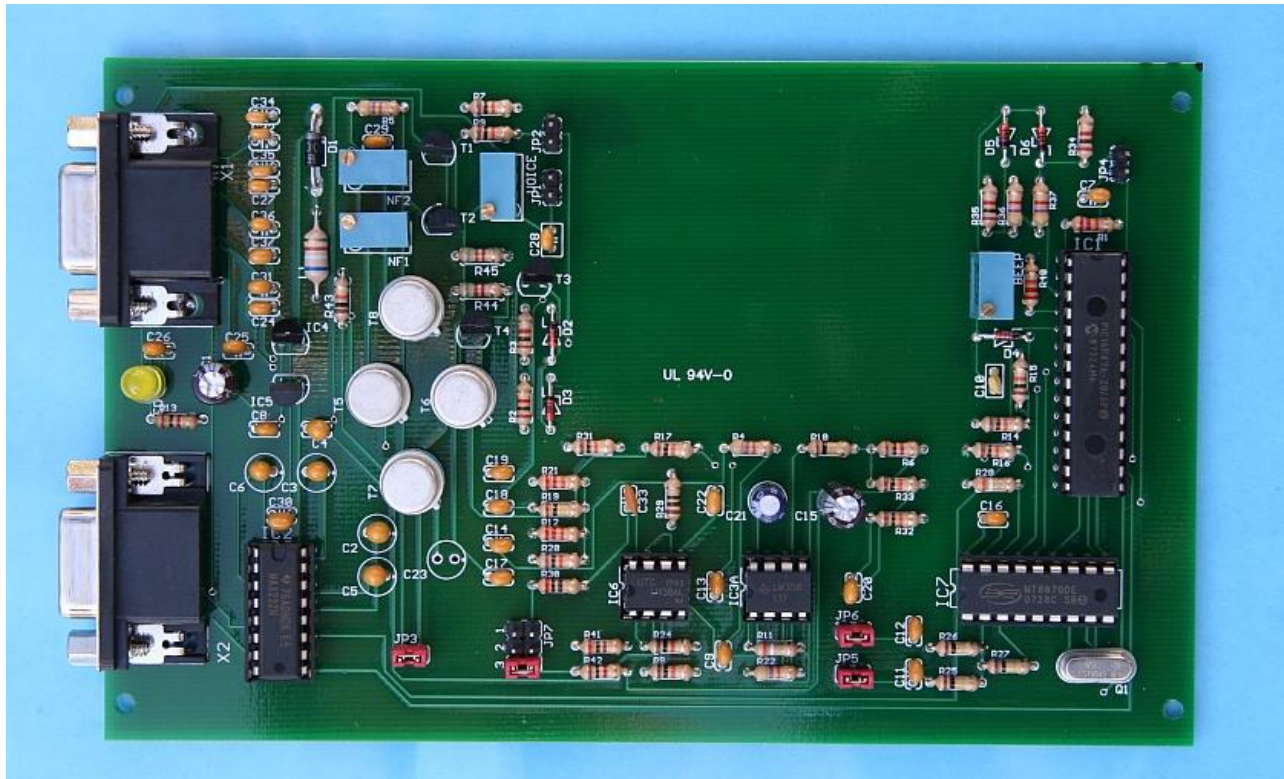


# Repeater Control Unit

## WX-Steu V1.7 HW2

PIC 16F876P



Manual and circuit diagram

ã Bernd Kernbaum, Matthias Hahn 2003 - 2012

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## INTRODUCE

Thank you for purchasing Repeater Control Unit “WX-Steuerung”

Before using this unit, read this Manual and keep them for future reference.

This unit is designed as Repeater Control Unit by amateur radio communication.

This manual is for the following hard- and software versions: hardware release from march of 2007 as eagle CAD-project and software from february of 2006 as hex-file relais17.hex ( software version 1.7 )

The choice of processors was easy. Bernd, DK3WX has well experience with the PIC processor from the Mikrochip© company. Easy for the user is, that the complete audio mixing from two receivers and for one transmitter onboard. Your radio equipment is easy connect with the repeater control unit. To minimize interference during DTMF remote, is it possible to use a 2nd optional receiver. This second channel is for remote control and priority message for the repeater sysop.

All parameters are saved in the PIC processor, an external EEPROM is not necessary. The PIC initialisation and programming take with a personal computer. You need only a simple straight cable between your personal computer and the repeater control unit.

Copyright etc. The introduce hard- and software is not public-domain.

The project was developed in teamwork, Bernd, DK3WX wrote the complete software. Matthias, DL2ROA developed the hardware.

Homepage: [www.wx-steuerung.de](http://www.wx-steuerung.de)

Please visit the online shop!

march of 2012

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## Capture 1: INTRODUCE / FUNCTION

In the following capture introduce the function from the RCU (repeater control unit )  
For details see the next captures.

**Capture 1.1** List the functions and the features

**Capture 1.2** Operation overview

### 1.1 Features overview

- Connector for one transmitter and two receiver
- Powered with DC +10 to +15 V @30 mA
- Input: audio from main and 2<sup>nd</sup> receiver, squelch
- Input to switch two alert messages „Einbruch“- burglar and aurora warning
- Output: audio for transmitter, PTT, 2 external open collector outputs
- Audio mixing with mute for DTMF tones and tone burst
- Easy configuration with personal computer and configuration file, many timers to change, 20 parameters and over 50 remote commands in 6 groups

Features:

- Serial ( RS232 ) port for configuration and software update
- Transmitter on with 1750 Hz tone burst or alternative DTMF tone or carrier controlled
- Selectable transmitter timeout
- Transmitter hold time addicted to squelch open time
- Selectable CW tone frequencies and CW tone speed
- Two different long roger beeps addicted from squelch open time
- Selectable standby call in CW and/or voice
- Call transmit in CW and/or voice in the „microphone over break“
- Burglar warning in CW for repeater cabinet or room
- Aurora warning in CW with optional aurora indicator
- Many remote control commands via 6 tone long DTMF tones
- Internal watchdog for perfect operation security
- Two open collector outputs remoteable with DTMF
- Remote control and priority messages with second receiver for Sysop
- Tone burst and DTMF Mute
- Welcome announcement ( with optional voice modul )

Remote commands:

- Tone burst ( 1750 ) decoder on/off
- DTMF open on/off
- Roger beep on/off
- Repeater-call before transmitter off on/off
- Repeater-call in preset time or in „microphone over breake
- Repeater-call beacon on /off
- DTMF tones notch on transmitter audio on/off
- Speech time limit on/off
- Welcome announcement

- Watchdogtest and software reset
- Block repeater open on 15, 60 minutes or without time limit
- Block repeater off
- Block transmitter total on/off
- Roger Beep on / off
- Save Changes in proprocessor
- Carrier control operation on/off
- Selectable transmitter on air time from 0 to 120 seconds
- Selectable carrier hold transmitter on time from 0 to 360 seconds

The RCU board is wired over an 15 pins sub-d high density connector to the repeater transmitter/receiver and the optional 2<sup>nd</sup> receiver for remote control and priority messages from sysop. The interface to the radio equipment is the audio signal from main-receiver and 2<sup>nd</sup> receiver, transmitter modulation audio. The audio level from the receivers must be greater than 450 mV RMS. This audio must be switched from the receiver squelch.

The RCU-board generate the CW-call and a roger beep. Squelch signal from receivers ( SQ1, SQ2 low active SQ3, SQ4 high active ) and the PTT for repeater transmitter. The PTT1 Output is low and PTT2 output is high.

Operation voltage for the RCU is 10 to 14 volts. The current is about 30 mA.

## 1.2 Operation

After switch on, the RCU board goes in standby state. Looked for an transmitter on signal ( 1750 Hz, DTMF open tone or simple carrier). From time to time send the repeater call in CW or/and in voice from the optional voice-chip board. The selectable transmitter on criterium are: tone call with 1750 Hz, DTMF open sign or simple carrier. Now the repeater goes in active state. After close squelch, the repeater call will be send and the timer „SQ hold“ ( parameter Q ) begin to run. A roger beep was generate after close squelch. A short beep than then parameter time „F“ not catch. Is this time longer as „F“, than the roger beep is longer. A short beep for squelch time < „F“ and a long beep for squelch time > „F“.

In the active phase the call will be send regular ( Timer D ). Set up to end of timer D or the next over break. Exist no over break ( bulletins or trouble maker carrier ), than the call we be send 1,25 after Parameter D.

Remote control is possible in active or standby. Connection to the service computer is only in standby.

Remote control commands are store in EEPROM of the PIC controller, than the PIC the command s: ( store or save ) from service computer receive.

S: via DTMF is functiongroup 4 / subfunction 8.

What is Welcome announcement mode?

This mode run only with voice modul. After open the repeater with burst tone / DTMF or Carrier. The voice modul running. After the announcement run the CW-ID and you can operate.

This mode need the follow set up:

CW-ID ( call ) and voice active – default setup

Welcome announcement mode active – function group 3 – subfunction #

Or bit Setting on service computer:  
Flagbyte x bit 0 active, bit 1 not active  
Flagbyte y bit 7 active

## **Capture 2: HARDWARE- description**

### **2.1 Circuit description**

The main part is the PIC 16F876 from Microship. MT8870 is for DTMF Decoding. The PIC decode the tone burst and generate roger beep and all other CW tones. The internal EEPROM in the PIC save all parameters and the firmware.

X1 connector for radio equipment  
X2 connector for service computer ( set up parameters or boot new firmware )

Operate voltage between 10 to 14 volts. Operate current is max. 30 mA. All audio signals mixe passive. LM386 – IC6 is audio amplifier. All audio level are adjustable. 3 Positions from JP7 for 3 transmitt audio ranges. Range 1 for around 4 mV, Range 2 for around 40 mV and Range 3 for 400 mV audio level for transmit.

Audio signal from receiver must be mute from the receiver internal squelch. Audio signal from the fm-discriminator is not useable.

Switch Outputs.  
For switch inductive loads, use antiparallel diods for protection!

Alarm inputs “Einbruch”  
“Einbruch” is the german word for burglary. Normally is this Input grounded via door switch. Then you have no door alarm switch, then please ground this Input direct. Then the door switch open, than the repeater goes in operate state and sent a 8 sign CW word in loop. Default word is “Einbruch “. This 8 sign word is editable of course ( parameter “U”). During the alarm it is possible to make traffic over the repeater. Roger Beep is switched off.

Alarm input “Aurora”  
Normally is this input grounded. In open state will be sent a 8 sign CW word only in repeater standby state. Repeating time interval is set up with parameter “J”. You can it use for what ever you want. For example: power supply monitoring or room temperature control....  
The text is editable with parameter “T”.

## 2.2 *Hardware-built*

The PCB material is high quality FR4. 100mm x 160 mm Size ( europa format )

No SMD devices.

Recommendation: Use a metal housing for the unit!

For all voice function you need a voice-chip modul. For example the voice modul from Conrad Electronic Germany or from ISD Company. ( ISD1416 )



Voice Modul 130017 from Conrad Electronic

On WX-Steu PCB are 4 Jumpers for voice modul connection:

JP1 /1 – Audio signal from voice modul

JP1/2 – start signal to voice modul – wired to the start ( play ) button from voice modul

JP2/1 - Ground

JP2/2 – operate voltage 5 V+

Onboard are 4 adjustable resistors

Beep – volume roger beep and CW-ID

Voice – volume Voice signal from voice modul

NF1 – audio level from main receiver

NF2 – audio level from 2nd receiver ( remote receiver )

## Capture 3: Remote with DTMF

### 3.1 *Remote*

A lot of parameters set up for your own repeater. You can all set up with service computer and some parameters remote over radio with DTMF tones.

A DTMF command are 6 digits. Then the PIC receive a 6 digit DTMF command, than confirm the PIC with CW sign "R" ( roger or received )

The parameter "M" is the time frame for DTMF Inputs.

After setup over radio the parameters must be saved in the internal EEPROM of PIC.  
Send the DTMF command functiongroup 4 / subfunction 8. ( s: via radio )

OM Uli DD1KU wrote a nice software for windows computer. It is for setup directly with cable connection and remote setup via radio.

Look to Homepage: [www.dd1ku.de](http://www.dd1ku.de). -> Download

### **3.1.1 2<sup>nd</sup> Receiver**

Remote is possible from main receiver and remote receiver. Remote receiver have priority.  
JP3 close – masters voice from Sysop over remote receiver.

The remote receiver AF-channel is not wired to the tone burst decoder.

Recommendation: Use as remote rx a CTCSS or tone squelch receiver on a discrete channel.

### **3.1.2 Repeater close**

You can switch repeater off, than you want. Block PTT with functiongroup 4 – subfunction 6.  
Command function 4 – 7 switch on.

Other commands see in the commands chart.

### **3.1.3 DTMF-special sign**

Repeater open sign „O“  
The first DTMF sign from a 6 sign DTMF command – “N”

O different N !

## **3.2 DTMF-function**

Syntax from a 6 digit DTMF command:

N\$\$\$\$y

y is last sign = subfunction

In the PIC setup you set 4 digit \$\$\$\$ groups.

N is the first digit

All 6 digits send in the time frame ( M – DTMF Input time )

PIC confirm with “R” in Morse code.

### **3.2.1 Function group 1: switch outputs**

2 Open Collector Outputs exist (Connector X1; Pin12 and 13 ).

This open-collector-outputs switch to ground with subfunctions.  
It is possible to switch continuous to ground or 1 second to ground.

For example switch blower, heater or make a reset from radio equipment. Or switch whatever you want.

- Subfunction 1:** Output1 switch to ground
- Subfunction 2:** Output1 switch to open wire
- Subfunction 3:** Output1 for 1 second switch to ground
- Subfunction 4:** Output2 switch to ground
- Subfunction 5:** Output2 switch to open wire
- Subfunction 6:** Output2 for 1 second switch to ground

### **3.2.2 Function group 2: ordinary parameters**

- Subfunktion 1:** Repeater open with tone burst 1750 Hz not allowed. Activate only with DTMF open sign, ( O ) ton burst decoder off
- Subfunktion 2:** 1750Hz tone burst decoder on ( default )
- Subfunktion 3:** DTMF open on ( default )
- Subfunktion 4:** DTMF open off
- Subfunktion 5:** roger-beep on ( default )
- Subfunktion 6:** roger-beep off
- Subfunktion 7:** call before transmitter on ( default )
- Subfunktion 8:** call before transmitter off
- Subfunktion 9:** call output cyclical timer ,D‘
- Subfunktion 0:** call in the next over break of microphone over after countdown ,D‘

No over break, than the call will be sent 1,25 D

### **3.2.3 Funktion group 3: ordinary parameters**

- Subfunktion 1:** CW-call off, than voice-call
- Subfunktion 2:** CW-call on, than no voice-call
- Subfunktion 3:** CW-call and voice-call ( first voice, than CW ) ( default )
- Subfunktion 4:** beacon on ( timer ,H‘ )( default )
- Subfunktion 5:** no beacon
- Subfunktion 6:** burst tone mute
- Subfunktion 7:** burst tone not mute ( Default )
- Subfunktion 8:** DTMF mute on( Default )
- Subfunktion 9:** DTMF mute off
- Subfunktion 0:** speak time limit on
- Subfunktion \*:** speak time limit off
- Subfunktion #:** Welcome announcement on

### 3.2.4 *Function group 4: Repeater on / off*

<b>Subfunktion 1:</b>	watchdog test and software RESET
<b>Subfunktion 2:</b>	block open 15 minutes
<b>Subfunktion 3:</b>	block open 60 minutes
<b>Subfunktion 4:</b>	block open without time limit
<b>Subfunktion 5:</b>	reset block open
<b>Subfunktion 6:</b>	block transmitter ( PTT is blocked, no „R“ or Standby-Call )
<b>Subfunktion 7 :</b>	transmitter blocking off
<b>Subfunktion 8:</b>	save parameters ( s:-command via DTMF )
<b>Subfunktion 9:</b>	Carrier operation on
<b>Subfunktion 0:</b>	Carrier operation off ( default )

### 3.2.5 *Funktion group 5: Tx on time in seconds ( Timer ,G‘)*

<b>Subfunktion 1:</b>	0
<b>Subfunktion 2:</b>	1
<b>Subfunktion 3:</b>	2
<b>Subfunktion 4:</b>	3
<b>Subfunktion 5:</b>	4
<b>Subfunktion 6 :</b>	5
<b>Subfunktion 7:</b>	10
<b>Subfunktion 8:</b>	15
<b>Subfunktion 9:</b>	20
<b>Subfunktion 0:</b>	30
<b>Subfunktion *:</b>	40
<b>Subfunktion #:</b>	60
<b>Subfunktion A:</b>	90
<b>Subfunktion B:</b>	120

Default is the parameter ,G‘

### 3.2.6 *Funktion group 6: Carrier on time in seconds ( Timer ,Q‘)*

<b>Subfunktion 1:</b>	0
<b>Subfunktion 2:</b>	4
<b>Subfunktion 3:</b>	5
<b>Subfunktion 4:</b>	7
<b>Subfunktion 5:</b>	10
<b>Subfunktion 6:</b>	15
<b>Subfunktion 7:</b>	30
<b>Subfunktion 8:</b>	60
<b>Subfunktion 9:</b>	120
<b>Subfunktion 0:</b>	360

Default is parameter ,Q'

## 4:Electrical Interface

### 4.1 Connector DSUB-15 HighDensity Female and DSUB-9 Female

X1 DSUB-15 High Density Female

Pin		Remark
1	Supply voltage	max. 15 Volt / 30 mA
2	Squelch main receiver ( SQ1 )	low active
3	Squelch 2nd receiver ( SQ2 )	low active
4	Rx-audio main receiver	> 450 mV RMS
5	Rx-audio 2nd receiver	> 450 mV RMS
6	Transmitter audio modulation	4 to 700 mV RMS
7	Squelch main receiver ( SQ3 )	high active
8	Squelch 2nd receiver ( SQ4 )	high active
9	Transmitter on ( PTT2 to Operate voltage )	max. 40V/800mA
10	Input aurora-warning	normally close
11	Input broke in warning	normally close
12	Output Out1	Open Collector 15V/1A
13	Output Out2	Open Collector 15V/1A
14	Transmitter on ( PTT1 to ground )	Open Collector 15V/1A
15	Ground	GND

Please connect SQ1 **or** SQ3 for main receiver

And SQ2 **or** SQ 4 for remote receiver

Use PTT1 **or** PTT2

X2 DSUB-9 Female ( RS232 ) for service computer

Pin	
1	n.c.
2	TxD
3	RxD
4	n.c.
5	Ground
6	n.c.
7	CTS
8	RTS
9	n.c.

## **4.2 DTMF-Decoder IC 8870**

DTMF decoder IC is G8870, MT8870 or TC35300BP.

## **Capture 5: PIC-boot and Personalizing**

### **5.1 PIC boot**

The Unit was shipped with the newest firmware version.

The ordinary user please jump to Capture 5.2 !

For firmware update use the RS-232 from your computer and the hyper terminal software from windows.

The follow setup:

Baudrate: 9600 Baud

Databits: 8

Parity: no

Stopbits: 1

Handshakeprotocol: Hardware

Connect a 9-SUD-cable between computer RS232 and unit.

You need the firmware file relaisxx.hex!

Unit Power off. Start terminal software. Close Jumper 4 and switch power on.

Monitor output. "Boot"

Open jumper 4 and send the new firmware as **text-file** into the PIC.

You see on the monitor HEX-Sign or dots lines. After about 30 second you see "OK" on the end of the lines. Now Power off

Wait some second – power on

Now close jumper 4 for some seconds ( Loading default parameters from the memory into the EEPROM ) – Ready!

Now you can personalize the PIC with your own setup.

### **5.2 PIC-Setup**

Connect a 9-SUD-cable between computer RS232 and unit

For Setup use the RS-232 from your computer and the hyper terminal software from windows.

The follow setup:

Baudrate: 9600 Baud

Datanbits: 8  
Parity: no  
Stopbits: 1  
Handshakeprotokol: Hardware

Connect Pin 10 and Pin 11 from X1 with ground ( alarm input not active ) !

Power on

Input on computer. "v:" enter  
Output on monitor: Relais 1.7 OK

Connection is ok.

Input on computer: "@:" enter

Output on monitor:

A=1000  
B=100  
C=TEST  
D=06000  
E=36000  
F=00020  
G=00200  
H=09000  
I=00050  
J=03000  
K1=2341  
K2=2342  
K3=2343  
K4=2344  
K5=2345  
K6=2346  
M=00050  
N=\*  
O=1  
P=01750  
Q=00100  
R=00030  
T=AURORA  
U=EINBRUCH  
W=00001  
X=00111101  
Y=00000001  
OK

The follow charts explain all parameters.

**Chart 1 configuration commands via RS232**

<b>Para meter</b>	<b>meaning</b>	<b>Default</b>	<b>Remark</b>
A	Tone frequency	A:800	steps in 100 Hz from 100Hz bis 1600Hz Default: 800
B	Morse speed	B:80	20 bis 160 sign per minute  Default: 80
C	Call	C:DB0XYZ	Call (6 signs), for less use „_“ Default: TEST__
D	Timer Call repeat	D:6000	600,0 seconds call output Default: 10 Minutes
E	Timer speak time limit	E:36000	Default: 60 Min
F	Timer SQ min time	F:20	Is the signal lenght shorter, the repater close 20 = 2 seconds
G	Timer on time	G:300	After TXHOLD foll back in stby Default: 30 Sec
H	Timer Call repeat Standby	H:9000	900,0 Sekunden Call output in stby Default: 15 Minute
I	Timer Voicehold	I:70	Play time from voice modul Default: 7 Seconds
J	Timer Aurora	J:3000	300 s aurora warning only in standby mode Default: 5 Min
K	DTMF commands	K:1,2341 ..... K:6,2346	Sequence for DTMF function group 1 ... 6, Sign 2.-5 from 6 sign command
L	Save all DTMF sequences	L:	
M	DTMF Input time	M:100	Input time for DTMF command Default: 10 s
N	DTMF start sign	N:1	Start sign from DTMF command Default: 1
O	DTMF Open	O:2	DTMF sign for open repeater Default: 2
P	Tone burst frequency	P:1750	200 to 2400 Hz in 10 Hz steps Default 1750 Hz
Q	Timer sqhold	Q:100	Timer, in this time open with carrier Default: 10 s
R	Tone burst bandwith	R: 30	Bandweigth tone burst decoder (1750Hz +/- R) 0 ... 150 Hz in steps from 10 Hz. Default:30
S	save in EEPROM	S:	SAVE
T	Text Aurora	T:AURORA__	Aurora text (8 signs) Default: AURORA__

			For less signs use “ _ ”
U	Text burglary	U:EINBRUCH	text for burglar alarm (8 signs ) Default: EINBRUCH (german word for burglary ) For less sign use “ _ ”
V	Output version	V:	Softwareversion
W	Tone burst time	W:	1 step is 200 ms 1...127 wait of closing SQ 129 ... 254 open without closing SQ Default 1 ( 200ms + SQ closing )
X	FlagByte1	X:255	all bits active, show chart 2 Default: 255
Y	FlagByte2	Y:0	No bit active , show chart 3 Default:0
@	Output all parameters	@:	All parameters on the monitor

Now you can edit each parameter.

For example the Call ( CW-ID )

Input : c:vk0abc (enter) ( 6 signs, you need less signs, than use „\_“ )

Output monitor: „OK“

You can edit all parameters step by step.

Important!

The last command on your setup is l: ( save DTMF sequences ) and s: ( save all other parameters )

A better and quickly way:

Write a simple txt-File in a text editor with all parameters and send it via hyper terminal to the PIC. -> Capture 5.3

After configuration disconnect the computer from unit.

Flagbyte x and y is for power on setup:

Default Flagbyte x : 255 and Flagbyte y : 0

**Chart 2 Flagbyte 1 = x ( see chart 1 )**

Bit	meaning	Standard	value Bit
0	CW ID Output	1	1
1	Voice Output	1	2
2	Tone burst open	1	4
3	DTMF open	1	8
4	Rogerbeep	1	16

5	Call Standby	1	32
6	Call before close	1	64
7	Call cyclic ( or over break )	1	128

Default: OffHex -> 255 Dez ( all bits active )

### Chart 3 Flagbyte 2 = y ( see chart 1 )

Bit	meaning	Standard	value Bit
0	Burst tone mute	0	1
1	DTMF mute ( 1 not mute )	0	2
2	Speech time limit on ( 1 = off )	0	4
3	Open block time limit	0	8
4	Open block without time limit	0	16
5	PTT block	0	32
6	Carrier open	0	64
7	Welcome announcement on ( 1 = off )	0	128

Default: 0 ( alle Funktionen aus – alle Bits 0 )

### 5.3 Syntax of parameter file

Parameter file is a text file with ending .txt

In this file all parameters stay in lines.

The end of parameter is the sign “;”

Important: Save command l: and s: on the end of lines

You can write this file with any text editor software

Here an example for a parameter file:

```
v;;          Version number output
a:600;      CW tone frequency
b:90;       CW Speed in word per minute
c:db0abc;   Call ( 6 signs, less use „_“ )
d:5500;     Timer Call repeat 550 s
e:36000;    speech time limit 3600 s
f:20;       SQ open minimal time 2 s
g:150;      Tx open time 15 s
h:9000;     Standby call repeat 900 s
i:65;       play time voice modul 6,5 s
k:1,9156;   function group 1 Code 9156
k:2,4146;   function group 2 Code 4146
k:3,4938;   f. g. 3 Code 4938
k:4,8914;   f. g. 4 Code 8914
k:5,6706;   f. g. 5 Code 6706
k:6,3027;   f. g. 6 Code 3027
m:15;       DTMF Input frame time 1,5s
n:*;        DTMF Start sign „*“
o:2;        DTMF Open „2“
q:0;        Carrier open time 0 s
r:30;       burst call bandwidth +/- 30 Hz
```

```

x:127;      Flagbyte 1 Call in over break
l;;        Save DTMF-sequencies
s;;        Save all in EEPROM
@;;        output all parameters on monitor
;end

```

DTMF Sequence 1111 is well for blocking from function group or groups.

Use 1111 and the group is not remotable via radio. The PIC confirm wit "R", but nothing happens.

#### 5.4 DTMF-function-codes

See our example and look what happens:

```

* 9 1 5 6 1   Output1 switch to GND
* 9 1 5 6 2   Output1 switch to open wire
* 9 1 5 6 3   Output1 switch to 1 second to GND
* 9 1 5 6 4   Output2 switch to GND
* 9 1 5 6 5   Output2 switch to open wire
* 9 1 5 6 6   Output2 switch to 1 second to GND

* 4 1 4 6 1   burst tone decoder off
* 4 1 4 6 2   burst tone decoder on
* 4 1 4 6 3   DTMF open on
* 4 1 4 6 4   DTMF open off
* 4 1 4 6 5   Roger Beep on
* 4 1 4 6 6   Roger Beep off
* 4 1 4 6 7   Call before standby on
* 4 1 4 6 8   Call before standby off
* 4 1 4 6 9   Call cyclic
* 4 1 4 6 0   Call in over break

* 4 9 3 8 1   only voice output
* 4 9 3 8 2   only CW-ID output
* 4 9 3 8 3   voice and CW-ID output
* 4 9 3 8 4   CW ID in standby on
* 4 9 3 8 5   CW ID in standby off
* 4 9 3 8 8   DTMF mute
* 4 9 3 8 9   DTMF not mute

* 8 9 1 4 1   Watchdog test and Software RESET
* 8 9 1 4 2   block open for 15 Min
* 8 9 1 4 3   block open for 60 Min
* 8 9 1 4 4   block open without time limit
* 8 9 1 4 5   block open reset
* 8 9 1 4 6   block PTT on
* 8 9 1 4 7   block PTT off
* 8 9 1 4 8   Save all Changes

```

- \* 8 9 1 4 9 Carrier operation on
- \* 8 9 1 4 0 Carrier operation off

- \* 6 7 0 6 1 Tx hold time 0 Sec
- \* 6 7 0 6 2 Tx hold time 1 Sec
- \* 6 7 0 6 3 Tx hold time 2 Sec

See 3.2.5

- \* 3 0 2 7 1 SQ open time 0 Sec
- \* 3 0 2 7 2 SQ open time 4 Sec

See 3.2.6

## 5.5 Remark to timer parameters

### **TxHold and SqHold:**

TxHold is setup with parameter „G“ or function group 5 via DTMF

SqHold is setup with “Q” or function group 6 via DTMF

### **Roger Beep:**

Roger Beep is send after closing SQ.

Parameter A and B setup beep length and beep frequency

Is the time between two SQ Opens shorter as “F” than is the Beep shorter factor 3

### **Speech time limit:**

Speech time limit is setup with „E“

Switch on / off via DTMF

Default is 36000 = 3600 s = 60 min = 1 h

### **DTMF-length:**

Each DTMF tone not less 40 ms! Decoder need 40 ms or more for decoding.

### **DTMF-Timeout:**

DTMF Input time frame.

### **Standby-Call:**

Standby call repeat time setup with Parameter „H“  
Default is H=9000 = 900 s = 15 Min

### **Call during operation ( Call cyclical )**

During Operation Call will be sent  $n \cdot 0,1$  Sec. ('D')  
Default: D = 6000 ( 600 s = 10 Min )

### **Call during operation ( Call in over break )**

Call will be sent in next over break after "D"  
No overbreak -> obligation call after  $1,25 \times "D"$

### **Timer Voicehold**

Playtime voice modul  
Default is 50 = 5 s

### **Timer Aurora**

Timer Aurora J set up all  $J \cdot 0,1$  Sec sent „Aurora“. This alarm is active than Pin 10 from X1 open.  
Default J = 3000 = 300 Sec = 5 Min

### **Burst tone bandweigth**

Timer R set up the burst tone decoder bandweigth. Default is +/- 30 Hz.

### **Carrier operate**

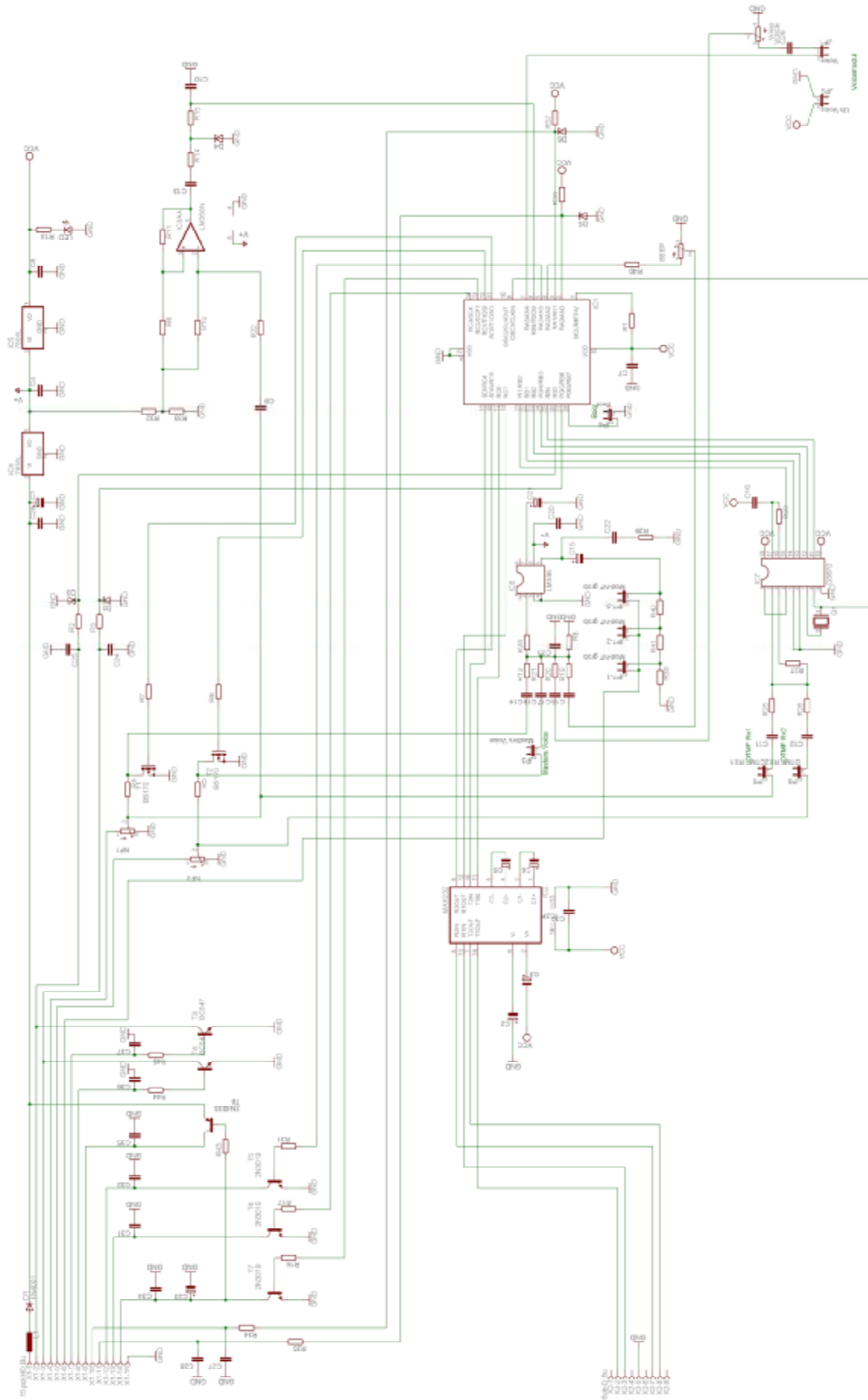
Set up bit 6 in flagbyte 2 activ or via DTMF function group 4 subfunction 9

Off with group 4 subfunction 0.

**Capture 6: part list / hardware**

<b>6.1 Part list RCU WX-Steu</b>	<b>Quantity</b>	<b>Remarks</b>
<b>Part</b>		<b>Remark</b>
IC1	1	PIC16F876P wx-st
IC2	1	MAX232
IC3	1	LM358N
IC4	1	78L08
IC5	1	78L05
IC6	1	LM386
IC7	1	CM8870
Q1	1	X-tal 3,5795MHz
T1, T2	2	MOSFET BS170
T3, T4	2	Transistor BC546A
T5, T6, T7	3	Transistor 2N3019 or BC141
T8	1	Transistor 2N4033 or BC161
D1	1	Diode 1N4007
D2, D3, D4, D5, D6	5	Z-Diode 5V
LED1	1	LED
Holder IC1/1/2	2	Holder DIL14
Holder IC2	1	Holder DIL16
Holder IC3, IC6	2	Holder DIL8
Holder IC7	1	Holder DIL18
X1	1	Connector HD15
X2	1	Connector 9pin
R29	1	10
R30	1	20
R41	1	200
R2, R3, R6, R13, R34, R35, R42	7	1k
R36, R37	2	4k7
R18, R23, R38, R39	4	4k7 adjustable
R44, R45	2	5,1k
R7, R8 ,R9, R14, R15, R16, R17, R20, R24, R31, R32, R33, R43	13	10k
R1, R12, R21, R40	4	22k
R4, R5, R22	3	47k
R10, R19, R25, R26, R27	5	100k
R11, R28	2	390k
C10	1	220p
C33	1	680p
C24, C25, C26, C27, C28, C31, C32, C34, C35, C36, C37	11	10n
C2, C3, C4, C5, C6	5	2,2µ
C7,C8,C9, C11, C12, C13, C14, C16, C17, C18, C19, C29	12	100n
C20, C22, C30	3	47n
C21	1	10µ
C1, C15	2	100µ
JP1-6	18	Stiftleisten
PCB	1	PCB wx-st HW2
L1	1	680µH
C23 optional , for PTT Delay	0	10... 47 µF

Repeater Control Unit WX-SteuV1.7



## **Capture 7: software versions history**

### *7.1 uP-Software-Versions*

Version 1.0 ( May 2003 )

Version 1.1 (July 2003 )

- new parameter: R, @

Version 1.2 ( August 2003 )

- output all DTMF paramter with @

Version 1.3 ( October 2003 )

- carrier operation
- burst tone mute

Version 1.4 ( July 2004 )

- for fire fighter, "P" - decoder burst tone range 200-2400 Hz, default 1750

Version 1.5 ( February 2005 )

- shorter delay time

Version 1.6 ( August 2005 )

- Welcome announcement
- New default parameter for A, B, I, G, M, O, N, DTMF mute default off
- Carrier delay set to 4 Sec

Version 1.7 ( February 2006 )

- New parameter W

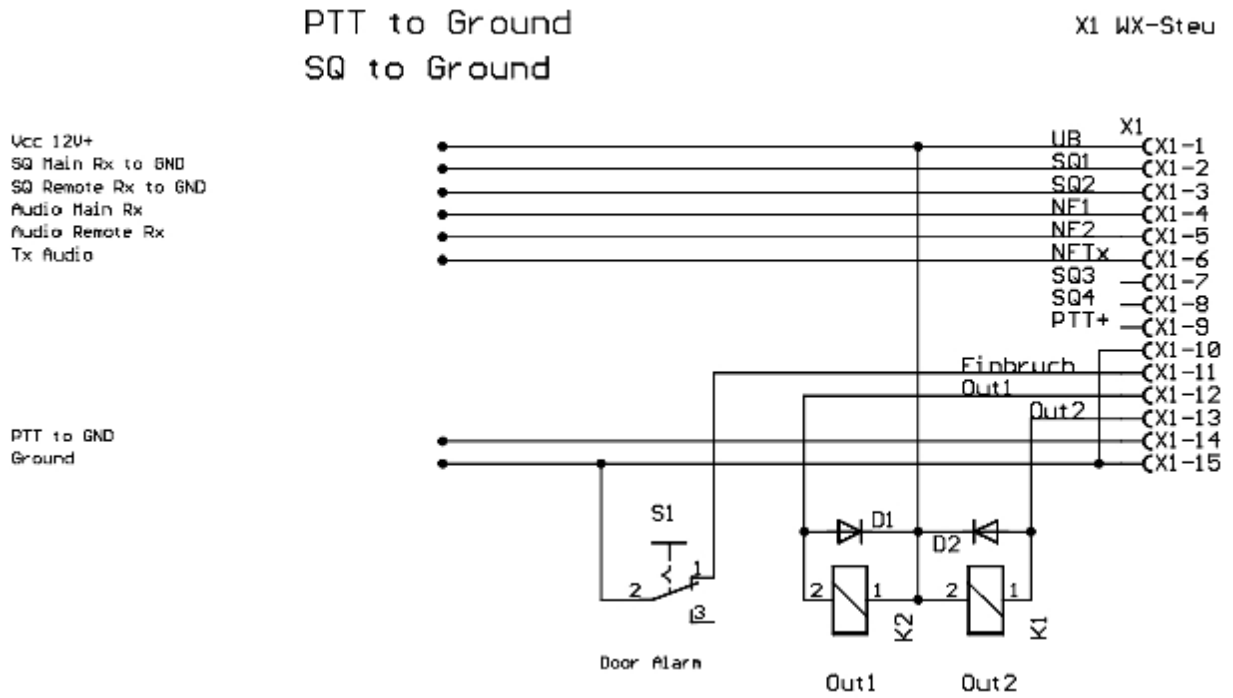
**Always remember: It's not a bug, it's a feature !**

## Standard application

PTT to Ground

Squelch to Ground

( Motorola GM300, GM350, GM900, GM950, Bosch KFS..7, KF..8, MR11, Tait800, MSF1000 u.v.a. )



PTT to high ( operate voltage )  
 Squelch to High

