Major BOS 8a

ENTWICKLUNG PRODUKTION SOFTWARE HARDWARE ELEKTRONIK BERATUNG

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Inhalt

Order Information

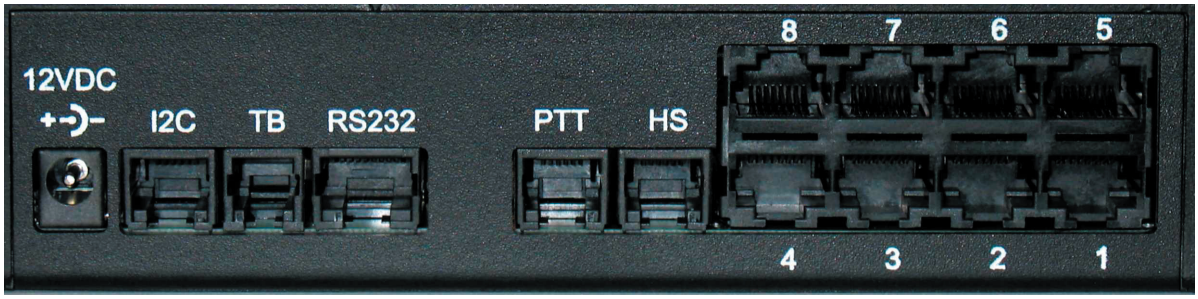
Order No.	Description
631110	Major BOS 8a
635090	RS232 programming cable
900011	Power supply unit, suitable for Major BOS 1a, 2b, 4a, 8a

Major BOS 8a

Major BOS 8a is a µC-controlled desktop controller unit for 2-way radio systems controlling up to eight radios. Different operating parameters can either be factory preset or programmed during installation.

Connectivity

For operation 12 V DC power supply is necessary. Up to eight channels (radio sets, PA systems -/intercom etc.) can be connected, also an external handset/headset, up to two external monitoring-interfaces (**TBBox4**), an external signalling device, a tape recorder and a AF-RX-amplifier for each channel.
Furthermore there is a RS232-connection, to which a terminal can be connected, or a PC for external control.
There is a squelch input for each radio and also a PTT output, a busy-line,an AF-input and AF-output. As the TX-AF-outputs are only active while transmitting, several ***Major BOS 4a´s*** can be connected in parallel without any problems.



12VDC	->	power supply connector (12V DC, external, max. 1.5A)
I2C	->	I^2C bus
TB	->	Tonbandgerät
RS232	->	RS 232 connection
PTT	->	PTT (e.g. foot switch)
HS	->	headset
1 - 8	->	transmit/receive (circuit 1 - 8: radio, PA system-/ intercom, etc.)

see also section **Sockets Pinout**

Control and Display Elements Major BOS 8a

1	-	PTT ▲ , carrier ▼, loudspeaker and selection displays ●
2	-	selection buttons
3	-	volume buttons (increase)
4	-	volume displays (LED line)
5	-	volume buttons (decrease)
6	-	loudspeaker buttons (mute)
7	-	call 1 buttons
8	-	call 2 buttons
9	-	PTT buttons (for gooseneck microphone)
10	-	loudspeaker
11	-	handset with PTT button
12	-	gooseneck microphone

Control and Display Elements (continued)

Keyboard

The keyboard holds the following functions for each of the eight channels:

Kreis	selection button
◢	increase volume
◣	decrease volume
🔈	mute loudspeaker
Ruf 1	button for tone call 1
Ruf 2	button for tone call 2
Senden	PTT button

Carrier Display (Squelch)

For each of the eight circuits there is a separate carrier display (squelch) LED ▼. To control the carrier display the squelch input can either be switched for ground (**GND**) or to **+12V**. The logic of the squelch input can be configured separately for each radio with the jumpers **J18** to **J25**.

PTT Display

For each of the eight circuits there is also a separate PTT display LED ▲, that lights if the transmitter for the respective circuit is keyed by pressing PTT, call 1 or call 2. If a PTT display flashes, another control set is transmitting on this radio circuit.

Loudspeaker Display

The loudspeaker display LED 🔈 lights either if loudspeaker AF is active or if the loudspeaker is muted for that circuit.
The logic of the loudspeaker display can be programmed in **register 030 / bit 0 of the EEPROM**:

register 030	**loudspeaker display lights when**
bit 0:	0 = loudspeaker AF is active
	1 = loudspeaker AF is muted

Selection Display

The selection display LED ● lights, if the respective circuit was selected and is active. If programmed in that way, the LED flashes if the circuit is selected by a different Major.

Calling a Single Radio Subscriber

To activate one of the eight channels push the corresponding **selection button**. To deactivate a channel again push the corresponding selection button once more.
Depending on the configuration of the **EEPROM-Register 030 in bit 1** you can either select several channels simultaneously or only one channel at a time.

register 030	**number of circuits that can be selected**
bit 1:	0 = several channels simultaneously (cumulative) 1 = only one channel at a time selected

When channels are activated the channel selection LED lights up. If the channel has already been selected by a different Major BOS 8a the device can be programmed so that the corresponding channel selection LED flashes.

In **EEPROM register 024** you can preselect which of the channels 1..8 **(bit 0..7)** is automatically selected after turning on the control set.

register 024	**selected channels after turning on**
bit 0:	**channel 1** no / yes (0/1)
bit 1:	**channel 2** no / yes (0/1)
bit 2:	**channel 3** no / yes (0/1)
bit 3:	**channel 4** no / yes (0/1)
bit 4:	**channel 5** no / yes (0/1)
bit 5:	**channel 6** no / yes (0/1)
bit 6:	**channel 7** no / yes (0/1)
bit 7:	**channel 8** no / yes (0/1)

It is possible to configure the **EEPROM-Register 027** so that the selected channels are automatically saved in the EEPROM-Register 024 when the radio installation is turned off.

Register 027	**angewählte Kreise speichern** Nein/Ja (00/01)

Communicating with the Radio Subscriber

There are three different ways of communication with a calling radio subscriber:

a) By pushing one of the red PTT buttons the transmitter of the corresponding channel is activated and you can talk to the caller through the gooseneck microphone. (It is also possible to connect an external switch contact instead of a PTT button. See section **Opto-Coupler input.)** After pressing the PTT button the caller can be heard on the loudspeaker. The receiver volume of the corresponding channel is adjustable.

b) By picking up the handset and pushing the PTT button on the inside of the handset. By doing so the transmitter of the selected channel is activated (PTT LED lights up) and you can talk with the caller through the microphone of the handset. Depending on the configuration you can hear the caller constantly on the handset or only after deactivating the PTT button. The call is ended by replacing the handset. The volume of the earpiece and the microphone are each adjustable by a potentiometer. The potentionmeter is situated near the earpiece of the handset and is easily accessible from the outside, using a screw-driver through a small opening on the inside of the handset.

c) By connecting a compatible handset/headset and pressing the corresponding PTT button PTT2 (e.g. a foot switch). By doing this the transmitter of the selected radio channel is also turned on (PTT LED lights up) and you can talk with the caller through the microphone of the handset/headset. Depending on the configuration you can hear the caller constantly on the handset or only after releasing the PTT button. The volume of the corresponding channel is adjustable.
If another controlling device is already transmitting on a radio channel the Major BOS 4a can be programmed so that the corresponding TX LED blinks and optionally the PTT button is blocked. After ending the call the activated radio channel can be deactivated by pressing the corresponding selection button again.
The microphone level of the handset/headset can be adjusted with the potentiometer **P10** and the level of its loudspeaker with the potentiometer **P12**.

Loudspeaker

The *built-in* loudspeaker is automatically turned off during transmission.
It is also possible to configurate the **EEPROM-Register 02A in bit 1** so that the loudspeaker is also turned off automatically when the handset is lifted.

register 02A **Loudspeaker switching status when handset is lifted**
bit 1: 0 = Loudspeaker ON
1 = Loudspeaker OFF

The receiver AF (on the loudspeaker) of individual radio channels can either be muted manually by pressing the loudspeaker buttons or automatically when the correspending busy line is activated (see section **Parallel circuit of several Major BOS 8a**).

In **EEPROM register 025** the loudspeaker switching statuses of the radio channels 1..8 (**bit 0..7**) can be preselected after turning on the radio installation.

register 025 **Loudspeaker switching status after turning on**

bit 0:	**Channel 1**	OFF/ON (0/1)
bit 1:	**Channel 2**	OFF/ON (0/1)
bit 2:	**Channel 3**	OFF/ON (0/1)
bit 3:	**Channel 4**	OFF/ON (0/1)
bit 4:	**Channel 5**	OFF/ON (0/1)
bit 5:	**Channel 6**	OFF/ON (0/1)
bit 6:	**Channel 7**	OFF/ON (0/1)
bit 7:	**Channel 8**	OFF/ON (0/1)

In addition it is possible to make a configuration in the **EEPROM register 028** so that the loudspeaker switching statuses are automatically saved in EEPROM register 025 when the Major is turned off.

register 028 **Saving the loudspeaker switching statuses**
No/Yes (00/01)

Loudspeaker (continued)

The **EEPROM-Register 02A in bit 0** can be configurated so that the receiver AF of all radio channels (without muting) is switched to the loudspeaker or that the corresponding radio channels also have to be activated additionally.

register 02A **receiver AF on loudspeaker**
bit 0: 0 = all radio channels without muting
1 = only activated radio channels without muting

Volume Control

The volume of the loudspeaker which is turned on can be set separately with the volume buttons (◢ = higher, ◣ = lower) for each radio channel. The volume level is displayed on the LED line.

In **EEPROM registers 018...01F** the volume settings **(´01..´08)** for each radio channel can be preselected separately after turning on the radio installation.

volume after switching on for

register 018	**Channel 1**
register 019	**Channel 2**
register 01A	**Channel 3**
register 01B	**Channel 4**
register 01C	**Channel 5**
register 01D	**Channel 6**
register 01E	**Channel 7**
register 01F	**Channel 8**

In **EEPROM register 029** you can also make a configuration so that the selected volume settings are automatically saved in the EEPROM registers 018...01F when the radio installation is turned off.

register 029 **save volume setting** No / Yes (00/01)

Earphones

The receiver AF of the selected radio channel can always be heard on the earphones of the handset and the headset.
The earphone AF of individual radio channels can be muted either manually by pressing the selection buttons or automatically by transmitting on the active or on one of the other radio channels (earphone muting).

a) In **EEPROM register 022** a configuration for the radio channels 1..8 (**bit 0..7)** can be made so that the earphone AF for the active radio channel is muted while transmitting.

register 022 **earphone AF** (while transmitting on the **active** channel) for

bit 0:	**Channel 1**	OFF / ON (0/1)
bit 1:	**Channel 2**	OFF / ON (0/1)
bit 2:	**Channel 3**	OFF / ON (0/1)
bit 3:	**Channel 4**	OFF / ON (0/1)
bit 4:	**Channel 5**	OFF / ON (0/1)
bit 5:	**Channel 6**	OFF / ON (0/1)
bit 6:	**Channel 7**	OFF / ON (0/1)
bit 7:	**Channel 8**	OFF / ON (0/1)

b) In **EEPROM register 023** a configuration for the radio channels 1..8 (**bit 0..7)** can be made so that the earphone AF is muted while transmitting on a different radio channel.

register 023 **earphone AF** (while transmitting on a **different** radio channel) for

bit 0:	**Channel 1**	OFF / ON (0/1)
bit 1:	**Channel 2**	OFF / ON (0/1)
bit 3:	**Channel 3**	OFF / ON (0/1)
bit 4:	**Channel 4**	OFF / ON (0/1)
bit 5:	**Channel 5**	OFF / ON (0/1)
bit 6:	**Channel 6**	OFF / ON (0/1)
bit 7:	**Channel 7**	OFF / ON (0/1)
bit 8:	**Channel 8**	OFF / ON (0/1)

RX-AF Outputs

The volume-controlled receiver AF can be tapped individually for each radio channel on the **Major BOS 8a.** The outputs can be used e.g. for connecting external AF-amplifier.

The receiver AF (RX-AF outputs) of individual radio channels can be muted either
- manually by pressing the loudspeaker buttons or
- automatically by activating the corresponding busy lines or
- automatically by transmitting on the active or a different radio channel

There is one **muting output** per radio channel with which the connected AF-RX amplifier can be muted when there is no receiver signal (squelch) (output switches to GND). See also section **Sockets Pinout.**

a) In **EEPROM register 020** a configuration for the radio channels 1..8 (**bit 0..7)** can be made so that the RX-AF output is muted while transmitting on the own radio channel.

register 020	**RX-AF output** (while transmitting on the **active** radio channel) **for**
bit 0:	**Channel 1** OFF / ON (0/1)
bit 1:	**Channel 2** OFF / ON (0/1)
bit 2:	**Channel 3** OFF / ON (0/1)
bit 3:	**Channel 4** OFF / ON (0/1)
bit 4:	**Channel 5** OFF / ON (0/1)
bit 5:	**Channel 6** OFF / ON (0/1)
bit 6:	**Channel 7** OFF / ON (0/1)
bit 7:	**Channel 8** OFF / ON (0/1)

b) In **EEPROM register 021** the radio channels 1..8 (**bit 0..7)** can be configured so that the RX-AF output is muted while transmitting on a different radio channel.

register 021	**RX-AF output** (while transmitting on a **different** radio channel) **for**
bit 0:	**Channel 1** OFF / ON (0/1)
bit 1:	**Channel 2** OFF / ON (0/1)
bit 2:	**Channel 3** OFF / ON (0/1)
bit 3:	**Channel 4** OFF / ON (0/1)
bit 4:	**Channel 5** OFF / ON (0/1)
bit 5:	**Channel 6** OFF / ON (0/1)
bit 6:	**Channel 7** OFF / ON (0/1)
bit 7:	**Channel 8** OFF / ON (0/1)

Encoder

Major BOS 4a has an integrated encoder for **call 1** and **call 2.** The calls for each channel are transmitted directly with the corresponding buttons on the keyboard (**RUF 1** or **RUF2**). The calls are transmitted as long as the corresponding button is being pressed.

External Signalling Device

An external signaling device can be connected to **Major BOS 8a**. The sensitivity of the potential-free inputs can be adjusted with the potentiometer **P11.**
By activating the corresponding PTT button input (**PTT3**) the external signal is transmitted to the selected radio channel(s). Here, an additional external switch contact can be connected as PTT button.

Transmitter Control

The transmitters of the selected radio channels are activated with one of the PTT buttons (e.g. handset or headset) and stay activated as long as the PTT button is being pressed. During transmitting the corresponding transmitters are automatically activated.
It is always possible to transmit on non-activated radio channels by using the red PTT buttons on the control panel.
The transmitter control can be switched to ground or to +12V. The logic of the PTT button outputs can be configured separately for each radio with the jumpers **J10** to **J17**. By using the **open-collector** outputs it is easily possible to connect several Major BOS 8a in parallel circuit.

Connection to Telephone AF

The audio-frequency connection is not integrated in the **Major BOS 8a** anymore. But by connecting the external headset-adapter the headset can be used as a combined communicating device for telephone and radio.
The headset is switched to the telephone by an opto-coupler input, which has to be programmed accordingly (**see section Opto-Coupler Input**).

Microphone Selection

For each of the 3 PTT inputs it is possible to program the corresponding microphone individually in register 052. Additionally there are **two** ways of automatic headset detection:
- the PTT2 input can be programmed as headset detection (programming **register 04C**)
- the Major BOS 8a can detect if a headset is connected by measuring the headset supply voltage (programming **register 051/052**).

The threshold level in register 051 has to be set so that the measured supply voltage (at ST10 between Pin 2 and 5) without headset is higher and with headset is lower than the threshold level. If the PTT2 input is used as headset detection the Major BOS 8a detects the headset when the input is activated (bridge to ground (GND)). If the Major BOS 4a has detected a headset then all buttons programmed as SH/HS-PTT use the headset microphone. Otherwise they use the gooseneck microphone.

Channel Selection (additionally)

In register 04E you can program whether the loudspeaker is turned on simultaneously when activating the radio circuit. In register 04F you can program whether the loudspeaker is turned off simultaneously when deactivating the radio circuit.

Opto-Coupler Input

The **Major BOS 8a** has an **opto-coupler input** at connector **ST14a**. This **opto-coupler input** can be programmed with different functions.

a) If this register is encoded to value ´**00**´**,** the opto-coupler input switches the handset/ headset to the audio-frequency-connection when activated (standard function, see section **Connection to Telephone AF**).

b) The opto-coupler input can also be used to emulate certain key functions of the switch panel or to enable switching functions for special applications.

To do this the assignment to the radio channels is coded at the **1st digit** (high-nibble) in **EEPROM register 047**. At the 2nd digit (low-nibble) the key function resp. the special function which is to be emulated, is encoded:

register 047 **Opto-coupler input**

Special function

00 = control the telephone relais
10 = microphone switching for PTT2
PTT2 transmits via gooseneck microphone, when opto-coupler is turned on
20 = microphone switching for PTT2
PTT2 transmits by gosoeneck microphone when opto-coupler is turned off

1st digit **Assignment to**

0 **=** all activated radio channels
1..8 **=** radio channel 1..8

2nd digit **emulated key / special function**

0 = (-no function -)
1 = radio channel (selction)
2 = volume higher
3 = volume lower
4 = loudspeaker ON / OFF
5 = call 2
6 = call 1
7 = transmit (gooseneck microphone)
8 = transmit (microphone of handset/headset)
9 = transmit (external encoder)
A = special functions button
B = transmit (SH or HS-micro), PTT2 selects micro
C = transmit (SH or HS-micro), switching by automatic headset detection

To **activate** the opto-coupler input direct current (3V < U < 15V) is necessary that can be obtained directly from **ST14a/2**. For higher ext. switching voltages an additional external dropping resistor is necessary (internal dropping resistor = 1kohm).

Connecting several Major in Parallel Circuit

As the AF outputs are only open during transmission and the AF inputs can be switched to high-resistance by pulling the jumpers J1 to J4, it is possible to connect several **Major BOS 8a** in parallel.
Therefor, all connections to the single radio circuits (TX-AF, RX-AF, squelch and transmitter PTT) have to be connected **in parallel** (bus- or hub-wiring).
Here the **busy lines** of the radio channels, which can only be connected with other control sets, have a special function.

Activating the Busy Lines

Each control set, which is connected to the corresponding busy line, can signalize to other control sets in parallel circuit, if a radio channel has already been selected and/or if a radio channel is already used for transmitting.

a) In the **EEPROM register 02B** it is possible to make a configuration for the radio channels 1..8 (**bit 0..7**) so that the corresponding busy line is activated if the circuit *is selected*.

register 02B	**activate busy line if circuit is selected**
bit 0:	**circuit 1** NO/YES (0/1)
bit 1:	**circuit 2** NO/YES (0/1)
bit 2:	**circuit 3** NO/YES (0/1)
bit 3:	**circuit 4** NO/YES (0/1)
bit 4:	**circuit 5** NO/YES (0/1)
bit 5:	**circuit 6** NO/YES (0/1)
bit 6:	**circuit 7** NO/YES (0/1)
bit 7:	**circuit 8** NO/YES (0/1)

b) In the **EEPROM register 02C** it is possible to make a configuration for the radio channels 1..8 (**bit 0..7)** so that the corresponding busy line is activated *when transmitting* (on this channel).

register 02C	**activate busy line during transmission**
bit 0:	**circuit 1** NO/YES (0/1)
bit 1:	**circuit 2** NO/YES (0/1)
bit 2:	**circuit 3** NO/YES (0/1)
bit 3:	**circuit 4** NO/YES (0/1)
bit 4:	**circuit 5** NO/YES (0/1)
bit 5:	**circuit 6** NO/YES (0/1)
bit 6:	**circuit 7** NO/YES (0/1)
bit 7:	**circuit 8** NO/YES (0/1)

Actions on Detection of Busy Lines

Each control set, which is connected to the corresponding busy line, detects an activated busy line and reports this optically to the user as a blinking channel selection LED or as a blinking TX LED.

This optical display can be configurated in **EEPROM register 02D** for the radio channels 1..8 (**bit 0..7**).

register 02D	**optical busy-LED for**
bit 0:	**circuit 1** as blinking channel selection LED / TX LED (0/1)
bit 1:	**circuit 2** as blinking channel selection LED / TX LED (0/1)
bit 2:	**circuit 3** as blinking channel selection LED / TX LED (0/1)
bit 3:	**circuit 4** as blinking channel selection LED / TX LED (0/1)
bit 4:	**circuit 5** as blinking channel selection LED / TX LED (0/1)
bit 5:	**circuit 6** as blinking channel selection LED / TX LED (0/1)
bit 6:	**circuit 7** as blinking channel selection LED / TX LED (0/1)
bit 7:	**circuit 8** as blinking channel selection LED / TX LED (0/1)

You can also configure how the **Major BOS 8a** treats busy radio channels: e.g. the *transmitter PTT* can be *disabled* and/or the receiver-AF for the *loudspeaker* (and the *RX-AF output)* can be *muted*:

a) In **EEPROM register 02E** it is possible to make a configuration for the radio channels 1..8 (**bit 0..7)**so that the *PTT* is *disabled* when the radio channel is busy.

register 02E	**PTT is disabled when the channel is busy**
bit 0:	**circuit 1** NO / YES (0/1)
bit 1:	**circuit 2** NO / YES (0/1)
bit 2:	**circuit 3** NO / YES (0/1)
bit 3:	**circuit 4** NO / YES (0/1)
bit 4:	**circuit 5** NO / YES (0/1)
bit 5:	**circuit 6** NO / YES (0/1)
bit 6:	**circuit 7** NO / YES (0/1)
bit 7:	**circuit 8** NO / YES (0/1)

b) In **EEPROM register 02F** it is possible to make a configuration for the radio channels 1..8 (**bit 0..7**) so that the *loudspeaker-AF* is *muted* when the radio channel is busy.

register 02F	**loudspeaker-AF is muted when the channel is busy**
bit 0:	**circuit 1** NO / YES (0/1)
bit 1:	**circuit 2** NO / YES (0/1)
bit 2:	**circuit 3** NO / YES (0/1)
bit 3:	**circuit 4** NO / YES (0/1)
bit 4:	**circuit 5** NO / YES (0/1)
bit 5:	**circuit 6** NO / YES (0/1)
bit 6:	**circuit 7** NO / YES (0/1)
bit 7:	**circuit 8** NO / YES (0/1)

Monitoring-Interface TBBox4 (Accessories)

The optional monitoring-interface **TBBox4** can be looped in to max. 4 radio channels in order to connect a multi-track **voice recorder** and/or to interpret or transmit signaling on the radio channels with the help of a PC if the TBBox4 is equipped with the corresponding **UGA-modules** (option)(**using a modem**).
For this purpose the external PC is connected by the integrated RS232-interface of the **TBBox4**.

Together with the **Major BOS 8a** certain calls like tone sequences or single tones (e.g. call 1, call 2), which are preprogrammed in the **TBBox4,** can be evaluated. The evaluation status is transmitted to the **Major BOS 4a** by the I²C-Bus (connector **ST14**).
If the evaluation status is to be transmitted to several Major BOS 8a or controlling the tape relay of the TBBox4 is used by several Major, their control inputs have to be connected to the I²C-Bus-concentrator **I2C-Con**.

For programming the **TBBox4** see manuals **Monitoring-Interface TBBox4** and **Universal-encoder/decoder-module UGA00**.

Assigning Circuits to the UGA-Modules

Each **TBBox4** can be equipped with max. 4 **UGA-modules,** so that up to 8 UGA-modules are available for decoder functions when 2 TBBox4 units are connected..
The individual radio channel numbers (´**01**´...´**04**´) in the **EEPROM registers 031...038** can be assigned freely to these 8 UGA-modules. If no radio circuit is to be assigned to a certain UGA-module set the radio channel number to value '**00'**.

Assigned radio channel number for

register 031	**UGA(1)/TBBox4(1)**
register 032	**UGA(2)/TBBox4(1)**
register 033	**UGA(3)/TBBox4(1)**
register 034	**UGA(4)/TBBox4(1)**
register 035	**UGA(1)/TBBox4(2)**
register 036	**UGA(2)/TBBox4(2)**
register 037	**UGA(3)/TBBox4(2)**
register 038	**UGA(4)/TBBox4(2)**

Ex factory the EEPROM registers 031...034 are programmed in sequence with the radio channel numbers 01...04 and the EEPROM-registers 035...038 with the value '00' (no radio channel assigned).

Decoder Functions

Each TBBox4 can be equipped with max 4 ***UGA-modules***, so that up to 8 UGA-modules are available for decoder functions when 2 TBBox4 are connected.

Each UGA-module can be programmed so that when certain signalings (single tones, tone sequences) are decoded either one of the two switching outputs ***DEC1*** or ***DEC2*** briefly (e.g. 1 sec)switches to ground (GND). See manuals **Monitoring-Interface TBBox4** and **Universal-encoder/decoder-module UGA00.**

The status of the switching outputs ***DEC1*** and ***DEC2*** of all UGA-modules is transmitted to the ***Major BOS 8a*** and causes the loudspeaker-AF of the corresponding radio channels to be turned on(if it was turned off before):

a) If the switching output ***DEC2*** is turned on because of the UGA-decoding, then the loudspeaker-AF of the corresponding radio channel is turned on *permanently.*

b) If the switching output ***DEC1*** is turned on because of the UGA-decoding, then the loudspeaker-AF of the corresponding radio channel is turned on *for the duration **T.*** The duration **T** can be programmed separately for the radio channels 1..8 in the **EEPROM registers 03D...044** in steps of seconds (Value coded as **HEX-Number** in seconds).

register 03D	**radio circuit 1**
register 03E	**radio circuit 2**
register 03F	**radio circuit 3**
register 040	**radio circuit 4**
register 041	**radio circuit 5**
register 042	**radio circuit 6**
register 043	**radio circuit 7**
register 044	**radio circuit 8**

Ex factory the EEPROM registers 03D...044 are programmed with the Hex-value **‘0A’** (10*1sec=10sec).

Tape Control (switching contact)

The switching contact for controling the tape (Start/Stop) can be configured separately for each of the two ***TBBox4*** units.

In **EEPROM registers 039 and 03A** you can code which radio circuits 1..8 (**bit 0..7**) control the audio tape switching contact of the ***TBBox4(1) and TBBox4(2).***

register 039 **audio tape switching contact *TBBox4(1)* controlled by**

bit 0:	**circuit 1**	NO/YES (0/1)
bit 1:	**circuit 2**	NO/YES (0/1)
bit 2:	**circuit 3**	NO/YES (0/1)
bit 3:	**circuit 4**	NO/YES (0/1)
bit 4:	**circuit 5**	NO/YES (0/1)
bit 5:	**circuit 6**	NO/YES (0/1)
bit 6:	**circuit 7**	NO/YES (0/1)
bit 7:	**circuit 8**	NO/YES (0/1)

Tape Control (continued)

register 03A **audio tape switching contact *TBBox4(2)* controlled by**

bit 0:	**circuit 1**	NO/YES (0/1)
bit 1:	**circuit 2**	NO/YES (0/1)
bit 2:	**circuit 3**	NO/YES (0/1)
bit 3:	**circuit 4**	NO/YES (0/1)
bit 4:	**circuit 5**	NO/YES (0/1)
bit 5:	**circuit 6**	NO/YES (0/1)
bit 6:	**circuit 7**	NO/YES (0/1)
bit 7:	**circuit 8**	NO/YES (0/1)

The tape control switching contacts are activated with each PTT or squelch/carrier detection of the corresponding radio channels. After discontinuation of these conditions they are deactivated automatically after the **delay time T.**
The delay time **T** can be programmed separately for the tape control switching contacts of the **TBBox4(1) resp. TBBox4(2)** in the **EEPROM registers 03B resp. 03C** in steps of 100ms.

Delay time **T = N*100ms (enter as Hex-value!!!)**

Register 03B **Delay time for tape control switching contact TBBox4(1)**
Register 03C **Delay time for tape control switching contact TBBox4(2)**

Ex factory the EEPROM-registers 03B and 03C are programmed with the Hex-value „**32”** (50*100ms = 5sec).

The own tape control switching contact (**ST12 / Pin2**) is activated as long as one of the two TBBox4 switching contacts is activated.

Functions for TETRA Digital Radios (Software V5.2 and newer)

Using TETRA, speaking is not pssoible until the conversation is initiated. Therefor, the radio transmits an attention tone. Usually, this tone cannot be heard in the loudspeaker as it is muted when transmitting. If transmitting using handset or headset the tone can be heard in the earphone. When the gooseneck microphone is used the toe cannot be heard.

In the new register 054 it can be programmed if an analogue (0) or a digital (1) radio is connected. If the radio is programmed as analogue, the usual settings are applied. If it is programmed as digital, the loudspeaker is not muted during transmission with the gooseneck microphone (ONLY with the GN microphone) to this radio. ALL currently activated radio circuits can still be heard on the loudspeaker during the conversation.

The programming of registers 020 and 021 also is of importance for transmission on a digital circuit. Usually, in register 020 the same value as in register 054 has to be programmed. Register 021 allows to turn off other radio circuits during transmission.

Programming Example:
radio circuits 1-6: analogue, radio circuit: 7-8 digital
Only the circuit of the current conversation is to be heard on the loudspeaker

register 020: C0
register 021: 00
register 054: C0

The values to program in all 3 registers are calculated as follows:
circuit 1: 1
circuit 2: 2
circuit 3: 4
circuit 4: 8
The numbers of all selected circuits have to be added and the result is programmed in the second digit of the register.
circuit 5: 1
circuit 6: 2
circuit 7: 4
circuit 8: 8
The numbers of all selected circuits have to be added and the result is programmed in the first digit of the register.
Numbers 10-15 are programmed as letters A-F (10=A, 11=B, 12=C,13=D, 14=E, 15=F).

Switching Matrix for Circuit Forwarding (optional)

The additional functions for radio circuit forwarding are controlled by long pressing of the the circuit's selection and loudspeaker buttons. MBOS 8a allows to transmit an incoming AF of one circuit to the same (RS1) and/or to any other circuit (RS2). Here, only one channel is receiving in order to avoid feedback. Controlling the transmitter can be done by carrier or by AF with a delay time. After decay of the carrier or at the end of the AF decay time the transmitters are turned off and the initiation of new forwarding is blocked for a programmable time

The circuits that are acitvated for forwarding are indicated by fast flashing of the lower volume LED. Long pressing of the selection buttons toggles the status of the circuit from forwarding active (LED flashes) to forwarding off (LED on or off depending on the volume). Long pressing of a loudspeaker button activates a combination of circuits defined in the EEPROM. At least one of the loudspeaker buttons should be programmed with '00' to be able to turn off all active forwarding operations.

Current forwarding is indicated on the display by fast flashing of the transmission LED. The programming of all parameters is acheived form the PC via the RS 232 interface using a terminal program. The EEPROM registers > 100 are adressing the EEPROM on the switching matrix board.

The RS1 function is active if exactly one circuit is active for forwarding and the respective BIT in register 113 is programmed properly. If the corresponding BIT in register 112 is programmed, forwarding of this circuit to all other circuits always results also in forwarding to the original circuit (RS1).

Starting with software version V3.8 of the Major BOS 8 main board forwarding to certain circuits can also be activated and deactivated via the RS232 interface. Therefor, there is the new command '$Kxx'. xx (00-FF) corresponds to the active circuits as also programmable in registers 080-087
Ab Software Version V3.8 der Major BOS 8 Hauptplatine lassen sich die Überleitkreise auch durch die RS232 aktivieren und deaktivieren. Dazu gibt es den neuen Befehl ‚$Kxx'. xx (00-FF) entspricht dabei den aktiven Kreisen wie auch im Register 080-087 programmierbar.
Example: $K00: no forwarding , $K03: forwarding to circuits 1+2

New Registers in MBOS 8a:

register 048: time for long pressing, (HEX) nn * 10ms
Example: 64 (HEX) = 100 (DEZ) * 10ms = 1s

register 080: predefined circuits to which forwarding is active upon long pressing of loudspeaker button (of circuit 1)
BIT0 = circuit 1 ..... BIT7 = circuit 8

reg. 081-087: same as Register 080 for loudspeaker buttons of circuits 2-8

reg. 100-107: threshold value for AF detection (circuit 1-8)

reg. 108-10F: delay time for AF detection (circuit 1-8, nn*50ms)
Example: 14 (HEX) = 20 (DEZ) * 50ms = 1s

register 110: forwarding mode for circuits 1 (BIT0) - 8 (BIT7)
BIT=0: AF-controlled, BIT=1: carrier controlled

register 111: blocking time after end of forwarding until new forwarding operations are possible, nn*10ms
Example: 32 (HEX) = 50 (DEZ) * 10ms = 500ms

register 112: RS1 additionally to RS2 for this circuit
BIT0 = circuit 1 ..... BIT7 = circuit 8

register 113: RS1 only if exactly one circuit is activated for forwarding
BIT0 = circuit 1 ..... BIT7 = circuit 8

Service Program

The ***Major BOS 8a*** has a **RS-232-interface** with the following specifications:

19200 Baud, 1 startbit, 8 databits, no parity, 1 stopbit

The connectors for the RS-232-interface (RXD, TXD, GND) are located on the 8-pin RJ45-plug **ST15** inside. See section **Sockets Pinout.**

To use the service program, a simple terminal or a PC with terminal program has to be connected to this RS-232-interface.
For this purpose the data format resp. the interface has to be set to the above mentioned specifications.
If ***Windows*** is installed on your PC, you can configure the standard Windows terminal program (e.g. Hyperterminal) accordingly, choosing the option **protocol = X on / X off.** (Therfore you only have to connect the three pins **RXD, TXD** and **GND**.

If the terminal (or the PC) is connected correctly, you will have access to the service program and to a range of service commands for:

- programming mode EEPROM
- software reset

To start the service program just enter <**$A2**>, <return>. The following text will appear on the screen:

```
Online - Monitor PIC 16F877A Software ,MBOS8a‘ V 2.0
vom {Datum} (C) FunkTronic ,01-07

Rxxx         Read EEPROM Register xxx
Pxxx:yy  Program yy in EEPROM Register xxx

X       Reset

#
```

Please note: the character _ means <space> resp. <blank>.

Monitor Status

The service program will usually be locked after the device has been turned on (monitor status = ´**00**`). In this case the service program has to be started by entering <**$A2><CR>**(=Enter). Then the **monitor menu (** see above) appears on the screen.

If the ***Major BOS 8a*** is to be programmed or controlled automatically by a PC or a control center computer it may be useful for the monitor function to be immediately available when turned on (monitor status = ´**01**`or ´**02**`).

The *monitor status* can be programmed in **EEPROM register 026** as follows:

register 026 **Monitor status after turning on**

00 = monitor function is turned off
01 = special control function (WED) is turned on
02 = monitor function is turned on

The monitor status (´**00**`,´**01**`or ´**02**`) can also be switched over while operating by entering <**$A0><CR>, <$A1><CR>** or **<$A2><CR>.**

Programming Mode EEPROM

To program an EEPROM register address <xxx> with the content <yy> proceed as follows:

1) Start the service program (see section **service program**)

2) To check the value of a register Enter <**R**xxx>,<Return> on the terminal.
=> <>xxx: ww> appears on the screen.

3) Program the new register content <yy> (Hex value!!!) in the register address <xxx> by entering the following on the terminal:
<Pxxx_yy>,<Return>(_=<**Space**>).

5) Check the new register content by means of the on-screen message:
<>xxx: ww **==>** yy >.

If instead of a valid address <xxx> the address <**999**> is entered, all registers are programmed with the ex factory preset values. A list of all the EEPROM- addresses can be found in the following section.

Please note (1): Do not change any registers, which are not described in this manual or whose functions are unclear or unknwon to you.

Please note (2): Almost all adjustable values (e.g. times etc.) of the ***Major BOS 4a*** have to be programmed as HEX numbers. See section **EEPROM-addresses**! A conversion chart for HEX numbers can be found in the **attachment!**

EEPROM Adresses

register	programming for
	volume after power-on
018	**circuit 1**
019	**circuit 2**
01A	**circuit 3**
01B	**circuit 4**
01C	**circuit 5**
01D	**circuit 6**
01E	**circuit 7**
01F	**circuit 8**

020 **RX-AF output** (while transmitting on **own** circuit) for

bit 0: **circuit 1** OFF/ON (0/1)
bit 1: **circuit 2** OFF/ON (0/1)
. .
. .
. .
bit 7: **circuit 8** OFF/ON (0/1)

for SW V5.2 and newer equal to reg. 054 (selection analogue/digital radio)

021 **RX-AF output** (while transmitting on a **different** circuit) for

bit 0: **circuit 1** OFF/ON (0/1)
bit 1: **circuit 2** OFF/ON (0/1)
. .
. .
. .
bit 7: **circuit 8** OFF/ON (0/1)

022 **earphone AF** (while transmitting on **own** circuit) for

bit 0: **circuit 1** OFF/ON (0/1)
bit 1: **circuit 2** OFF/ON (0/1)
. .
. .
. .
bit 7: **circuit 8** OFF/ON (0/1)

023 **earphone AF** (while transmitting on a **different** circuit) for

bit 0: **circuit 1** OFF/ON (0/1)
bit 1: **circuit 2** OFF/ON (0/1)
. .
. .
. .
bit 7: **circuit 8** OFF/ON (0/1)

024 **selected circuits after power-on**

bit 0: **circuit 1** NO/YES (0/1)
bit 1: **circuit 2** NO/YES (0/1)
. .
. .
. .
bit 7: **circuit 8** NO/YES (0/1)

EEPROM Adresses (continued)

register		programming for
025		**loudspeaker status after power-on**
	bit 0:	**circuit 1** OFF/ON (0/1)
	bit 1:	**circuit 2** OFF/ON (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** OFF/ON (0/1)
026		**monitor status after power-on** 00 = monitor function is turned on 01 = special control function (WED) is turned on 02 = monitor function is turned on
027		**save selected circuits** NO/YES (00/01)
028		**save loudspeaker statusses** NO/YES (00/01)
029		**save volume values** NO/YES (00/01)
02A	bit 0:	**receiving AF on the loudspeaker** 0 = all circuits without muting 1 = only selected circuits without Muting
	bit 1:	**loudspeaker status if handset is taken** 0 = loudspeaker is ON 1 = loudspeaker is OFF
	bit 4:	**earpiece AF is ON, if circuit AND LS are on (0x) or if circuit is ON (1x)**
02B		**activate respective busy line if circuit is selected**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
02C		**activate respective busy line while transmitting on**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
02D		**optical busy display for**
	bit 0:	**circuit 1:** flashing selection display / transmission display (0/1)
	bit 1:	**circuit 2:** flashing selection display / transmission display (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8:** flashing selection display / transmission display (0/1)

EEPROM Adresses (continued)

register		programming for
02E		**PTT keying blocked if circuit is busy**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
02F		**loudspeaker AF is muted if circuit is busy**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
030	bit 0:	**loudspeaker display if** 0 = loudspeaker AF is ON 1 = loudspeaker AF is OFF
	bit 1:	**number of selectable circuits** 0 = several circuits simultaneously 1 = only one circuit at a time
		assigned radio channel number for
031		**UGA(1) / TBBox4(1)**
032		**UGA(2) / TBBox4(1)**
033		**UGA(3) / TBBox4(1)**
034		**UGA(4) / TBBox4(1)**
035		**UGA(1) / TBBox4(2)**
036		**UGA(2) / TBBox4(2)**
037		**UGA(3) / TBBox4(2)**
038		**UGA(4) / TBBox4(2)**
039		**tape switching contact *TBBox4(1)* controlled by**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
03A		**tape switching contact *TBBox4(2)* controlled by**
	bit 0:	**circuit 1** NO/YES (0/1)
	bit 1:	**circuit 2** NO/YES (0/1)
	.	.
	.	.
	.	.
	bit 7:	**circuit 8** NO/YES (0/1)
03B		**delay time for tape switching contact *TBBox4(1)*** *[n∗100ms]*
03C		**delay time for tape switching contact *TBBox4(2)*** *[n∗100ms]*

EEPROM-Adresses (continued)

register	programming for
	loudspeaker is on for n*1sec at DEC1 for
03D	**circuit 1**
03E	**circuit 2**
03F	**circuit 3**
040	**circuit 4**
041	**circuit 5**
042	**circuit 6**
043	**circuit 7**
044	**circuit 8**
045	**button that is simulated via INP1 on MBOS8a**
046	**button that is simulated via INP1 on MBOS8a**
047	**opto-coupler input**
digit 1	**assignment** to 0 = all *activated* circuits 1..8 = circuit 1..8
digit 2	**simulated button / special function** 0 = (- no function -) 1 = circuit (selection) 2 = increase volume 3 = decrease volume 4 = mute loudspeaker 5 = call 2 6 = call 1 7 = transmit (gooseneck (GN) microphone) 8 = transmit (headset (HS) microphone) 9 = transmit (ext. signalling device) B = transmit (GN or HS mic.), microphone switched by PTT2 C = transmit (GN or HS mic.), microphone switched by automatic headset detection
digit 1+2	00 = switch telephone relay 10 = microphone switching by PTT2 0 = Headset, 1 = Schwanenhals 20 = microphone switching by PTT2 0 = Schwanenhals, 1 = Headset
048	**time of long pressing (HEX) nn * 10ms** **Example: 64 (HEX) = 100 (DEZ) * 10ms = 1s**
049	**Muting 1-8 active at PTT on own circuit**
04A	**Muting 1-8 active at PTT on another circuit**
04B	**Muting 1-8 active if no squelch on own circuit**

EEPROM Adresses (continued)

register **programming for**

04C **headset detection with PTT2 input at headset socket (ST10)**
PTT2 active ==> headset microphone in use
PTT2 off ==> gooseneck microphone in use

00 = normal PTT function, PTT2 is headset PTT
>00 = PTT2 is headset detection,
SH-micro is open, HS-micro is active

>00 = INP 1-3 and opto-coupler is SH/HS-PTT
(if programmed)
01 = PTT3 is SH/HS-PTT
02 = keyboard-PTT is SH/HS-PTT
03 = PTT3 and keyboard-PTT is SH/HS-PTT
04 = only opto-coupler is SH/HS_PT (if programmed)

04D **transmission PTT turns on loudspeaker (LS)**
bit 0: LS is on at PTT with handset microphone NO/YES (0/1)
bit 1: LS is on at PTT with haedset microphone NO/YES (0/1)
bit 2: LS is on at PTT with gooseneck microphone NO/YES (0/1)
bit 3: LS is on at ext. PTT NO/YES (0/1)
bit 4: LS is on at call 1 NO/YES (0/1)
bit 5: LS is on at call 2 NO/YES (0/1)

04E **automatic activation of loudspeaker at circuit activation**
bit 0-7: circuit 1-8 (active if BIT = 1)

04F **automatic deactivation of loudspeaker at circuit deactivation**
bit 0-7: circuit 1-8 (active if BIT = 1)

051 **threshold value for automatic headset detection by measuring of the microphone supply voltage**

threshold = nn*19.5mV

052 **flags for PTT / automatic headset detection by measuring the microphone supply voltage**

00 = **HS-Mic**, 01 = **GN-Mic**, 10 = **Ext.-NF**, 11 = **GN / HS**

bit 0+1: HS - PTT
bit 2+3: ext. PTT
bit 4+5: GN - PTT

Example:	free	GN-PTT	ext. PTT	HS-PTT	
standard	00	01	10	00	= 0001 1000 = 18
switching at GN-PTT	00	11	10	00	= 0011 1000 = 38
switching at HS-PTT	00	01	10	11	= 0001 1011 = 1B
GN mic. at HS- / GN-PTT	00	01	10	01	= 0001 1001 = 19

053 muting of earpiece and loudspeaker, if no carrier is present
BIT0 = circuit 1 ..... BIT7 = circuit 8

EEPROM-Adressen (continued)

register	programming for
054	**selection analogue or digital radio (SW V5.2 or newer)**
	0 = analogous radio, 1 = digital radio
bit 0 - 3:	radio 1 bis 4
bit 4 - 7:	radio 5 bis 8
080	**predefined circuits to which forwarding is active upon long pressing of the loudspeaker button of the respective circuit**
	BIT0 = circuit 1 ..... BIT7 = circuit 8
081-087	**same as register 080, but for LS buttons of circuits 2-8**
090-096	**button activation BIT0-7: circuit 1-8 (active if BIT = 1)**
090	**button activation for button: circuit (Kreis)**
091	**button activation for button: VOL+**
092	**button activation for button: VOL-**
093	**button activation for button: LS**
094	**button activation for button: call 1 (Ruf 1)**
095	**button activation for button: call 2 (Ruf 2)**
096	**button activation for button: transmit (PTT)**
100-107	**threshold value for AF detection, circuit 1-8**
108-10F	**delay time for NF-Erkennung, circuit 1-8: nn*50ms** Beispiel: 14 (HEX) = 20 (DEZ) * 50ms = 1s
110	**forwarding mode for circuits 1 (BIT0) - 8 (BIT7)** BIT=0: AF controlled, BIT=1: carrier controlled
111	**blocking time after end of forwarding until new forwarding is possible:** nn * 10ms Example: 32 (HEX) = 50 (DEZ) * 10ms = 500ms
112	**RS1 in addition to RS2 on this circuit** BIT0 = circuit 1 ..... BIT7 = circuit 8
113	**RS1 only, if exactly one circuit is activated for forwarding** BIT0 = circuit 1 ..... BIT7 = circuit 8

Jumpers und Potentiometers

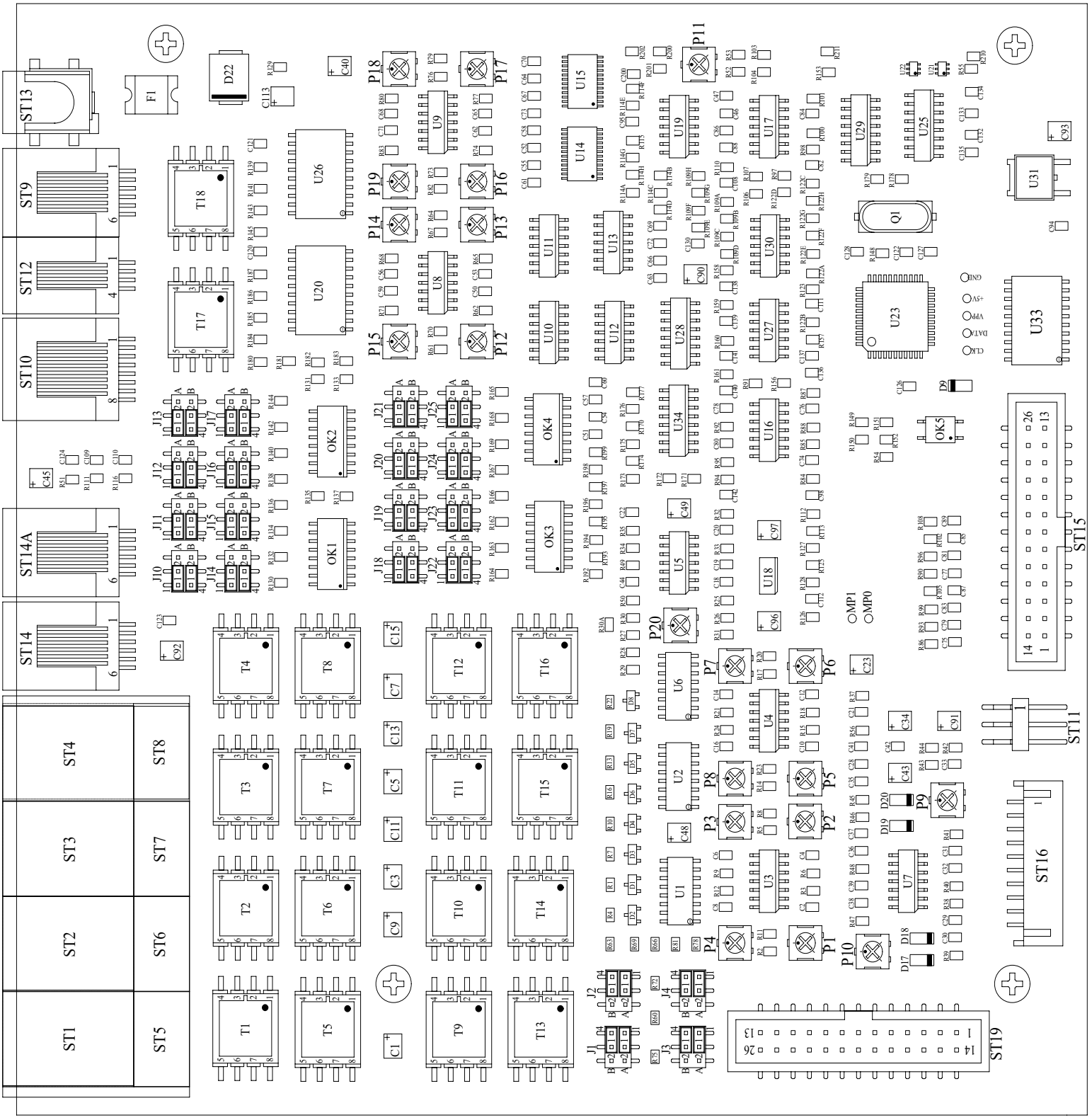
If necessary different configurations and adjustments can be made by using several jumpers and potentiometers. See **Layout.**

The jumper functions can be seen in the following chart:

Jumper	**Function**
J1A	RX-AF input circuit 1 is **600ohm/3kohm** (1/2)
J1B	RX-AF input circuit 2 is **600ohm/3kohm** (1/2)
J2A	RX-AF input circuit 3 is **600ohm/3kohm** (1/2)
J2B	RX-AF input circuit 4 is **600ohm/3kohm** (1/2)
J3A	RX-AF input circuit 5 is **600ohm/3kohm** (1/2)
J3B	RX-AF input circuit 6 is **600ohm/3kohm** (1/2)
J4A	RX-AF input circuit 7 is **600ohm/3kohm** (1/2)
J4B	RX-AF input circuit 8 is **600ohm/3kohm** (1/2)
J 10 A+B	PTT output circuit 1 switches to **+12V/GND** (1/2)
J 11 A+B	PTT output circuit 2 switches to **+12V/GND** (1/2)
J 12 A+B	PTT output circuit 3 switches to **+12V/GND** (1/2)
J 13 A+B	PTT output circuit 4 switches to **+12V/GND** (1/2)
J 14 A+B	PTT output circuit 5 switches to **+12V/GND** (1/2)
J 15 A+B	PTT output circuit 6 switches to **+12V/GND** (1/2)
J 16 A+B	PTT output circuit 7 switches to **+12V/GND** (1/2)
J 17 A+B	PTT output circuit 8 switches to **+12V/GND** (1/2)
J 18 A+B	carrier input circuit 1 is active to **+12V/GND** (1/2)
J 19 A+B	carrier input circuit 2 is active to **+12V/GND** (1/2)
J 20 A+B	carrier input circuit 3 is active to **+12V/GND** (1/2)
J 21 A+B	carrier input circuit 4 is active to **+12V/GND** (1/2)
J 22 A+B	carrier input circuit 5 is active to **+12V/GND** (1/2)
J 23 A+B	carrier input circuit 6 is active to **+12V/GND** (1/2)
J 24 A+B	carrier input circuit 7 is active to **+12V/GND** (1/2)
J 25 A+B	carrier input circuit 8 is active to **+12V/GND** (1/2)

Poti	**Function**
P1	TX-AF for circuit 1
P2	TX-AF for circuit 2
P3	TX-AF for circuit 3
P4	TX-AF for circuit 4
P5	TX-AF for circuit 5
P6	TX-AF for circuit 6
P7	TX-AF for circuit 7
P8	TX-AF for circuit 8
P9	input sensitivity for gooseneck microphone
P10	input sensitivity for headset microphone
P11	input sensitivity for ext. signalling device
P12	RX-AF for circuit 1
P13	RX-AF for circuit 2
P14	RX-AF for circuit 3
P15	RX-AF for circuit 4
P16	RX-AF for circuit 5
P17	RX-AF for circuit 6
P18	RX-AF for circuit 7
P19	RX-AF for circuit 8
P20	earphone AF for headset

Board Layout



Adjustment Instructions

The AF levels have already been correctly preadjusted ex factory. If necessary please follow these instructions.

1) **Adjustment RX inputs (radio channels 1..8)** (receiving radio)

a) At the *RX-input radio channel 1 (and 2-8)* feed in the AF level provided by the radio device at **1000 Hz**.

b) Select *radio channel 1 (2-8)*

c) Connect the level meter to the RX-AF-output **H_Sum** (ST15/pin6) **(GND** is **MP0).**

d) Adjust the level with potentiometer **P12 (P13 - P19)**.
The level should be **500mVeff (=-3,8 dBm)**.

e) After finishing the adjustment:
repeat steps a) to d) correspondingly for the *radio channels 2 to 8.*

2) **Adjustment TX outputs (radio channels 1..8)** (transmitting radio)

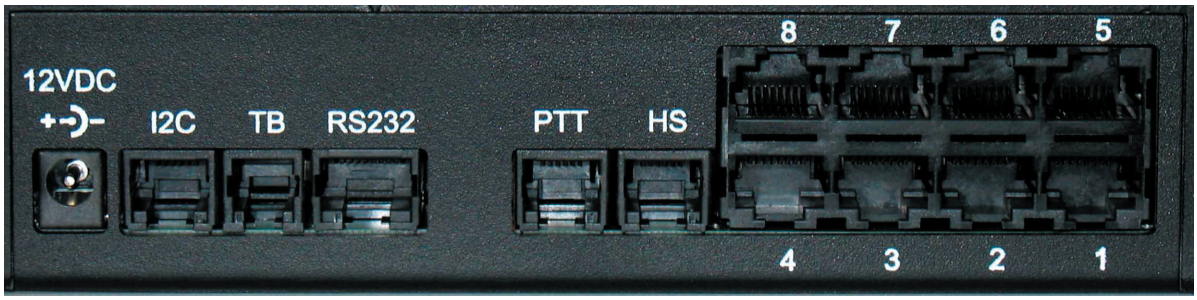
a) Connect the level meter and the radio device at the *TX output radio channel 1(2-8).*

b) Transmit **encoder 1 (1750Hz)** on *radio channel 1(2-8).*

c) Adjust the level with the potentiometer **P1 (P2 - P8)**.

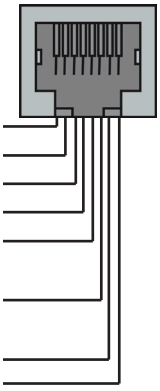
d) After finishing the adjustment:
repeat steps a) to d) correspondingly for the *radio channels 2 to 8.*

Sockets Pinout



All sockets of the Major shown from rear view.

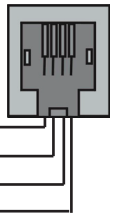
Layout FK 1- 8 (radio channels) ST1 - 8



RX-AF input (earphone +)	1
RX-AF input (earphone –)	2
squelch input (carrier)	3
GND (ground)	4
busy lines (**Do not connect to FuG!**)	5
PTT output (PTT out, open collector **max. 100mA**)	6
TX-AF output (mod +)	7
TX-AF output (mod –)	8

The AF- in/outputs are equipped with transformers and hence potential-free.

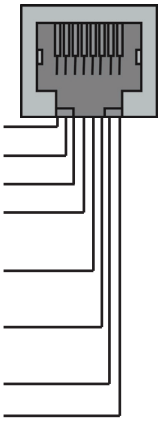
Layout TB Audio Tape ST12



GND (ground)	1
audio tape switching contact	2
AF output A (mod. +)	3
AF output B (mod. –)	4

The AF output A-B is equipped with a transformer and hence potential-free.

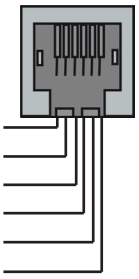
Layout RS 232 ST10



TXD (RS232)	1
RXD (RS232)	2
GND	3
PTT input (ext. signal source (PTT3, to GND)	4
RX-AF output LS sum (loudspeaker AF, activated radio channels)	5
RX-AF output H sum (earphone AF, selected radio channels)	6
AF input, ext. source. **Ext_AF** (mod +)	7
AF input, ext. source. **Ext_AF** (mod –)	8

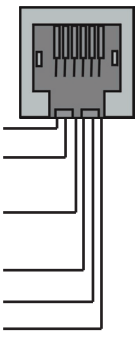
Two connectors for headsets are available. A headset can be connected to ST14. An external PTT button (e.g. foot switch) can be connected to ST14A.

Layout Headset ST14



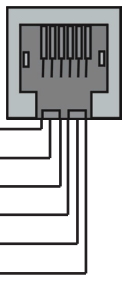
PTT input HS (PTT2, to GND)	1
AF input HS (micro +)	2
AF output HS (headset +)	3
AF output HS-GND (headset -)	4
AF input HS-GND (micro -)	5
GND (PTT2 ground)	6

Layout PTT (Headset Switching) ST14A



PTT input, HS (PTT2, to GND)	1
+batt. output., supply voltage for headset-headset switching PCB	2
control pin for headset-headset switching PCB	3
opto-coupler input (anode +)	4
opto-coupler Input (cathode –)	5
GND (PTT2 ground)	6

Layout I2C ST9



power supply. (+12VDC)	1
power supply. (+12VDC)	2
SDA (I^2C-bus-data)	3
SCL (I^2C-bus-clock	4
GND (ground)	5
GND (ground)	6

Layout Power PWR

12 VDC, max 1.5 A,
center: positive pole, ring: GND

Sockets Pinout (continued)

Socket ST15 for ext. RX-AF amplifier (internal 26-pin latch socket)

pin	1	RX-AF output circuit 1 **LS1** (loudspeaker AF)
pin	2	RX-AF output circuit 2 **LS2** (loudspeaker AF)
pin	3	RX-AF output circuit 3 **LS3** (loudspeaker AF)
pin	4	RX-AF output circuit 4 **LS4** (loudspeaker AF)
pin	5	RX-AF output circuit 5 **LS5** (loudspeaker AF)
pin	6	RX-AF output circuit 6 **LS6** (loudspeaker AF)
pin	7	RX-AF output circuit 7 **LS7** (loudspeaker AF)
pin	8	RX-AF output circuit 8 **LS8** (loudspeaker AF)
pin	9 - 12	Mute switching contact for **LS1** to **LS4**
pin	13 - 21	GND (ground for RX-AF outputs)
pin	22 - 25	Mute switching contact for **LS5** to **LS8**

The use of these mute switching contacts via button press is programmable via the software. The firmware V5.4 is needed for support, which was supplied ex factory for SN #3191 and newer.

Socket ST19 (internal 26-pin latch socket)
connection for optional switching matrix

Connection Cable to the PC (RS232, Ord.No. 635090)

ST6	Function	9pin COM at PC
1	TxD	2
2	RxD	3
3	GND	5

Technical Data

Supply

voltage	+12V_{DC} -15% +25%
current consumption	typ. 350 mA (max. 650 mA)

Input level (RX in), (from circuit 1..8)

factory settings	775 mV (= 0 dBm) / 600 ohm
	500 mV (= -3,8 dBm) / 200 ohm
adjustment range (with poti **P12..P19**)	- 8 dBm to +3 dBm
input impedance	600 ohm or 3 kohm

Output level (TX out), (to circuit 1..8)

factory settings	500 mV (= - 3,8 dBm) / 200 ohm
adjustment range (with poti **P1..P8**)	- 9 dBm to +1 dBm / 200 ohm
	- 5 dBm to +5 dBm / 600 ohm
output impedance (when **transmitting**)	approx. 200 ohm
output impedance (when **receiving**)	high-resistance (open)

Earpphone output level (RX out, to headset)

factory settings	- 10 dBm (an 200 ohm)
adjustment range (with poti **P20**)	- 18 dBm bis - 8 dBm (an 200 ohm)
output impedance	ca. 150 ohm

Microphone input MIC2 (TX in, electret, routed from handset/headset)

sensitivity ex factory	4 mV (= - 46 dBm)
adjustment range (with poti **P10**)	- 52 dBm bis - 41 dBm
input impedance	approx. 700 ohm

AF input Ext_NF (TX in, routed from e.g. external signalling device)

sensitivity ex factory	500 mV (= - 3,8 dBm)
adjustment range (with poti **P11**)	- 7 dBm bis - 1 dBm
output impedance	ca. 20 kohm

AF output LS_Sum (RX out, routed to e.g. external loudspeaker amplifier)

at max. volume	- 14 dBm (an 600 ohm)
output impedance	ca. 1 kohm

AF output H_Sum (RX out, routed to e.g. external headset)

for selected curcuit	- 13 dBm (an 600 ohm)
output impedance	ca. 1 kohm

AF outputs LS_i (RX out, routed to e.g. external loudspeaker amplifier)

at max. volume	250 mV (an 10 kohm)
output impedance	ca. 10 kohm

Weight	ca. 1750 g

Dimensions (without gooseneck microphone)

width x depth x height	245 x 220 x 90 mm

General Safety Remarks

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

10.09.2012	- first English version of Major BOS 8a manual released
25.02.2014	- pinout of socket ST14 revised
13.03.2014	- order information (RS232 cable) added
05.09.2018	- Use of "mute switching contacts" added (see Sockets Pinout ST15)

Appendix

Conversion chart: hexadecimal (HEX) <--> decimal (DEC)

The corresponding HEX number (2 digits, HEX numbers are often indicated by a preceding '$' sign) to a common DEC number (<256) or vice versa can be directly deduced from this table:

HEX	$x**0**	$x**1**	$x**2**	$x**3**	$x**4**	$x**5**	$x**6**	$x**7**	$x**8**	$x**9**	$x**A**	$x**B**	$x**C**	$x**D**	$x**E**	$x**F**
$**0**x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$**1**x	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
$**2**x	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
$**3**x	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
$**4**x	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
$**5**x	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
$**6**x	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
$**7**x	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
$**8**x	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
$**9**x	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
$**A**x	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
$**B**x	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
$**C**x	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
$**D**x	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
$**E**x	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
$**F**x	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

By using this chart, also higher decimal numbers (255 < x < 65536) can be converted to the corresponding 4-digit HEX number ($\mathbf{h_3h_2h_1h_0}$):

HEX number ($\mathbf{h_3h_2}$) = DEC number **DIV** 256 (high-byte)
HEX number ($\mathbf{h_1h_0}$) = DEC number **MOD** 256 (low-byte)

Here, the operation **DIV** is a division yielding the whole number part of the division (before the decimal point, no rounding up) and the operation **MOD** yields the rest of the division.

As a proof, the following must be true:

DEC number = $\mathbf{h_3}$ x 4096 + $\mathbf{h_2}$ x 256 + $\mathbf{h_1}$ x 16 + $\mathbf{h_0}$

Example: DEC number = **4800** --> HEX number = ?

1) HEX number($\mathbf{h_3h_2}$) = 4800 DIV 256 = 18 (DEC number) = $**12** (Hex) (high-byte)
2) HEX number($\mathbf{h_1h_0}$) = 4800 MOD 256 = 192 (DEC number) = $**C0** (Hex) (low-byte)

==> HEX number($\mathbf{h_3h_2h_1h_0}$) = $**12C0**