1)

The connection cable MBOS2Kx for the control set (Major) is connected to socket ST1. The radios FuG1 to FuG4 can be connected via terminal strips ST3 to ST6.



Level of the Microphone

Major BOS 2a2 exhibits an output level of approx. 500 mV (at 200 ohm) for the direct connection to the secondary microphone input (at the rear) of a FuG8/9. If the Major is to be connected at the control panel of the FuG8/9 (BOS connector), AF has to be diminished to approx. 4mV (at 200 ohm).
This is achieved preferably by integration of a voltage divider (10 kohm / 180 ohm) into the BOS connector. Alternatively, the voltage divider can as well be integrated into the junction box MBOS2AB1. Therefor, the resistors R1, R5, R9, R13 (for circuits 1-4) must be changed from 0 ohm to 10 kohm and 180 ohm resistors have to be used as R2, R6, R10 and R14 (for circuits 1-4).

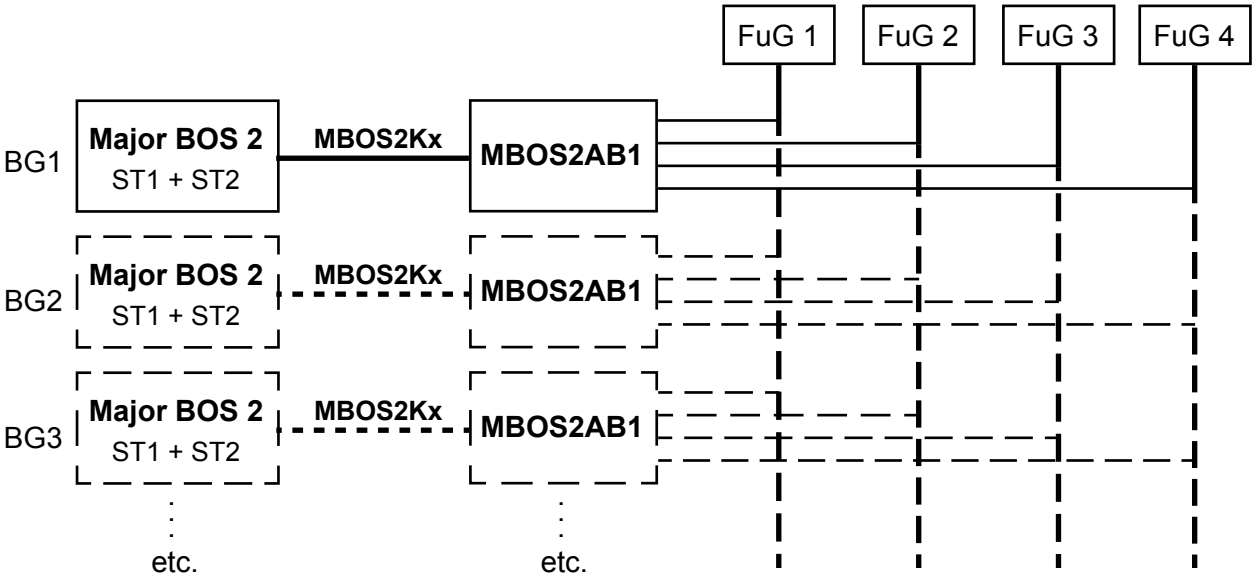
Pin Assignment (Junction Box MBOS2AB1)

Sockets radio 1 (ST3) to radio 4 (ST6)

Pin	1	AF input (earpiece, live)
Pin	2	GND
Pin	3	AF output (microphone, live)
Pin	4	AF output (microphone, dead)
Pin	5	squelch input (carrier, active at +12V)
Pin	6	busy-line (do not connect to the radio!!!)
Pin	7	PTT keying output (PTT, open collector max. 100 mA)
Pin	8	voltage supply (+12V, ext. DC from radio))

Connectivity Scheme (with Junction Box MBOS2AB1)

Using the connection cable MBOS2Kx and the junction box MBOS2AB1 (available separately) up to 4 radios can be cannected to the Major BOS 2 via terminal strips. Furthermore, several control sets (or rather junction boxes) can be connected in parallel.



Jumpers (Junction Box MBOS2AB6)

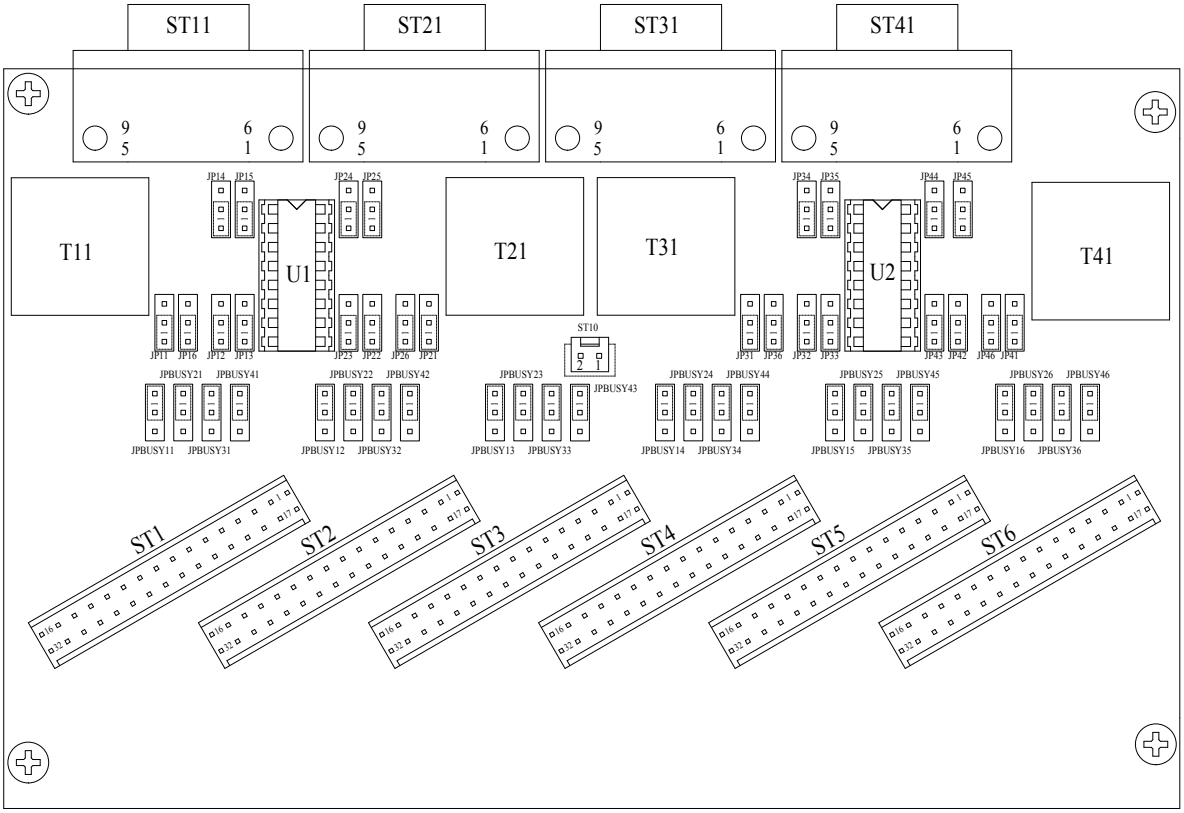
By the use of several jumpers different configurations of the junction box MBOS2AB6 can be achieved as needed. Most of these configurations were mentioned already during the preceding sections, if they are generally relevant.

The following table describes the functions of the respective jumpers:

jumper	function	pos. 1	pos. 2
JP12+13	carrier display of circuit 1 is is active at	+batt	GND
JP22+23	carrier display of circuit 2 is is active at	+batt	GND
JP32+33	carrier display of circuit 3 is is active at	+batt	GND
JP42+43	carrier display of circuit 4 is is active at	+batt	GND
JP14+15	PTT keying of circuit 1 connects to	+batt	GND
JP24+25	PTT keying of circuit 2 connects to	+batt	GND
JP34+35	PTT keying of circuit 3 connects to	+batt	GND
JP44+45	PTT keying of circuit 4 connects to	+batt	GND
JP16	GND of circuit 1 is connected to overall GND	yes	no
JP26	GND of circuit 2 is connected to overall GND	yes	no
JP36	GND of circuit 3 is connected to overall GND	yes	no
JP46	GND of circuit 4 is connected to overall GND	yes	no
JP11	TX level (AF output) of circuit 1 is	500mV	4mV
JP21	TX level (AF output) of circuit 2 is	500mV	4mV
JP31	TX level (AF output) of circuit 3 is	500mV	4mV
JP41	TX level (AF output) of circuit 4 is	500mV	4mV
JPBusy11	control set 1 is connected to busy-line circuit 1	JA	NEIN
⋮	⋮	⋮	⋮
JPBusy**XY**	control set **Y** is connected to busy-line circuit **X**	JA	NEIN
⋮	⋮	⋮	⋮
JPBusy46	control set 6 is connected to busy-line circuit 4	JA	NEIN

Board Layout (Junction Box MBOS2AB6)

The connection cable MBOS2Kx to the control set (Major) 1...6 is connected to one of the sockets ST1...ST6. The radios FuG 1 to FuG 4 can be connected via the D-Sub sockets ST11, ST12, ST13 and ST14.



All jumpers in this scheme are situated in pos. 1.

Pin Assignment (Junction Box MBOS2AB6)

Sockets FuG 1 (ST11) to FuG 4 (ST41) (9-pin D-Sub, male)

Pin	1	AF input (earpiece, A)
Pin	2	AF input (earpiece, B)
Pin	3	AF output (microphone, A)
Pin	4	AF output (microphone, B)
Pin	5	squelch input (carrier)
Pin	6	voltage supply (+12V, ext. DC from FuG)
Pin	7	PTT keying output (PTT, open collector max. 5 mA)
Pin	8	free (- not used -)
Pin	9	GND (ground of FuG)

Socket ST10 (2-pin plug connector)

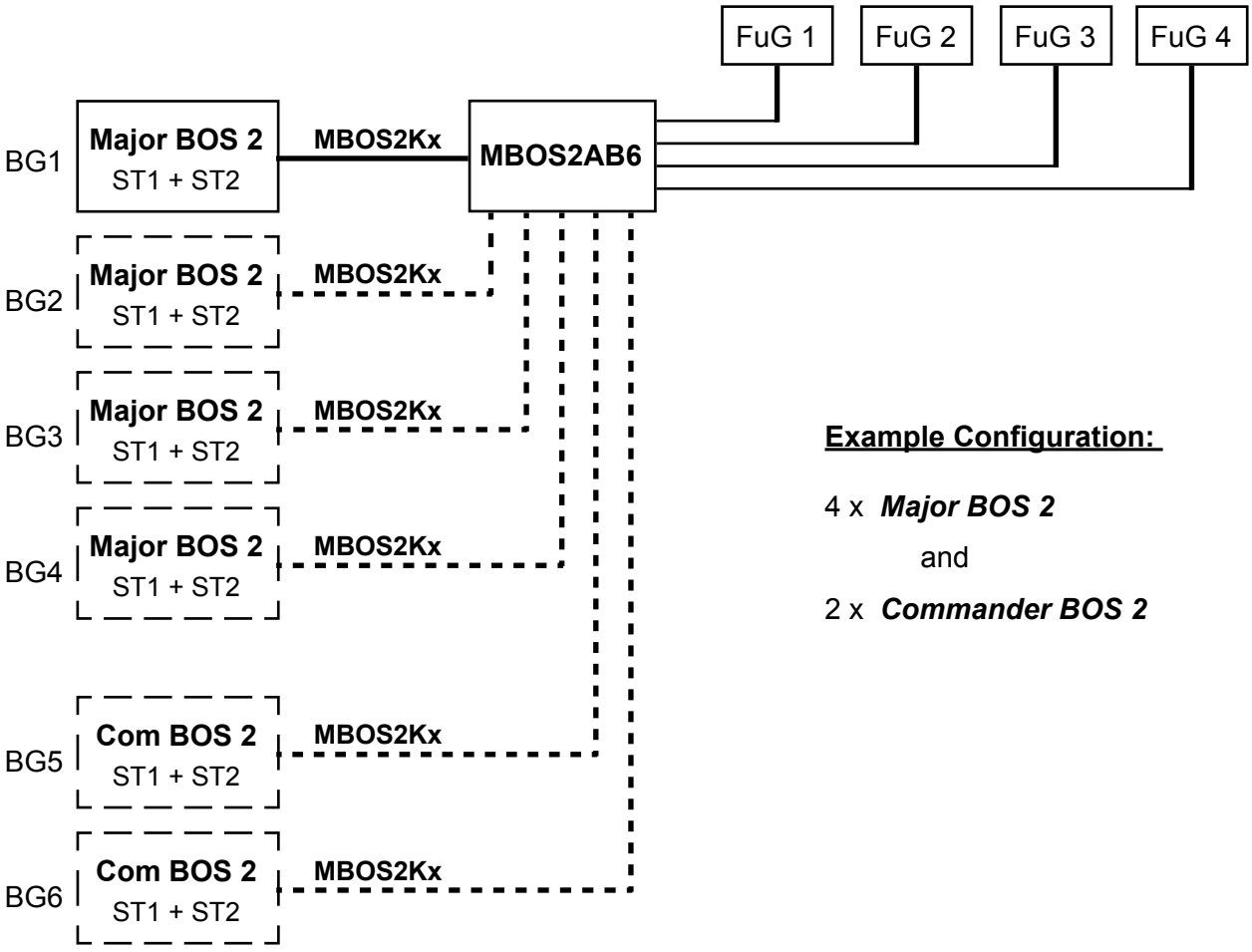
Pin	1	GND
Pin	2	voltage supply for control sets (+12V_{DC}, from ext. supply unit)

Sockets ST1 to ST6 (32-pin plug connectors)

for connection of the cables MBOS2Kx to the control sets (Major BOS 2 / Commander BOS 2)

Connectivity Scheme (with Junction Box MBOS2AB6)

Up to 6 Major BOS 2 or Commander BOS 2 (using the connection cables MBOS2Kx) and up to 4 radios (FuG, using 9-pin D-Sub connectors) can be connected to junction box MBOS2AB6.



Example Configuration:

4 x ***Major BOS 2***

and

2 x ***Commander BOS 2***

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
GERMANY

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

February 2nd , 2006

Subject to change, Errors excepted

Release Notes

12.08.12 - German manual for Major BOS 2a2 translated to English

06.09.12 - Minor changes/corrections regarding programming and registers