

Jenal Communications

Model DT8T and DT8R

DTMF Controller Board

Programming Instructions

(Software Version 1.00)
(PCB Version 1.00)

Programming Instructions for DT8T and DT8R

Note: *The information contained in this programming booklet applies to both the DT8R (DTMF controller board with eight relay outputs) and the DT8T (DTMF controller board with eight open-collector transistor outputs). Any references to relay outputs also apply to open-collector outputs.*

The DT8 DTMF controlled relay board has been designed to offer a simple remote control facility which can be used over both land-line and radio links. Each of the eight relays can be programmed for operation in one of four modes: **Follow, Pulse, Latch** or **Exclusive**.

In **Follow** mode a relay (1 to 8) is operated when the appropriate tones are being received and the relay is released when the tones stop. DTMF 1 operates relay 1, DTMF 2 operates relay 2, etc, up to DTMF 8 operating relay 8. DTMF 9, 0, * and # are used for special functions (see below).

In **Pulse** mode a relay is operated as soon as its DTMF tones are received and stays operated for a time determined by the programming. The pulse time is retriggerable, ie. sending the DTMF tones again resets the timer for that relay. Note that the pulse time is measured from when the DTMF tone is first recognised - holding the DTMF tone on continuously will NOT alter the length of the pulse.

In **Latch** mode a relay can be turned ON and OFF by sending DTMF tones. To turn ON a relay send a DTMF code followed by *, eg. sending 8 * turns on relay 8 (if relay 8 is already turned on then this command does nothing). To turn OFF a relay send a DTMF code followed by a #, eg. sending 8 # turns off relay 8 (if relay 8 is already turned off then this command does nothing). Any relay in Latch mode can be programmed to turn ON at power-up or Restart (see below).

In **Exclusive** mode a number of relays can be programmed to operate exclusively, only one relay can be operated at any one time. Relays are switched ON by sending the appropriate DTMF code, any exclusive relay that is already operated is released. For example if relays 1, 3, 5 and 8 are all programmed to be exclusive and relay 3 is operated then sending the DTMF 5 would switch on relay number 5 and release relay number 3. Any relay in Exclusive mode can be programmed to turn ON at power-up or Restart (see below).

SPECIAL COMMANDS

There are a number of special commands available: **Lock, Unlock, All On, All**

Off as described below.

A **Lock** code can be programmed into the unit if required to disable operation of the DT8. The lock code can be between 1 and 8 characters in length and any characters 0, 1 to 9 or A to D can be used (* and # are not allowed) giving a total of over 1500 million exclusive lock codes.

An **Unlock** code can be programmed either to be the exactly the same as the lock code or to be entirely different. The unlock code is used to re-enable the DT8. The unlock code can also be between 1 and 8 characters in length and any characters 0, 1 to 9 or A to D can be used (* and # are not allowed) giving a total of over 1500 million exclusive unlock codes.

All On can be used to turn on all the relays at the same time. Because this command could cause potential problems it has to be specifically enabled in programming. The All On command is DTMF 0 *.

All Off also has to be specifically enabled in programming. The All Off command has four possible operating modes selectable by programming:

- a) Disabled - do nothing
- b) Reset All - reset all relays to off
- c) Soft Restart - This sets the relays in the normal power up state
- d) Hard Restart - This is basically a system reset where the DT8 software is restarted

The All Off command is DTMF 0 #.

AUTO-LOCK FEATURE

The DT8 has an auto-lock feature that will automatically lock the unit after a certain amount of time.

There are three options for this feature: OFF, IMMEDIATE and TIMED. The OFF option disables the auto-lock feature while the IMMEDIATE option means you have to enter the unlock code then immediately follow with a command code. The TIMED option allows you to set a time between 0.1 and 9.9 minutes after which the unit will be locked. The timing starts from when the unlock code is entered and is restarted after every entry. This means that the auto-lock time out period is from the last entry you made.

ADDRESSING MODES

As well as the normal operating mode three special access codes are available. They are INDIVIDUAL, GROUP and ALLCALL access codes. Each of these

codes require the sending of two digit DTMF codes before the command codes are sent. When using GROUP and ALLCALL access codes no Audio Feedback is produced and multiple units can share the same codes. GROUP and ALLCALL access codes allows control of multiple units at the same time. When using INDIVIDUAL access codes the DT8 will produce Audio Feedback tones if enabled. Only one unit should be allocated any one INDIVIDUAL access code. Individual LOCK and UNLOCK Codes still work but AUTO-LOCK IMMEDIATE should preferably not be used.

AUDIO FEEDBACK

AUDIO FEEDBACK is enabled by a programming sequence. When AUDIO FEEDBACK is enabled the microprocessor keys a PTT control transistor (open collector) so that the DT8 may be used with a radio transceiver. Using the AUDIO FEEDBACK feature slows down the operation of the DT8 as acknowledgement tones and PTT signals are generated and transmitted after each tone or command is received.

There are several tones used:

First is the input acknowledge tone (a high pitched tone). This tone is produced after the end of each input tone (unless an error, action acknowledge or off tone is sent, see below).

If an error is detected then the error tone is produced (a low pitched tone) or if an relay OFF command is received then an off tone is produced (a medium pitched tone).

When a special command is received by the DT8 (such as ALL ON, ALL OFF, LOCK CODE or UNLOCK CODE) then the command acknowledge sequence is produced. This consists of three pulses of a high pitched tone.

LINKS

There are three links on the DT8 board, their functions are described below.

Link	Function
LK 1	This link when closed feeds voltage out on the Squelch (COR) line for use with radios which have open collector or relay outputs.
LK 2	This link when closed enables Programming Mode. The reset switch should be pressed after each change of LK 2
LK 3	This link when closed increases the output voltage drive for the audio feedback signals. The link is normally left open. Output voltage level is set by the multi-turn pot VR1.

Programming Commands

Programming mode is entered by closing link LK2 on the DT8 board and then pressing the reset switch. Three beeps will be heard from the piezo alarm to indicate the unit entering programming mode. The DT8 uses DTMF tones for programming, these tones can be fed in via the "Receive Audio" terminal or a telephone handset can be plugged into the socket provided.

To programme for the following relay modes enter the key sequence as shown.

Note that three short beeps will be heard after pressing the * key to indicate the starting of the sequence. Each key press after will produce one beep, unless an error is detected, when the unit will produce one long beep followed by three short beeps. An accepted command is indicated by three short beeps after the # key is pressed. If an error is detected in programming a particular relay or function then the previously stored programming is still valid.

Relay Operating Modes

Function	Key Sequence	Notes
Follow	* n 1 # or * n 1 0 0 #	Relay is operated when DTMF tone n is present n = relay number to use this mode
Pulse	* n 1 t t #	Relay is operated for a fixed period of time when the DTMF tone n is recognised n = relay number to use this mode t t = time 0.1sec to 9.9sec in 0.1 sec steps
Latch	* n 2 0 s #	Relay is latched operated by DTMF tones n followed by * Relay is released by DTMF tones n followed by # n = relay number to use this mode s = 0 - relay is released at power on s = 1 - relay is operated at power on
Exclusive	* n 2 1 s #	Relay is latched when DTMF tone n is received. All other Exclusive relays are released. n = relay number to use this mode s = 0 - relay is released at power on s = 1 - relay is operated at power on

Special Operating Modes

All On and All Off

These two programming commands allow you to operate (All On) or release (All Off) all the relays at the same time using one simple operating command. The operating commands can be enabled or disabled as shown. The default relay condition can be reloaded if R = 3 or the DT8 firmware can be restarted (software reset) if R = 4.

Key Sequence	Notes
* 0 1 # or * 0 1 0 0 #	All On and All Off disabled.
* 0 1 S R #	S = 0 = Set all disabled S = 1 = Set all enabled R = 0 = Reset all disabled R = 1 = Reset all enabled R = 2 = Reload relay defaults R = 3 = Restart firmware

Key Press Timer

This timer controls the amount of time allowed between key presses in a multi-key command. The timer can be disabled or set to any time from 0.1 sec to 9.9 secs in 0.1 second steps.

Key Sequence	Notes
* 9 0 # or * 9 0 0 0 #	Timer disabled - no time out
* 9 0 t t #	Timer enabled t t = time out time, 0.1 sec to 9.9 secs in 0.1 sec steps

Auto-lock Timer

The DT8 has an automatic lock facility which can lock the unit after a preset period of no DTMF tones being received. The Auto-lock timer can be either disabled, set for immediate operation or to operate after a period of time from 0.1 min to 9.9 mins in 0.1 minute steps. Once locked the DT8 has to receive it's unlock code before accepting further commands.

If the Auto-lock timer is set for immediate then the DT8 will accept only one command after an un-lock command before automatically locking again.

Key Sequence	Notes
* 9 1 #	Auto-lock Timer disabled
* 9 1 0 0 #	Auto-lock Timer immediate. DT8 will accept only one command after the un-lock code has been received.
* 9 1 t t #	Auto-lock Timer enabled. DT8 will lock at a preset time after the last DTMF tone is received. t t = time in minutes, 0.1 min to 9.9 mins in 0.1 min steps

Audio Feedback Control

The DT8 can produce audio feedback in response to the received DTMF tones or commands. The feedback can be immediate or controlled by a squelch (COR) signal.

Key Sequence	Notes
* 9 2 # or * 9 2 0 0 #	Audio Feedback disabled
* 9 2 A B #	Audio Feedback control - when A = 0 B has no effect A = 0 - No Audio Feedback A = 2 - Audio Feedback on every key press A = 3 - Audio Feedback only on command completion. B = 0 - Immediate - ignore squelch (COR) signal B = 2 - Wait for squelch (COR) signal, active low B = 3 - Wait for squelch (COR) signal, active high

Squelch (Cor) Adjustments

Squelch (COR) condition		DT8 Settings/Programming	
Active	Inactive	Link 1	Audio Feedback
High (>5v)	Low (<1v)	Open	Active High
Low (<1v)	High (>5v)	Open	Active Low
Low (<1v)	Open	Closed	Active Low
Open	Low (<1v)	Closed	Active High
High	Open	Open	Active High
Open	High	Open	Active Low

Access Codes

As well as the Lock and Un-lock codes each DT8 can have up to three Access Codes. They are INDIVIDUAL, GROUP and ALLCALL codes. When these codes are activated each command must be preceded by the two digit Access Code before the command is accepted by the DT8. If necessary the Un-lock code must be sent first followed by the Access code and then the command. Auto-lock can be activated but it is recommended that Auto-lock immediate is not used.

By using Access Codes multiple DT8 units can be controlled at the same time, by either using the Group Access Code or the Allcall Access Code, or units can be controlled individually. If all units share the same Lock and Unlock codes then total control is easily achieved.

Note: If audio feedback is required then it is necessary to allocate the Group Access Code as an Individual Access Code to one of the DT8 units, likewise for the Allcall Access Code.

Individual Access Code

Key Sequence	Notes
* 9 3 #	Individual Access code disabled
* 9 3 A B #	Individual Access code enabled A A = two digit code (valid digits 0 to 9, A to D)

Group Access Code

Key Sequence	Notes
* 9 4 #	Group Access code disabled
* 9 4 A B #	Group Access code enabled A A = two digit code (valid digits 0 to 9, A to D)

Allcall Access Code

Key Sequence	Notes
* 9 5 #	Allcall Access code disabled
* 9 5 A B #	Allcall Access code enabled A A = two digit code (valid digits 0 to 9, A to D)

Lock and Unlock Codes

If required the DT8 can be programmed to accept both a **Lock** code and an **Unlock** code.

These codes can be from 1 to 8 digits in length and can use the digits 0 to 9 as well as the A to D tones, giving over 1500 million possible combinations. The two codes can either be the same or different and the length of the lock code does not need to be the same as the length of the unlock code (unless they are the same code of course). For example the lock code could be 1 digit in length and the unlock code 8 digits in length.

As a security feature the DT8 does not give any audio feedback regarding the length of either code. For instance if a lock code of say 3 digits is programmed then the unit will give an error tone (if audio feedback is turned on) at the completion of any wrong code irrespective of the number of digits (between 1 and 8) in the wrong code. The DT8 only checks the lock or unlock code after the terminating # has been received.

The DT8 will always reset to the locked condition if a lock code has been programmed.

Lock Code

Key Sequence	Notes
* * #	No lock code programmed. If no lock code is programmed then no unlock code can be programmed.
* * N N #	Where N N = between 1 and 8 digits (DTMF numbers 0 to 9, letters A to D).

Unlock Code

Key Sequence	Notes
* # #	Unlock code is the same as the lock code (if lock code is programmed).
* # N N #	Where N N = between 1 and 8 digits (DTMF numbers 0 to 9, letters A to D).

Operational Commands

Below are listed the various operating modes for the DT8 DTMF controller board. If the AUDIO FEEDBACK feature is enabled then the DT8 will produce a PTT signal and acknowledgement or error tones for each DTMF tone or command received. Do NOT enable AUDIO FEEDBACK if you are not going to use this feature as it slows down the operation of the DT8.

The sequence of events for the AUDIO FEEDBACK and PTT is as follows:

- 1) turn on PTT transistor (open collector)
- 2) wait 100 milliseconds
- 3) produce tones
- 4) wait 50 milliseconds
- 5) turn off PTT transistor.

Follow Mode

N	N = 1 to 8. Relay N operates when DTMF tone N is received. Relay releases when tone disappears.
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Pulse Mode

N	N = 1 to 8. When DTMF tone N is received relay N operates and stays operated for the length of the programmed pulse period. The pulse period can be extended by resending the tone N. Holding the tone N on for an extended period of time does not affect the pulse period
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Latch Mode

N *	N = 1 to 8. When DTMF tone N is received followed by DTMF * the relay N is operated and stays operated until reset with N #
N #	N = 1 to 8. When DTMF tone N is received followed by DTMF # the relay N is released and stays released until operated with N *

Note: Any relay can be programmed to operate on power up or restart

Exclusive Mode

N	N = 1 to 8. Any or all relays can be in the exclusive list. When tone N is received relay N is operated and all other relays in the exclusive list are released. Only one relay in the exclusive list can be operated at any one time.
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Note: Any relay can be programmed to operate on power up or restart

All On / All Off

0 *	This command sets all relays into the operated condition. Note: This command can be enabled or disabled by programming.
0 #	This command has four possible operations depending on the DT8 programming. 0) Disabled - command ignored 1) Reset All - command resets all relays to the un-operated condition 2) Soft Restart - command sets all relays to the normal power up state 3) Hard Restart - command restarts the DT8 software as a power up reset.

Note: Extreme care should be exercised particularly when using the All On command as all outputs are activated and could cause unforeseen problems. Only enable this command if you are sure of why you want to use it!

Lock code

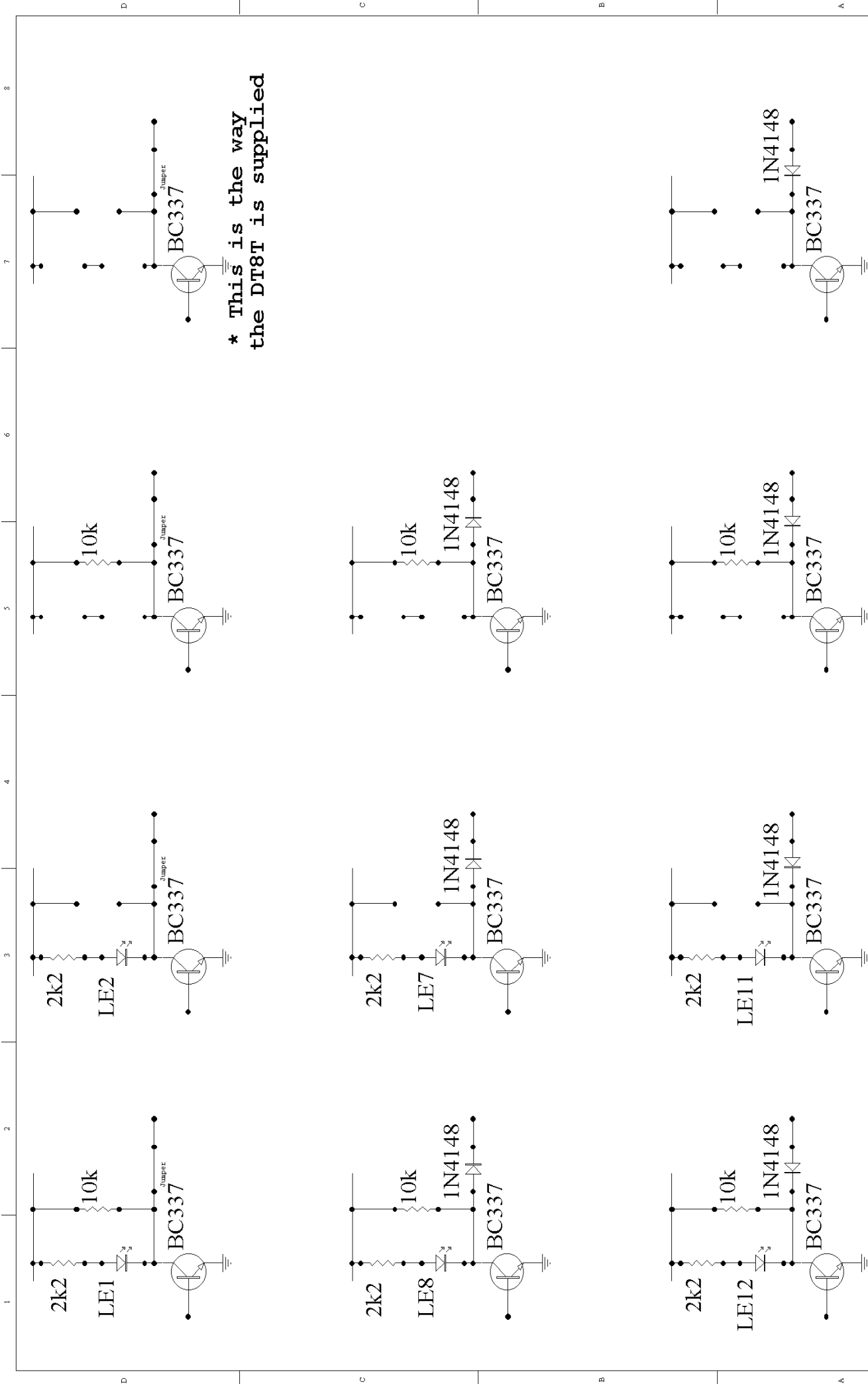
* N N #	Where NN means between 1 and 8 digits (DTMF numbers 0 to 9, letters A to D) When the DT8 receives a valid lock code it cannot be activated by any more commands until after it has received a valid unlock code.
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Unlock code

# N N #	<p>Where NN means between 1 and 8 digits (DTMF numbers 0 to 9, letters A to D)</p> <p>This command has three possible operating modes:</p> <ol style="list-style-type: none">1) Normal - After receiving a valid unlock code the DT8 will respond to all further commands.2) Auto-lock timed - After receiving a valid unlock code the DT8 will respond to all further commands unless the timer period of inactivity is exceeded when the DT8 will not respond to any commands except the unlock command.3) Auto-lock immediate - After receiving a valid unlock code the DT8 will respond to only one command after which it is automatically locked again.
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Access codes

A A	<p>Where AA means any two digits (DTMF numbers 0 to 9, letters A to D) followed by any command except Lock or Unlock. Three different types of access codes are available, Individual, Group or Allcall. Audio Feedback only works with individual addressing mode and then only for command completion.</p>
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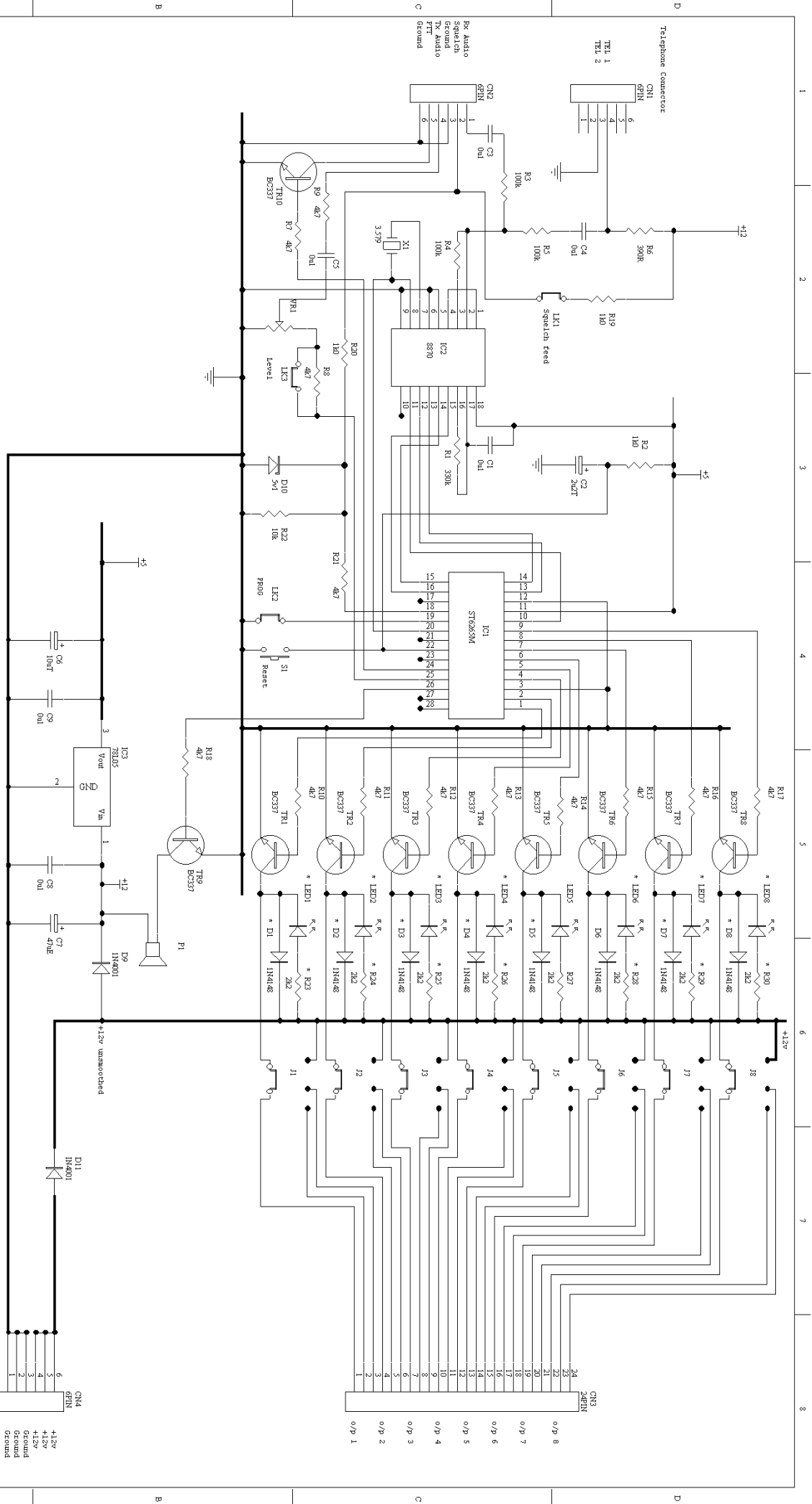


* This is the way the DT8T is supplied

DT8T o/p options
 Number DT8op
 Revision

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Sheet of	8
Drawn By	

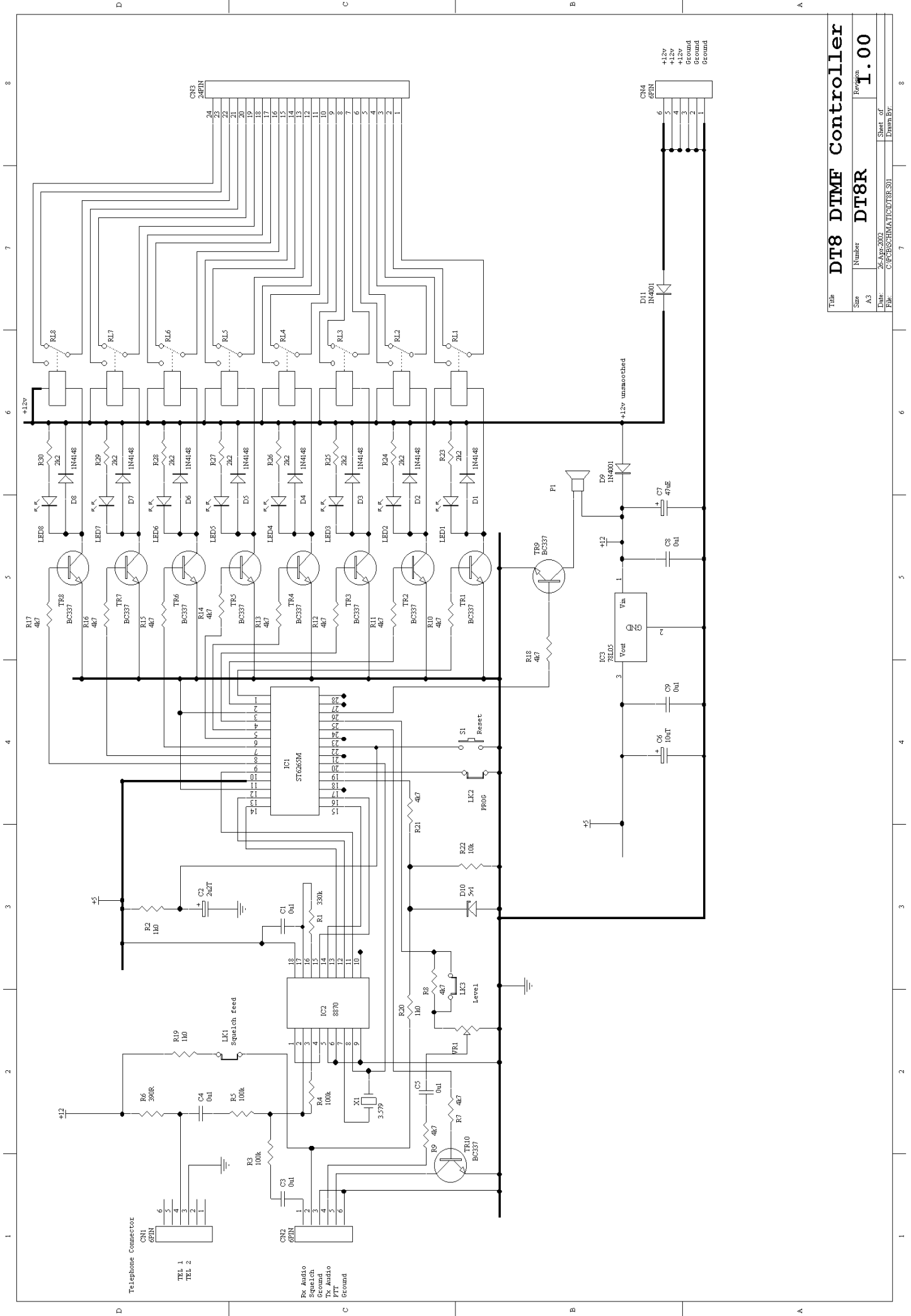
Diagrams showing various possible o/p configurations



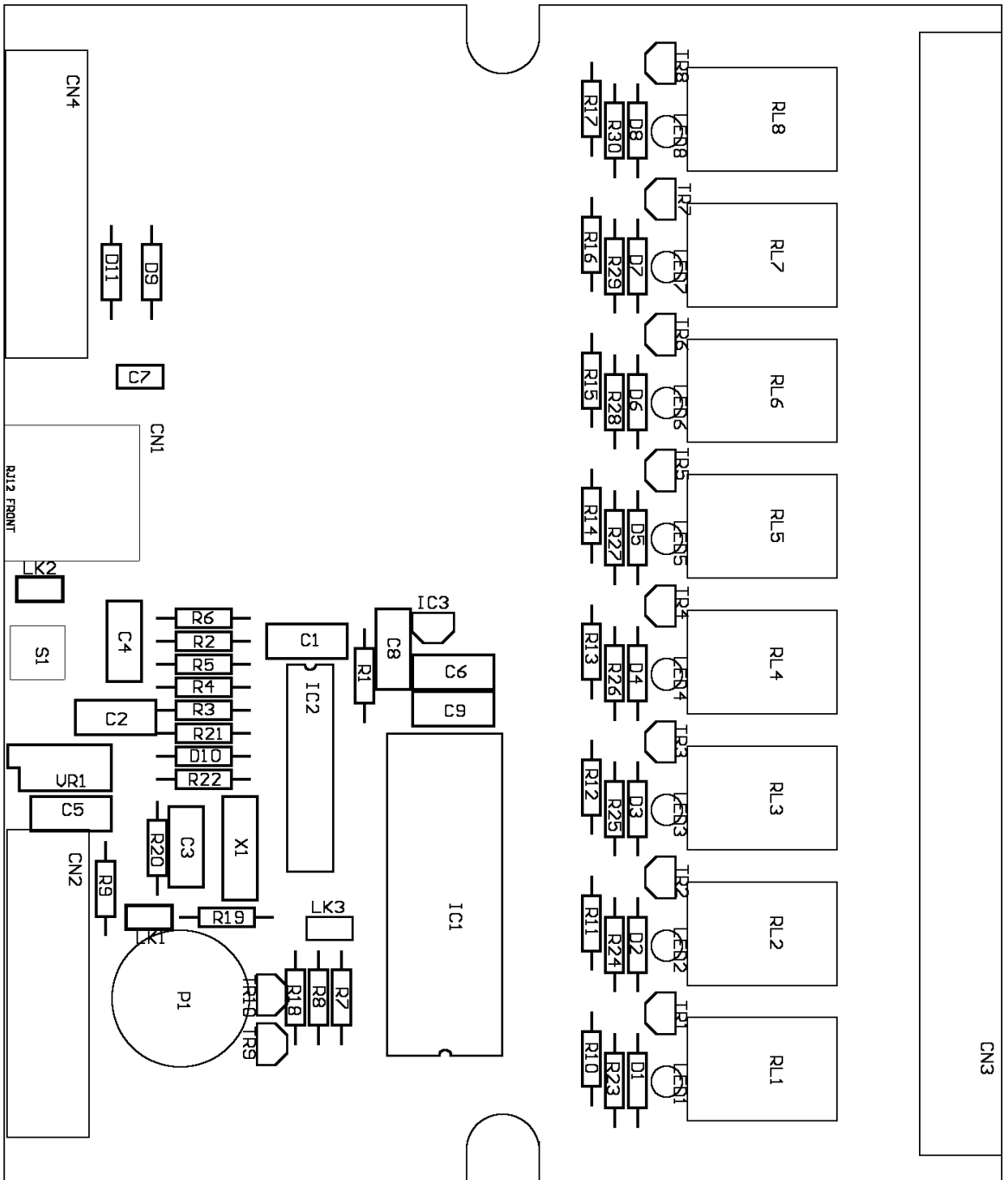
Note: * = Not fitted

D1 to D8 can be fitted or replaced by resistors if required
 LED1 to LED8 and R23 to R30 can be fitted
 if true open collect or is not required
 J1 to J8 can be replaced by diodes if required

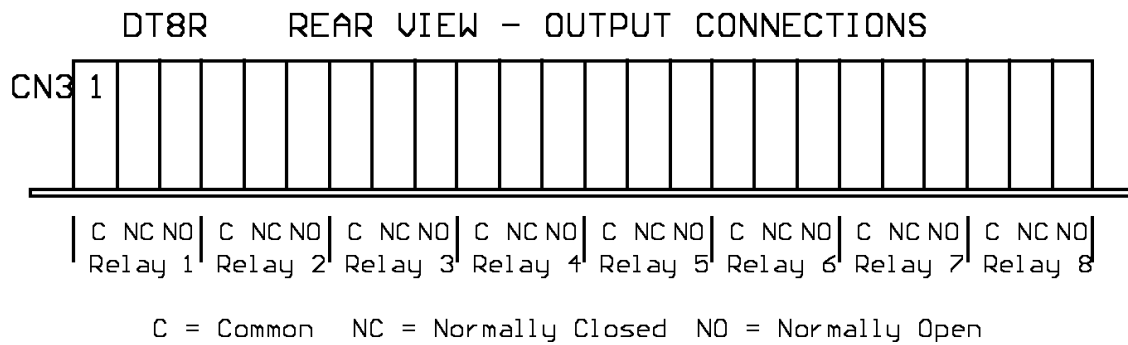
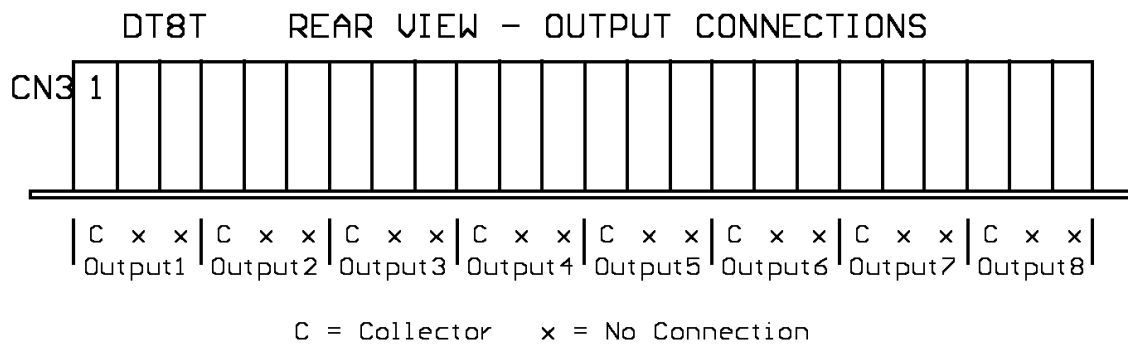
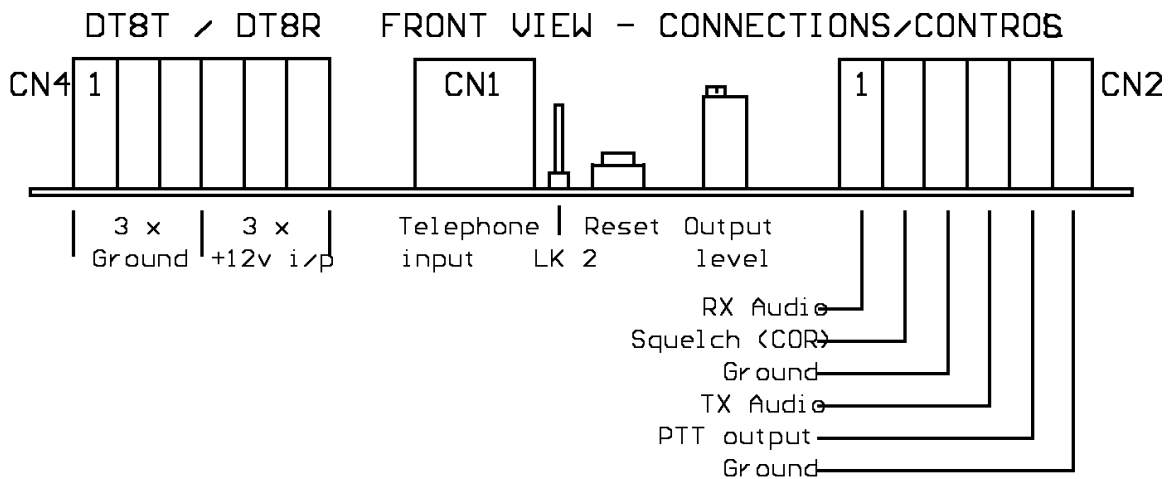
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Size	A3	Number	DT8T	
Date	26-Apr-2003		Sheet of	1
File	C:\PERSCHM\ATC\DT8T.S01		Drawn By:	



Title		DT8 DTMF Controller	
Size	Number	Revision	
A3	DT8R		
Date:	26-Apr-2002	Sheet of	8
File:	C:\PCB\SCHEMATIC\DT8R.S01	Drawn by:	



DT8 Component layout



DT8 Connections details

Programming notes

Record your DT8 programming details here for future reference.

Relay Programming

Relay	Key sequence						Notes
1	*	1				#	
2	*	2				#	
3	*	3				#	
4	*	4				#	
5	*	5				#	
6	*	6				#	
7	*	7				#	
8	*	8				#	

All On/All Off

Key sequence						Notes
*	0	1			#	

Key Press Timer

Key sequence						Notes
*	9	0			#	

Auto-lock Timer

Key sequence						Notes
*	9	1			#	

Audio Feedback Control

Key sequence						Notes
*	9	2			#	

Individual Access Code

Key sequence						Notes
*	9	3			#	

Group Access Code

Key sequence						Notes
*	9	4			#	

Allcall Access Code

Key sequence						Notes
*	9	5			#	

Lock Code

Key sequence										Notes	
*	*									#	

Unlock Code

Key sequence										Notes	
*	#									#	

Link positions

Record here the positions of the two adjusting links.

Link No	Open/Closed	Notes
1		
3		

Link 1 : COR polarity.

Link 3 : Audio Feedback output level.

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