MICROPROCESSOR CONTROLLED TONESYSTEM.

GENERAL_DISCRIPTION

(TP3000)

MICROPROCESSOR CONTROLLED TONESYSTEM.

GENERAL DISCRIPTION

The TP 3001 µp tonesystem is developed in accordance to the well known
European selective call system standards "CCIR" and "ZVEI".
These two standards and one local are included in the basic software.

Normally the tonesystems are used to receive and transmit a 5 or 4
tone call.
But a tendency of a more sophisticated use is apparent.
In systems using a repeater, a 5 tone call is often used to activate
the repeater.
This means that two 5-tone codes must be transmitted. 1 for repeat and
1 for the call.

It is often very time saving to know the identity of the calling station.
In order to achieve that an identity code must be transmitted and
displayed at the called station.
This means, that a modern tonesystem must be able to transmit at least
3 times 5 tone sequencies.
The TP 3001 µp tonesystem is capable af transmitting and receiving 3
times 8 tones plus 1 intermidiate tone (B). The B tone is located
between the call sequence and "ID" sequence.
Further more TP 3001 µp is capable of receiving any "group call" and
"all call" code.

If the driver is not at his car, it is useful to have a memory for
calls, so when returning he can go through the "stack" of incoming
calls and call back in turn.
The TP 3001 µp is capable of memorizing up till 25 incoming calls.

If the network uses pagers, it is possible in the TP 3001 µp to program
the number of the pager into a memory. When the mobile is called, the
no. in the memory is transmitted and the pager will respond. This is
a very usefull feature.

TP 3001 µp is capable of surveilling an arbitrary ID code. If a certain
mobile is not responding to your call, the number is put under surveillance.
As soon as the number appears in the air, positioned as an ID that is,
you will be alerted.

The facility to recall the last transmitted no. is included in the
TP 3001 µp.
8 Short number calls are programable, and several other features are
included.
Typical for all these features and functions are, that all are programable
from the Control panel.
In some networks it is often the driver who carries the call number.
In these cases it is very useful to have an easy change of call number,
when the driver goes from one car to another.
In the TP 3001 µp, you may simply change your ID code directly from
the control panel. This abillity is normally secured by an access code.

MICROPROCESSOR TONESYSTEM.

TECHNICAL DESCRIPTION

TONERECEIVER.

The LF-signal (60-250 mV) is led through IC 9, where it is cleaned
for noise, amplified and multiplied by 4.
Hereafter the signal is divided by 4 in IC 8, so that again fout= fin.
It is further inverted by transistor T 7, because the NMI input of
the µp, IC 1 must be "1" when the divider IC 8, is reset at pin 15.
This reset is generated by the NMI routine, after each check of input
frequency.
The input frequency, LF in, is constantly measured by the NMI routine.
These measurements are delivered to the TRX routine in the main program.
The NMI is stopped during programming of Registers and Shortnumbers.
When the TRX routine in the µp is activated, this routine starts to
receive a call. At this state, it is not decided whether the call is
valid or not, merely if it includes the correct number of tones.
"ID is not neccessary for this routine, even if it is used, but it
well be accepted if present.
Hereafter it is checked if the received call is identical with the
programmed numbers. If that is the case, the tone system will react,
by audio and visual indications.

TONE TRANSMITTER

When the tone key is activated, the µp "TTX" routine is called.
This routine starts by investigating whether the correct numbers of
tones are tipped in, either direct or via the short number keys.
Then the routine checks if a "repeatercall" will precede and an "ID"
succeed the call. Then the complexed call is transmitted, by means
of timer 1, IC 5, and according to the actual tonetabel.

SERIAL INTERFACE

Volume, channelregister and display are all controlled via a serial
bus.
This "bus" has common "clock" and "data" and a seperate "select" control
for each unit.
For further control af the display a "comdat" and "busy" command is
used.

PARALLEL INTERFACE.

The parallel interface is used to input keyboard data.
It consists of four "data" input and a "strobe", when "strobe" receives
a positiv edge, the CA1 input stops all other functions in order to
collect the data input.
These data are immediately delivered to the display.

PROGRAMMING INSTRUCTIONS.

Install the special 30 pin multiplug with the built in programming switch, between the station and the controlpanel.

Get into the programming mode by pressing the programming switch while the station is switched "ON".

The display now writes "CODE" asking for a 4 figure accesscode.

Write the code and the display indicates by "--" that you have access to the programming registers.

The list below will view the amount of registers and explain the functions.

WHEN PROGRAMMING: Always start by programming register 30. if, for any reason, reg. 30 has been programmed, registers 31-37 and 40 <u>MUST</u> be reprogrammed.

After programming register 30, the station always returns to normal mode and the programming procedure must be started again.

Every keystroke is followed by a short acoustic "BEEP".

False inputs are indicated by a longer "BEEP".

When during programming, a keystroke is regretted, push ⟨✳⟩ and ⟨▽⟩ , or wait for the automatic resetting.

System fault is indicated by a continuos "BEEP", this means that the circuit must be repaired or the EE-prom reprogrammed.

Clearing a register is done by selecting the wanted register number. Then press ⟨✳⟩ and ⟨♪⟩ . A long "BEEP" indicates that the register has been cleared.

REGISTER NO.	REGISTER NAME.	CODING AND FUNCTIONING
00	Rx channel code	Two-8 bit codes pr. channel write "0" and "1" for band code and channel code
01	Tx channel code	
02	Max. number of channel	Max. no. are 90, always write two figures.
03	Speaker on - off	"1" not open when called "0" open when called
04	Horn alert length	Input 2 digits from 00-99. 99 means 9,9 sec.
05	Memory size	Input 2 digits from 00-25 setting the amount of calls to be memorized.
06	Number of ringings	Input 2 digits, max. is 10 times "00" means no ringing.
07	Pure ID system	"1" means ID is sent when keying and displayd when received. "0" means not in use.
08	Autovolume	"1" volume reduced to min. when 2nd tone received. "0" not in use.
09	Tonesystem choice	"0" AP tonesystem. "1" CCIR tonesystem. "2" ZVEI tonesystem.
10	Access code	Input any 4 digits after "pass ----". "0000" means no code.
30	Call construction	Max. 8 digits. Selectable figures are "#". Sp. off is repeat tone "E" end is "TTX".
31	Tonelength	"0" is normal length. "#" is extended.
32	"Basestation call" code	Input only selectable digits.
33	"Repeater call" code	Input only selectable digits.
34	"Horn alert" code	Input only selectable digits.
35	"All call" code	Input only selectable digits.
36	"Group call" code	Input only selectable digits.
37	"ID" code	Your own call number, input selectable digits only.

CHANNEL PROGRAMMING OF TP 3000 Up.

In order to programme channels into the TP 3000 Up a code board
TP 164 must be installed and connected according to the instructions.

Channelprogramming are carried out via the control panel by authorized
personel.

PROGRAMMING PROCEDURE:

Programming steps.

1. Get into the programming mode.

2. Enter the 4 figure accesscode.

3. Enter the reqister 00 for Rx channel code.

4. Enter the channel no. you wish to programme.

5. Enter the 7-bit Rx channel code and the 8-bit band code.

6. Enter the register 01 for Tx channel code.

7. Enter the same channel no. as before.

8. Enter the 7-bit Tx channel code and the 8 bit band code.

9. Enter 99 to get back into the user mode.

PROGRAMMING EXAMPLE.

We want to programme channel 1 Rx 160,150, Tx 160,750 MHz.
Calculate the channel and band codes:

For the Rx frequency we have:

$$\frac{160,150 + 21,4}{0,025 \times 32} = 226,9375 \text{ we choose 226 as band code.}$$

and 0,9375 x 32 = 30 as channel code.

For the Tx frequency we select the same band code: 226 that gives
us a channel code figure of 54.

We have <u>Rx: channel code</u>   <u>band code</u>

     64 32 16 8 4 2 1   128 64 32 16 8 4 2 1

      0 0 1 1 1 1 0   1 1 1 0 0 0 1 0

And <u>Tx channel or</u>

      0 1 1 0 1 1 0   1 1 1 0 0 0 1 0

Then we start the programming.

                                                <u>DISPLAY</u>

Step 1 : Get into the programming mode   C O D E _ _ _ _

    2 : Our access code is „2000"   - -

    3 : Enter „00" for Rx   0 0   0 0

    4 : Enter channel no. 01   - - - - - - - -

    5 : Enter the 7-bit channel code starting   1 2 4 8 16 32 64 x
        with the least significant bit

                                          0 1 1 1 1 0 0 -

                                        enter either „0" or „1"

        And the 8-bit band code starting
        with the LSB.   0 1 0 0 0 1 1 1

    6 : Enter „01" for Tx   0 1   0 2

    7 : Enter channel no. 01   - - - - - - - -

    8 : Enter 7-bit channel code for Tx.   0 1 1 0 1 1 0 _

REGISTER NO.	REGISTER NAME	CODING AND FUNCTIONING
39	"Mobile alert" code	Input selectable digits only.
40	"ID code" transm/not transm.	"1" transmitted. "0" not transmitted. (not displayd)
41-49	"Short numbers"	Input selectable digits (may also be progr. in user mode).
50	"Base alert" code	Special alert code for base-station Rx. Input selectable digits.
88	Version no.	A 2 figure no.
89	Dealers code	A 2 figure no.
99	Return to user mode	No input.

Enter the 8-bit band code   `   0 1 0 0 0 1 1 1

Step 9 : Enter „99" and you will return to user mode.

     Check that the frequencies of the programmed channels are
     correct.

In order to illustrate the easyness in programming the system, an example is used.

A costumer wants a tonesignaling system in the following manor.

Tonesystem   : CCIR 5 tones.

Call construction   : 6RXRX, that is 2 selectable digits.

Tone length   : All tones 100 ms.

ID (own no.)   : 25

Repeater call   : 05

ID transmit yes/no   : Yes.

Horn alert code   : 30

Max. no. af channels   : 1

Speaker open yes/no   : yes.

Horn alert length   : 2 sec.

Memory size   : 10 (no af memorized calls)

Group call   : 50

All call   : 00

Auto volume yes/no   : Yes.

No. of rings   : 2

Access code   : 2010

Start by getting the station into the programming mode as descriped.
If the factory access code i s 1060 following procedure is carried out.

REG.NAME	INPUT	DISPLAY	INPUT	DISPLAY
		>CODE---<	1060	>CODE 1060<
Access code	10	>PASS----<	2010	>-- <
Call construct	30	>_-------<	6 # #	>01 EE<

The station returns to normal mode and the programming procedure must
be started again.

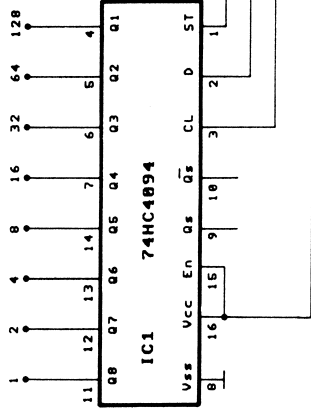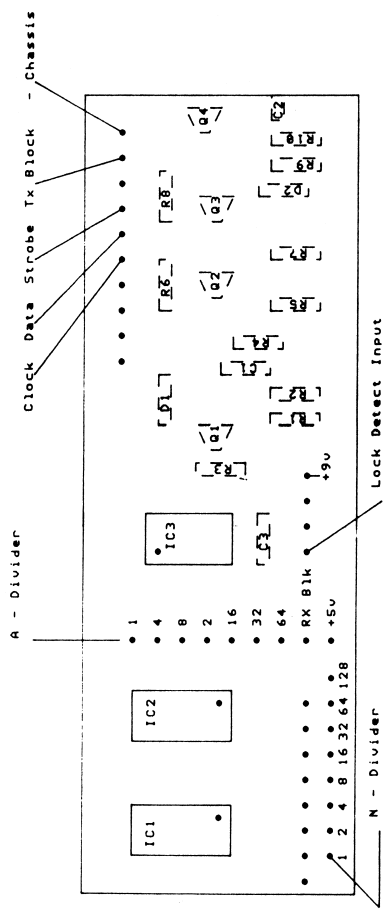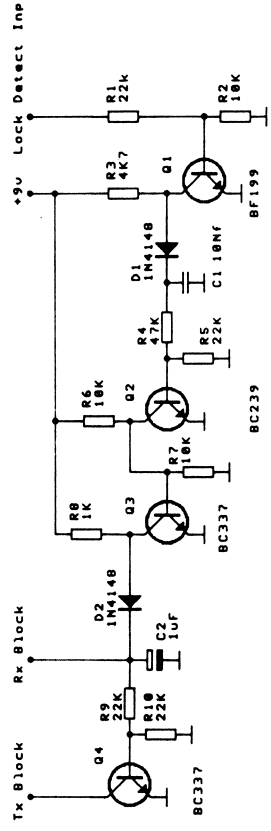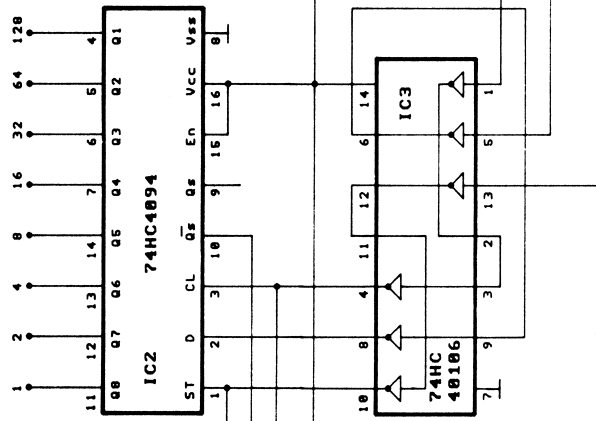| REG.NAME	INPUT	DISPLAY	INPUT	DISPLAY
Tone length	31	>_-------<	00000	>-- <
ID (own no.)	37	>37 EE<	25	>-- <
Repeater call	33	>33 EE<	05	>-- <
ID transmit	40	>40 -<	1	>-- <
Horn alert	34	>34 EE<	30	>-- <
Max. channels	02	>02 09<	01	>-- <
Speaker open	03	>03 1-<	0	>-- <
Horn length	04	>04 25<	20	>-- <
Memory size	05	>05 25<	10	>-- <
Group call	36	>36 EE<	50	>-- <
All call	35	>35 EE<	00	>-- <
Autovolume	08	>08 0-<	1	>-- <
No. of rings	06	>06 05<	02	>-- <

This completes the programming.

Press 99 to get beck into the user mode or wait for the automatic return.

N – DIVIDER

A – DIVIDER

+9v Lock Detect Inp

R1 22k
R2 10k
R3 4K7
Q1 BF199
D1 1N4148
C1 10Nf
R4 47K
R5 22K
R6 10K
Q2 BC239
R7 10K
Q3 BC337
R8 1K
D2 1N4148
C2 1uF
Rx Block
R9 22K
R10 22K
Q4 BC337
Tx Block

+5v
C3 1nF

Clock
Data
Strobe

IC2 — 74HC4894

128	Q1	Vss	4
64	Q2	Vcc	5
32	Q3	En	6
16	Q4	Qs	7
8	Q5	Qs̄	14
4	Q6	CL	13
2	Q7	D	12
1	Q8	ST	11

IC3 — 74HC 40106

IC1 — 74HC4894

128	Q1	ST	4
64	Q2	D	5
32	Q3	CL	6
16	Q4	Qs̄	7
8	Q5	Qs	14
4	Q6	En	13
2	Q7	Vcc	12
1	Q8	Vss	11

A – Divider
Clock Data Strobe Tx Block – Chassis

1
4
8
16
32
64
RX Blk
+5v

N – Divider
1 2 4 8 16 32 64 128

IC1 IC2 IC3

Q4 C2
R10 R9
D1 D2
R8 Q3
R6 Q2
R4 R5
Q1
R2 R3 R1

+9v
Lock Detect Input

µP Controlled Tone En-/Decoder
Standard Version
TP 160c

TP RADIO

revision	JH	scale		sign.	JS
90-06-22				date	24 89 89
				drawing no.	EA3 - 898984

µP Controlled Tone En-/Decoder
"Secretess"
TP 160c - 1

TP RADIO

revision	scale	date	sign.
		30-09-89	JS
		drawing no.	
		EA3 - 890905	
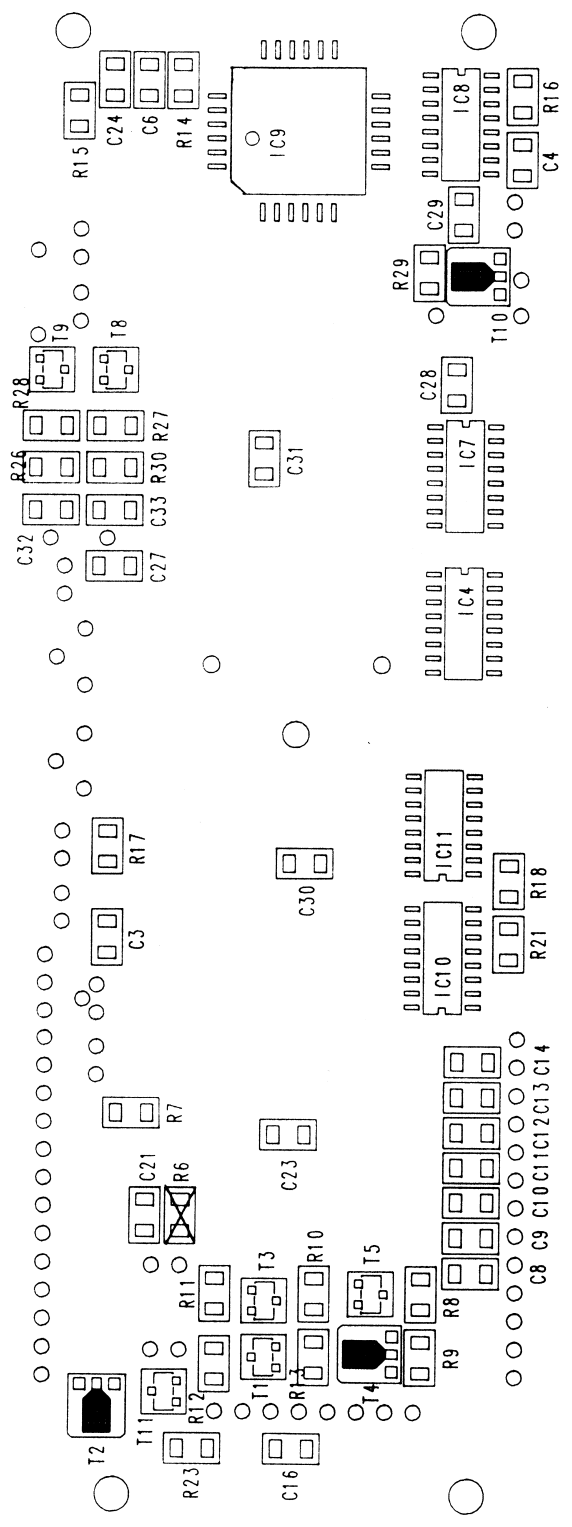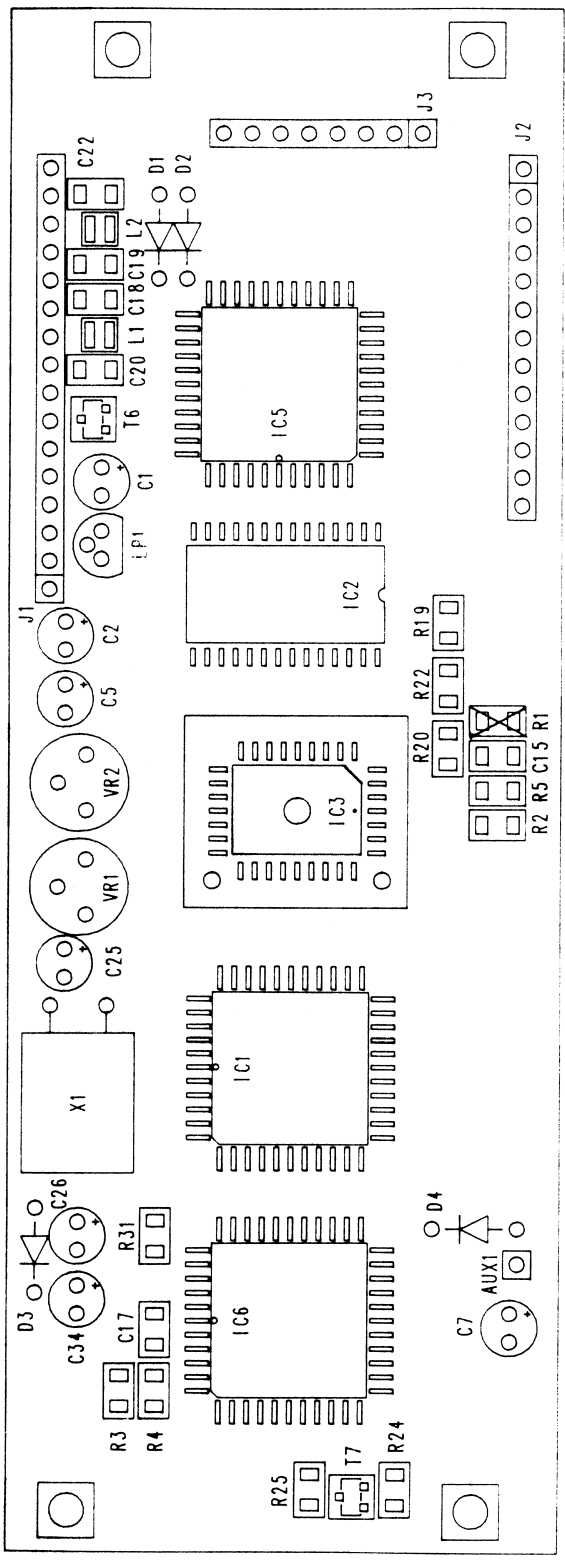
J3

J2

C22

D1
D2

L2

C20 L1 C18 C19

T6

C1

iP1

IC5

J1

C2

C5

VR2

VR1

C25

IC2

R19

R22

R20 R2 R5 C15 R1

IC3

X1

IC1

C26

D3

C34 C17

R31

IC6

D4

AUX1

C7

R3
R4

R25

T7

R24

R15

C24 C6 R14

IC9

IC8 R16

C4

C29

R29

T10

T9

T8

R28

R26

R27

R30 R33 R27

C32

C27

C31

IC7

C28

IC4

IC11

IC10

R18

R21

C30

R17

C3

R7

C21

R6

C23

T3

R10

T5

R11

T1

R13

T4

R9 R8

C8 C9 C10 C11 C12 C13 C14

T2

R12

R23

C16
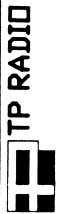
EMNE: TP160c SMD montage

pos.nr	lagernr.	beskrivelse				antal
		print	TP160c			1
R1		modstand	270	ohm	1206	1
R2		modstand	470	ohm	1206	3
R3		modstand	470	ohm	1206	
R4		modstand	1	Kohm	1206	4
R5		modstand	1	Kohm	1206	
R6		modstand	1	Kohm	1206	
R7		modstand	4,7	Kohm	1206	14
R8		modstand	4,7	Kohm	1206	
R9		modstand	4,7	kohm	1206	
R10		modstand	4,7	kohm	1206	
R11		modstand	4,7	kohm	1206	
R12		modstand	4,7	kohm	1206	
R13		modstand	4,7	Kohm	1206	
R14		modstand	2,2	Mohm	1206	1
R15		modstand	10	Kohm	1206	6
R16		modstand	680	ohm	1206	1
R17		modstand	4,7	Kohm	1206	
R18		modstand	10	Kohm	1206	
R19		modstand	4,7	Kohm	1206	
R20		modstand	2,2	kohm	1206	1
R21		modstand	1	Kohm	1206	
R22		modstand	470	ohm	1206	
R23		modstand	4,7	Kohm	1206	
R24		modstand	4,7	Kohm	1206	
R25		modstand	4,7	kohm	1206	
R26		modstand	10	Kohm	1206	
R27		modstand	10	kohm	1206	
R28		modstand	10	kohm	1206	
R29		modstand	4,7	kohm	1206	
R30		modstand	4,7	kohm	1206	
R31		modstand	10	Kohm	1206	
C3		kondensator	1	nF NPO	1206	23
C4		kondensator	1	nF NPO	1206	
C6		kondensator	2,2	nF X7R	1206	1
C8		kondensator	1	nF NPO	1206	
C9		kondensator	1	nF NPO	1206	
C10		kondensator	1	nF NPO	1206	
C11		kondensator	1	nF NPO	1206	
C12		kondensator	1	nF NPO	1206	
C13		kondensator	1	nF NPO	1206	
C14		kondensator	1	nF NPO	1206	
C15		kondensator	1	nF NPO	1206	
C16		kondensator	1	nF NPO	1206	
C17		kondensator	1	nF NPO	1206	
C18		kondensator	1	nF NPO	1206	
C19		kondensator	1	nF NPO	1206	
C20		kondensator	1	nF NPO	1206	
C21		kondensator	1	nF NPO	1206	
C22		kondensator	1	nF NPO	1206	
C23		kondensator	1	nF NPO	1206	
C24		kondensator	47	nF X7R	1206	1
C27		kondensator	1	nF NPO	1206	

EMNE: TP160c SMD montage

pos.nr	lagernr.	beskrivelse					antal
C28		kondensator	1 nF	NPO	1206		
C29		kondensator	1 nF	NPO	1206		
C30		kondensator	1 nF	NPO	1206		
C31		kondensator	1 nF	NPO	1206		
C32		kondensator	27 pF	NPO	1206		2
C33		kondensator	27 pF	NPO	1206		
L1		spole 6,8 μH SMD					2
L2		spole 6,8 μH SMD					
T1		transistor	BC849	NPN			8
T2		transistor	BCV29	NPN	darlington		2
T3		transistor	BC849	NPN			
T4		transistor	BCV28	PNP	darlington		1
T5		transistor	BC849	NPN			
T6		transistor	BC849	NPN			
T7		transistor	BC849	NPN			
T8		transistor	BC849	NPN			
T9		transistor	BC849	NPN			
T10		transistor	BCV29	NPN	darlington		
T11		transistor	BC849	NPN			
IC1		65C102	μP	PLCC-44			1
IC2		H6264	8K RAM	SO-24			1
IC4		74HC139		SO-16			2
IC5		65C022	I/O	PLCC-44			2
IC6		65C022	I/O	PLCC-44			
IC7		74HC139		SO-16			
IC8		74HC4520		SO-16			1
IC9		FX102LG					1
IC10		MC14504		SO-16			1
IC11		74HC4094		SO-16			1

EMNE: TP160c håndmontage

pos.nr	lagernr.	beskrivelse	antal
VR1		modstand 47 Kohm variabel	2
VR2		modstand 47 Kohm variabel	
C1		kondensator 2,2 μF/25V tantal	2
C2		kondensator 22 μF/16V tantal	1
C5		kondensator 4,7 μF/16V tantal	2
C7		kondensator 1 μF/35V tantal	1
C25		kondensator 4,7 μF/16V tantal	
C26		kondensator 2,2 μF/25V tantal	1
C34		kondensator 10 μF/16V tantal	1
D1		diode 1N4148	3
D2		diode 1N4148	
D3		zenerdiode BZX 83 5,6V	1
D4		diode 1N4148	
IC3		28C64 PROM **UDLEVERES IKKE**	
IC12		LM2931AZ	1
X1		krystal 8 MHz	1
J2		tulipansokkel 11-polet	1
J3		tulipansokkel 8-polet	1
		fladkabel 14-polet	1
		IC-sokkel 32-pin	1
		skrue UHJ 2x9	1
		møtrik 2mm	1
		fiberskive	1
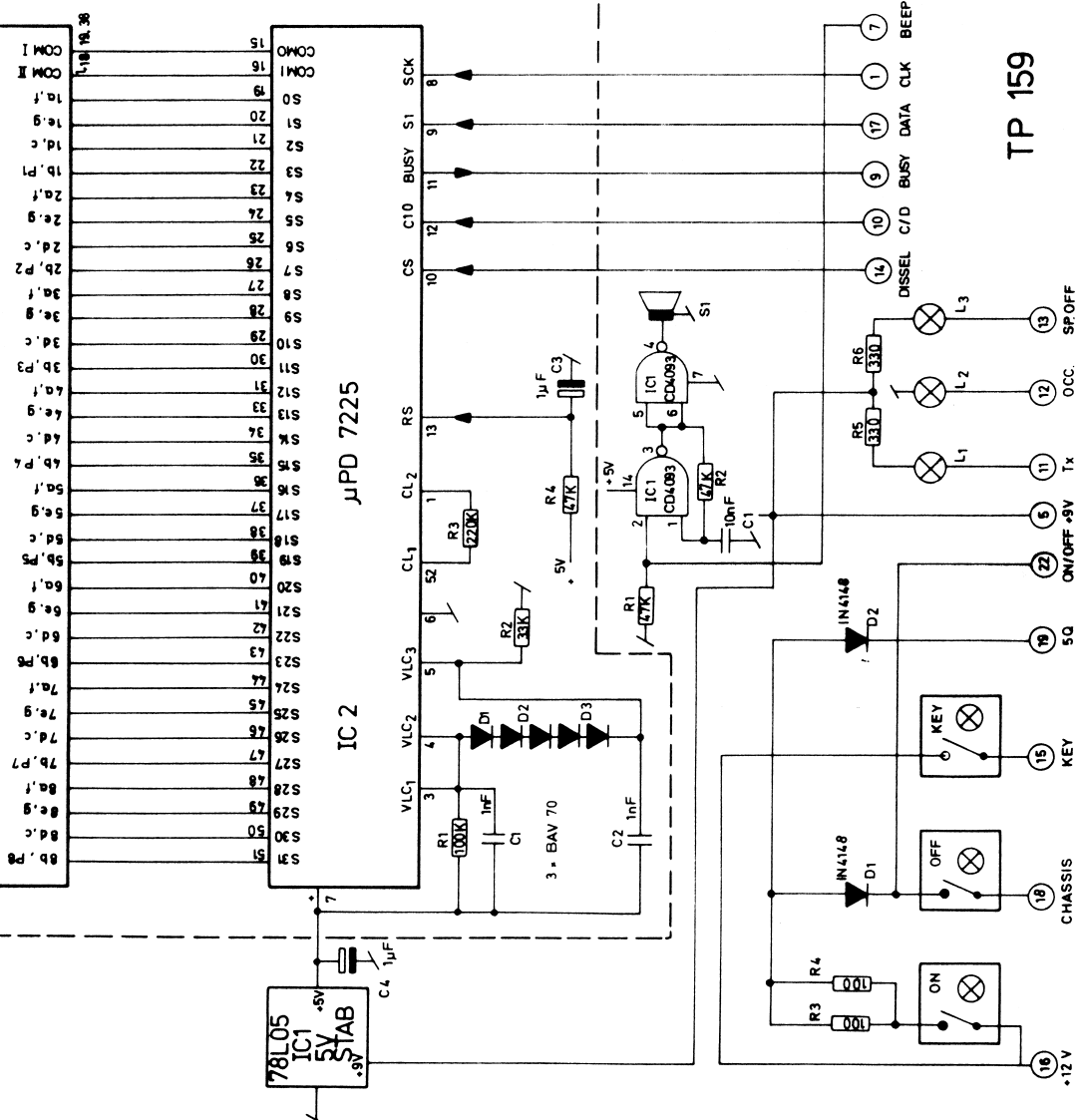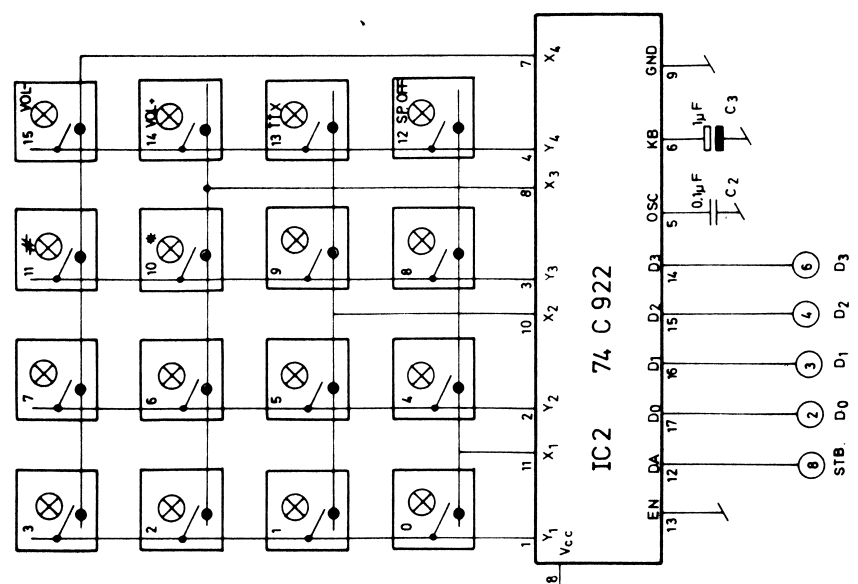
DISPLAY AND KEYBOARD
FOR CONTROL PANEL BB4
TP 158 AND TP 159

TP RADIO

EA3 – 880806

10. 06. 88
JS

"R" CONTACTS MAY OPERATE SIGNAL HORN RELAY

MULTICONNECTOR - FUNCTION

A1	
2	
3	
4	
5	MICROPHONE
6	+9V STAB.
7	EXT. ALARM
8	+12V FOR BOX
9	DATA
10	+12 V BAT
B1	COMDAT.
2	BUSY
3	STROBE
4	ERR. BEEP
5	MICRO SCR.
6	SPEAK OFF LED.
7	OCCUPIED LED.
8	TRANSMIT LED.
9	SPEAKER
10	+BAT
C1	D_3
2	D_2
3	D_1
4	D_0
5	CLK.
6	SQ REG.
7	
8	ON-OFF
9	DISSEL
10	KEY

Violet

+BAT

R   A7

MIC.   A5
A6
B6

HT   B9
B10

EXT. KEY   A8

+BAT   C10
+BAT   A10

-BAT   B10

CONTROL PANEL BB4

5 16 17 10 9 8 7 13 12 11 18 6 4 3 2 1 19 22 14 15
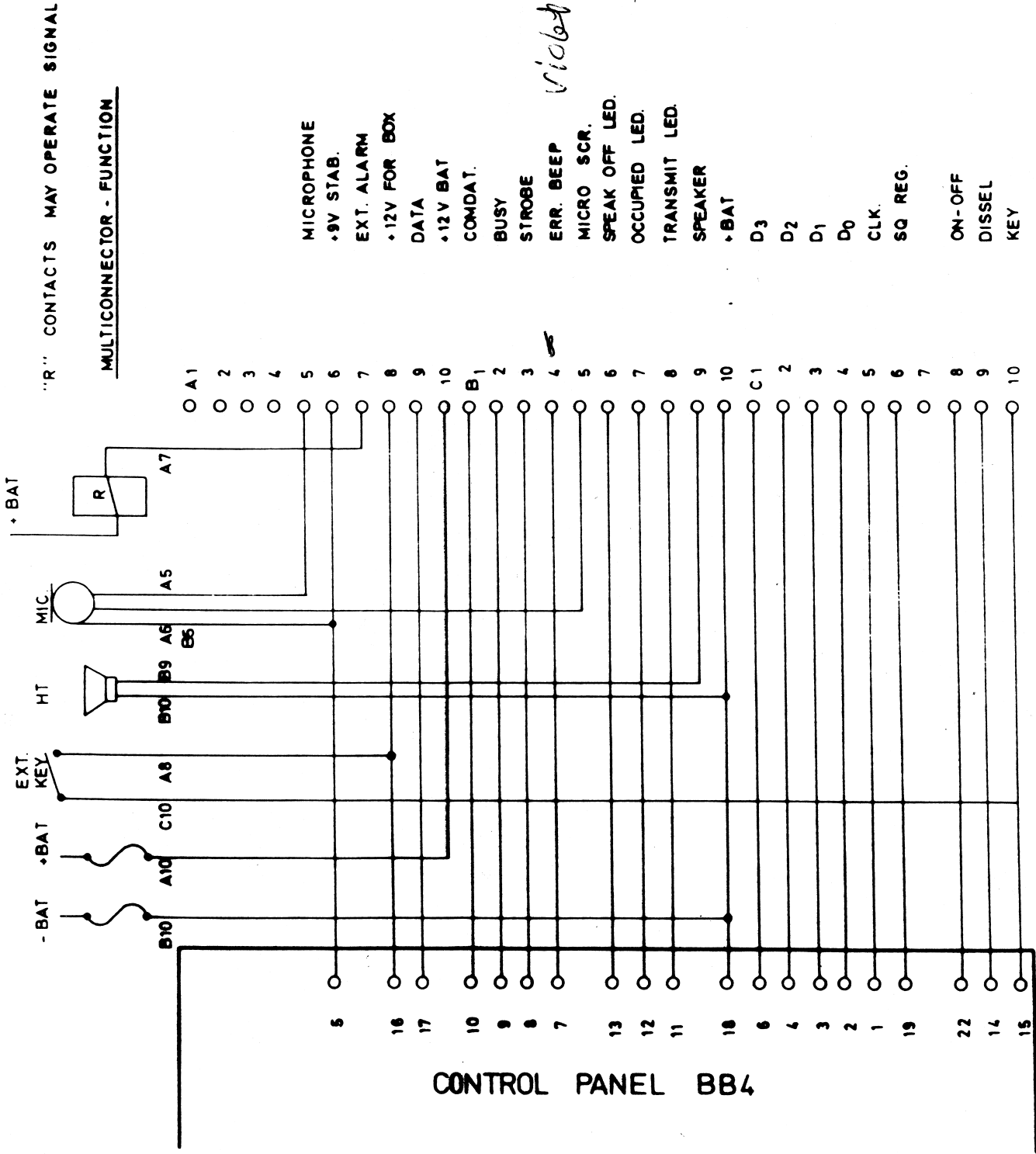
INSTALLATION TP 3000 µP	10. 08. 88
CONTROL PANEL BB4	JS
TP RADIO	EA4-880804

TP   3000

MICROPROCESSOR CONTROLLED TONESYSTEM.

BETJENINGSVEJLEDNING.

Lyser grønt når HT er udkoblet
Blinker hurtigt ved opkald
Slukkes med HT ud/ind

Viser aktuel
højttalerstyrke

Højttalerstyrke
op – ned

Viser valgt kanal

Funktionstast

Lyser rødt
ved sending

ID

Funktionstast

01   XXXXX

TP RADIO

TX   OCC   SP.OFF   REP
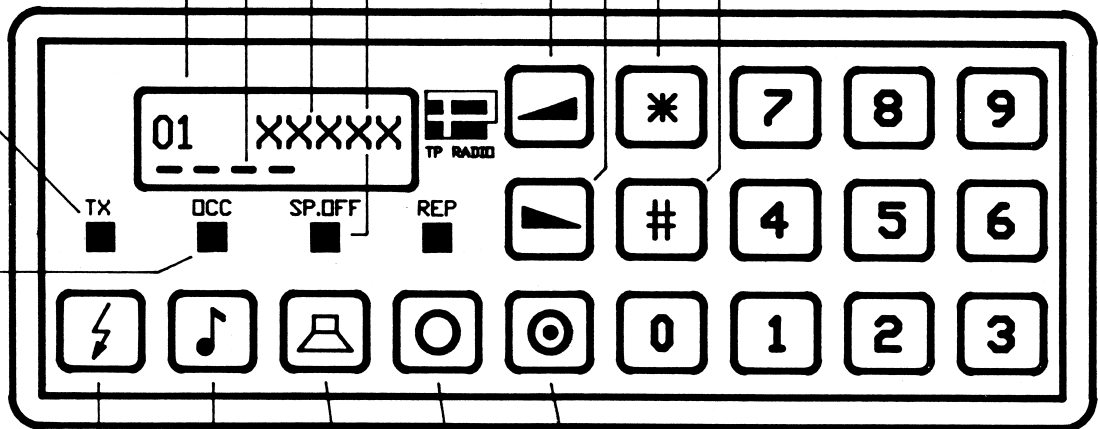
Taletast

Sluk

Ciffertastatur
kanal valges med
* og 2 ciffre

Lyser gult
når kanal
er optaget

Normal
opkald

Højttaler
ind/ud

Tand
SQ. åben

TP3000 mobil

TP RADIO type 709925

BETJENINGSVEJLEDNING.

Tænd   : Tryk ⊙

Sluk   : Tryk ○

Tale_tast   : Tryk ⚡ ☀rød lampe lyser.

Nummer_valg   : Tryk tasterne **0** til **9** for der ønskede nr.,
                             max. 5 cifre.

Kanal_valg   : Tryk **✳** og **0** **1** - **9** **0** for ønsket
                             kanal nr.

Kort_nr._valg   : Tryk **⛶** og **1** til **9** . Kun et ciffer. Nr.
                             ses i display.

Sidst_kaldte_nr.   : Tryk **⛶** **0** sidste nr. ses i display.

Sende_kalde_nr.   : Tryk **♪** ☀rød lampe lyser kort. Nr. i display
                             afsendes.

Højttaler_blokering   : Tryk **▽** ☀Grøn lampe lyser konstant. Opkald
                             kan modtages.

Tilslut_hornalarm   : Tryk **✳** **♪** ☀Grøn lampe blinker 50/50 ved
                             frakobling gentages betjeningen.

Overvågning_af_ID.   : Tryk det ønskede nr. med **0** - **9** samt **✳** **🔔**

                             ☀ Grøn lampe blinker 20/80. Hvis hornalarm
                             er tilsluttet har denne prioritet og hvis
                             HT blokering er aktiv har denne prioritet,
                             overvågning fjernes ved tryk på **✳** **🔔**

Volume_op   : Tryk **◣** volumen forøges for hvert step.

Volume_ned   : Tryk **◥** Volumen formindskes for hvert step.

                             Hvert 4 step indikeres på display, ved ved-
                             varende tryk kører volumen automatisk op
                             hhv. ned.

Opkalds_kø_op   : Tryk **✳** **◣** " bladrer" op gennem modtagne
                             opkald, stopper ved sidste nr.

Opkalds_kø_ned   : Tryk **✳** **◥** " bladrer" ned gennem modtagne
                             opkald, stopper ved første nr.

Viderestilling : Tryk **0** - **9** for det ønskede nr. samt **#** og

9 tryk dernæst **⋆** **9** **0** og **1** . Display

viser " H er⁻". Slet ved tryk på **⋆** og vent

ca. 10 sek.

Kort nr. program : Tryk **0** - **9** for der ønskede nr. Derefter

og kort nr. **1** til **9** .

Hornalarm længde : Tryk **⋆** **#** **⋆** **4** Display viser den
nuværende længde.

Tryk **0** **0** - **9** **9** for ønsket længde max.

99 (9,9 sek.).

Kø størrelse : Tryk **⋆** **#** **⋆** **5**

Status kan læses og ændres, max. er 25.

tryk **0** **0** til **2** **5** for ønsket

størrelse.

Antal ring ved opkald : Tryk **⋆** **#** **⋆** **6** læs status og programmer⁻

ændring. Tryk **0** **0** til **1** **0** max. er 10.

00 er ingen ringning.

Squelch : **Tryk** **⊙** vedvarende. Der høres støj i højttaler.