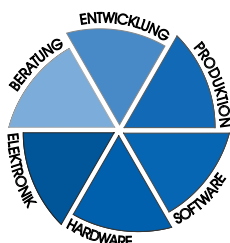


Telephone Line Interface FT 635 UELE



FunkTronic
Kompetent für Elektroniksysteme

Inhaltsverzeichnis

Connection possibilities	3
Connection examples	4
Carrier detection	5
Transmitter control	5
Transmitter follow-up time	6
Transmission time limit	6
Transmitter lead-up time	6
In- and outputs	7
Inputs	7
Outputs	8
Digital output control	8
AF-signals (telephone to radio)	9
AFsignals (radio to telephone)	9
AF-signaling pathways	9
DTMF	9
Tone sequence encoder and decoder	10
Dial-up - telephone -> radio	13
Direct dialing by DTMF - telephone -> radio	13
Access code - telephone -> radio	13
Automatic connection - telephone -> radio	13
Night mode - telephone -> radio	14
Automatic call forwarding with direct call - tel -> radio	14
Radio -> telephone	14
Direct dialing with tone sequence - radio -> telephone	15
Direct dialing with DTMF - radio -> telephone	15
Speed dial - radio -> telephone	16
Speed dial memory	16
Call monitoring	16
Operating mode	17
Voice announcement (option)	18
Example for the configuration	19
Call progress tone detection	20
T11-55	22
EEPROM register layout	23
Registers in TIM (Telefon Interface Modul)	29
Installation TIM (Telephone Interface Module)	32
Connector pinout	33
RS232-Connection cable	35
Service program and setting	35
Ordering information	38
Technical data	38
General Safety Instructions	39
Revision remarks	40

FT635 Telephone Line Interface

The FT635 telephone line interface (UELE) consists of a CPU card of Europe with an attached TIM (telephone interface module).

There are 3 different housings available. The standard version is a flange aluminum housing. There also is a 19" plug-in unit and a special version in the FT635 system housing. The version in the system housing has a connector which is pin-compatible to FT633UELE to the two-way radio. In the standard version only the most important connectors are available as sockets on the front. The FT635UELE serves as interface between the telephone network and the radio installation. For phone lines with direct outward dialing the FT635 can be additionally equipped with the option VMM (voice memory/voice response).

To connect the UELE to the radio there is a 15-pole D-Sub--connector available (the version in the FT635 system housing has the additional 37-pole D-Sub-connector). The connection to the telephone network is made by a RJ11 connector.

Connection possibilities

The telephone network is connected to the 6-pole RJ11 connector (TEL) by two-wire technology (analog a/b) and can optionally work with the DTMF- or the pulse dialing method. Ex factory the dialing method is preset to "DTMF dialing".

The connection to the radio is made by the 15-pole D-Sub-connector (RADIO). It includes squelch input, PTT output, AF input, AF output, 4 digital outputs (or digital inputs) and the power supply. The PTT output and the AF inputs/outputs are potential-free.

The 37-pole D-Sub-connector of the version in the FT635 system housing has 12 additional digital outputs (or digital inputs), a second AF input, a second AF output, 2 analog inputs and a RS232 interface.

The RS232 interface and 5 digital inputs (or digital outputs) can be connected at the RJ45 connector.

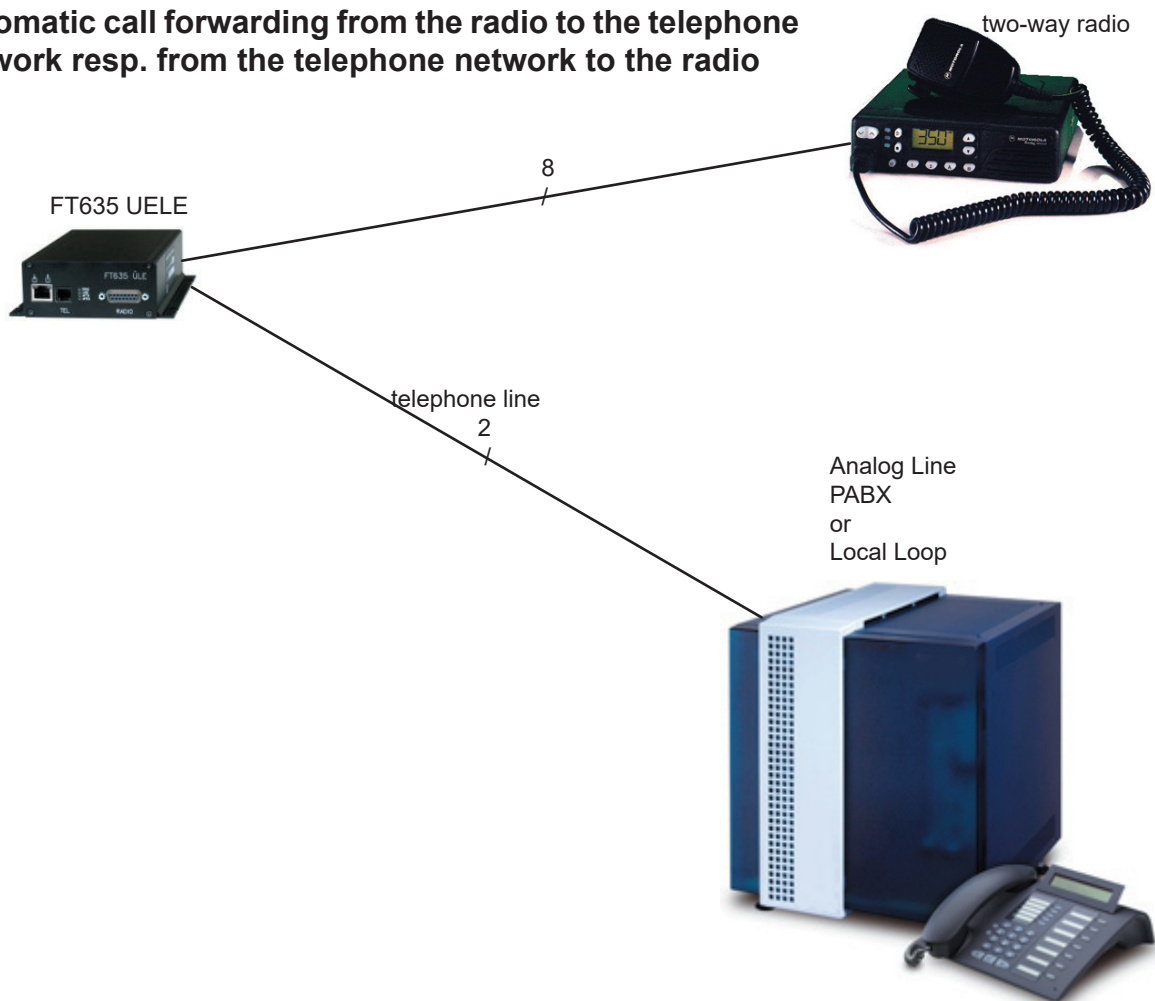
Reg.	Function
366	4. digit
	0 = pulse dialing
	1 = DTMF dialing

Connection examples

There are different applications for the operation of a FT635 UELE:

- automatic call forwarding from the telephone network to the radio
- automatic call forwarding from the radio to a telephone

Automatic call forwarding from the radio to the telephone network resp. from the telephone network to the radio



Carrier detection

The FT635UELE offers different possibilities of carrier detection. The carrier input can be low or high active and a pull-up resistance can be activated additionally. Alternative possibilities are the AF controlled carrier and the phantom control. For phantom control the solder jumper JP2 has to be resoldered. The carrier is active if one or both pins of the AF input of the radio are connected to ground.

Reg.	Function
056	1. digit
	0 = carrier input low active, pull-up on
	1 = carrier input high active, pull-up off
	2 = AF controlled carrier
	3 = phantom carrier
	4 = carrier input low active, pull-up off
	5 = carrier input high active, pull-up on

If the normal carrier input is also to be used as external input additionally or exclusively for other functions, 2 or 3 needs to be programmed at the first digit in register 056.

Reg.	Function
056	2. digit: configuration of the carrier input without carrier function (if the 1. digit is programmed with 2 or 3) possible values: 0,1,4,5 same as 1.digit

Transmitter control

The FT635 Interface can activate the transmitter in 3 different ways. The PTT relay has a potential-free output for the PTT activation. One pin has to be connected externally to the reference voltage which is needed by the two-way radio (normally GND or +Batt) and the other pin is connected to the PTT input of the two-way radio. Alternatively there is the possibility of PTT phantom control. With phantom control the PTT is activated by switching the center tap of the output transformer to GND. To activate the phantom control the solder jumper JP1 needs to be resoldered. For reasons of compatibility to FT633UELE the PTT by a switching output is possible. For FT633UELE I/O15 is used as PTT output. Ex factory I/O15 is configured as input for FT635UELE and needs to be reprogrammed (see section "In- and outputs").

Transmitter lead-up time

The lead-up time is defined as the time between the activation of the transmitter and the start of the signaling (e.g. tone sequence). It can be adjusted from 0 to 990ms. Ex factory it is set at 100ms.

Reg.	Function
------	----------

055	1.+ 2. digit: transmitter lead-up time $nn * 10\text{ms}$
-----	---

Transmitter follow-up time

The follow-up time is defined as the time between the end of the signaling(e.g. tone sequence) and the end of the transmission. It is adjustable from 0 to 990ms. Ex factory it is set at 100ms.

Reg.	Function
------	----------

055	3.+ 4. digit: transmitter follow-up time $nn * 10\text{ms}$
-----	---

Transmission time limit

The transmitter can be turned off by the transmission time limit. The transmission time limit can be adjusted from 1 to 999s or be turned off with 000. Ex factory it is turned off.

The transmission time limit can be adjusted separately in the telephone mode and in the none-telephone mode. Currently only the telephone mode is used with the UELE.

Reg.	Function
------	----------

010	1.- 3. digit: transmission time limit in none-telephone mode $nnn * 1\text{s}$
-----	--

310	1.- 3. digit: transmission time limit in telephone mode $nnn * 1\text{s}$
-----	---

In- and outputs

The FT635UELE has 16 in- and outputs and the carrier input, which can be used for special functions. The 16 in- and outputs can be programmed as either input or output. Ex factory I/O0-7 are configured as open collector outputs and I/O8-15 as inputs with 27kOhm pullup to 5V. With an alternative equipping all 16 I/O can be fitted with pullup resistors to +5V or to supply voltage or as open collector output.

Reg.	Function
-------------	-----------------

095	1.- 8. digit: I/O-configuration 1 (I/O 0-7)
096	1.- 8. digit: I/O-configuration 2 (I/O 8-15)
For all digits: 0=output, 1=input	

Inputs

If the I/Os are configured as inputs then they each use 2 registers in which their functions are programmed. In the first register the function is programmed when activating the input (input switches to ground) and in the second register the function is programmed when the input is deactivated (input is opened or switches to +).

Currently there are 2 possible functions:

- T11-55 input (see section T11-55)
- night mode input (see section Night mode)

Reg.	Function
-------------	-----------------

108	1. digit: function for input I/O 0 in case of activation to GND
109	1. digit: function for input I/O 0 in case of deactivation to +
110 - 141	the same as register 108/109 for I/O 1-15 and carrier input possible functions at
	1. digit
	0: no function
	3: T11-55 input
	9: night mode input
	further configuration for T11-55 input (1.digit = 3)
	2. digit
	0: channel free
	1: channel busy
	further configuration for night mode input (1.digit = 9)
	2. digit
	0: normal operation
	1: night mode

Outputs

If the I/Os are configured as output, then there currently there are 3 possible functions:

- additional PTT output
- output for telephone active
- digital output by tone sequence (see section Digital output control)

Up to 4 I/Os can be programmed with digital output functions.

Reg.	Function
097	1. digit function 1
097	2. digit digital output for function 1
097	3.+ 4. digit digital output and function 2
097	5.+ 6. digit digital output and function 3
097	7.+ 8. digit digital output and function 4

possible functions at 1./ 3./ 5./ 7. digit:

- 0: no function
- 1: PTT output normal
- 2: PTT output inverted
- 3: TEL output normal
- 4: TEL output inverted
- 5: RING output normal
- 6: RING output inverted
- 7: CALL output normal
- 8: CALL output inverted

possible digital outputs at 2./ 4./ 6./ 8. digit:

0-9,A-F: In/Out 0-9,10-15

Examples for function 1 = In/Out15 = PTT output the same as FT633UELE:

Register 097: 1Fxxxxxx

Digital output control

The digital outputs I/O8-15 can be switched by transmitting certain 8-tone sequences from the radios. In this process the first 5 digits of the 8-tone sequence are evaluated selectively. The last 3 digits of the 8-tone sequence are interpreted as decimal value and are converted into the binary switching pattern of the 8 digital outputs I/O8-15. This means that for the last 3 digits values varying from '000' and '255' can be entered (8-bit-number). The tone sequence for switching is acknowledged by a 5-tone sequence acknowledgement. The acknowledgement can be turned off by 'F' at the 1. digit.

Example: The last 3 digits are '036'. The decimal number '036' corresponds to the 8-bit binary number '0010 0100', so that the digital outputs can be switched as follows: ('1'=ON, '0'=OFF).

digital output 15 14 13 12 11 10 9 8 output state 0 0 1 0 0 1 0 0

Reg.	Function
030	1.- 5. digit tone sequence for digital output control for I/O8-15
030	6.- 8. digit needs to be programmed with F
031	1.- 5. digit acknowledgement after digital output reswitching (Reg.030)

AF-signaling pathways

All AF pathways are switched wear-free with analog switches. The radio in-and outputs (except discriminator input and CTCSS output) are galvanically decoupled using a transformer.

AF-signals (telephone to radio)

The level of the incoming telephone signal is adjusted in register 620. The AF signal is transferred from here to the radio output by means of the output level adjustment. Also see section Service program/adjustment.

AFsignals (radio to telephone)

The AF signals of the radio go through an input level adjustment. The discriminator input of the UELE also has an electronic input level adjustment. Also see section Service program/adjustment. The level of the outgoing telephone signal is adjusted in register 621.

Signalings of the radio (e.g. 5-tone sequences) which are processed in the UELE, can optionally be connected to the normal RX output or to the discriminator output of the two-way radio. This is programmed in the EEPROM-register 080:

Reg. Function

080 6.digit tone sequence decoder

7.digit FFSK decoder

8.digit CTCSS (subtone) decoder (optionally available)

For all 3 digits the following applies:

1 = decoder at the RX input (radio in) of the UELE

2 = decoder at the discriminator input (discriminator in) of the UELE

To program the EEPROMs please read the section Programming mode EEPROM. Ex factory the tone sequence decoder and the FFSK decoder are connected to „radio in“ and the CTCSS decoder is connected to „discriminator in“.

DTMF

The FT635UELE has 2 independent DTMF decoders. Therefore a directional switch-over, as with the FT633UELE, is no longer necessary. Now it is possible to wait for an termination call from the radio and to decode new mobile IDs from the telephone. The following assignments of the programmable values to the DTMF tones apply in all registers in which DTMF tones are programmed:

programmed values: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

DTMF tone: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,*,#

For both directions the DTMF signals have a delete key and an end key. These keys can be configured individually. Ex factory '*' is the delete key and '#' is the end key. By using the delete key the complete telephone number is deleted and the entry begins anew. By using the end key the input is finished and the call is started. It is necessary to use the end key when dialing via DTMF from the radio.

Calling the mobile ID via telephone is started with the end key or automatically after the complete input of the mobile ID.

Ex factory telephone dialing uses DTMF, but pulse dialing is also possible.

Specifications for the DTMF encoder and decoder can be adjusted in the TIM, if problems arise.

Reg. Function

357	1. digit	delete key from radio
357	2. digit	end key from radio
357	3. digit	delete key from telephone
357	4. digit	end key from telephone
366	4. digit	dialing mode
		0 = pulse dialing, 1 = DTMF dialing

Tone sequence encoder and decoder

The FT635UELE can decode tone sequences from the radio by means of the normal AF input or the discriminator input. Ex factory the tone sequences are decoded at the normal AF input. The standard version does not include the discriminator input. The tone sequence encoder always transmits via the normal AF output to the radio. The tone sequence for encoder and decoder can only be adjusted together. But the length of the individual tones can be adjusted separately. After changing the tone sequence the duration of the tones also has to be reprogrammed. This is not automatically carried out by the FT635UELE.

The tone sequence encoder supports the following ID-Modes when calling a vehicle.

ID-Mode	Function
0	5-tone sequence
1	double tone sequence call, link tone, ID 2*X-tone sequence (number of tones of register 081 / 6. digit)
2	double tone sequence, ID, link tone, call 2*X-tone sequence (number of tones of register 081 / 6. digit)
3	6-tone sequence (5-tone sequence with attached 1 digit ID of register 015 / 5.digit)
4	7-tone sequence (5-tone sequence with attached 2 digit ID of register 015 / 4.+5.digit)
5	8-tone sequence (5-tone sequence with attached 3 digit ID of register 015 / 3.-5.digit)
8	4-tone sequence
9	X-tone sequence (number of tones of register 081 / 6.digit)
F	no tone sequence

The decoder evaluates each incoming tone sequence individually. There are 10 decoders (T1-T10) with corresponding configuration register available for the telephone functions. The decoder T1 has the highest priority and the decoder T10 the lowest.

Incoming tone sequences are checked for conformity with the decoders T1-T10. If there is a match, this decoder is processed and all the following decoders with lower priority are not checked anymore. The correct number of tones and conformity with the key tones is necessary for decoding. If all tones are to be accepted at a certain position of the tone sequence or if this position does not exist in the tone sequence (e.g. tones 6-8 when decoding a 5-tone sequence), then the decoder must be programmed with 'F' at this digit.

Example:

decoder T3 is to decode all 6-tone sequences which begin with 1234 (123400-123499)

register 322 = 1234FFFF: decodes all tone sequences which begin with 1234, tone duration 4-15 digits

register 332 = 6xxxxxxx: 1.digit: 6 = valid tone duration is 6-tone sequence

Reg. Function

015 1.- 8. digit: own ID when transmitting ID

055 1.+ 2. digit: nn * 10ms PTT advance time before tone sequences and tones

055 3.+ 4. digit: nn * 10ms PTT follow-up time after tone sequences and tones

080 1.- 3. digit: decoder: maximum tone duration 1. tone nnn * 5ms

080 4.+ 5.digit: decoder: minimum tone duration of all tones nnn * 5ms

080 6. digit: tone sequence decoder at: 1=radio AF, 2=discriminator

081 1.- 3. digit: decoder: maximum tone duration all other tones nnn * 5ms

081 4. digit: decoder locking period after transmitting tone sequences n * 100ms

081 5. digit: tone sequence encoder and decoder (0/1/2/3:ZVEI1/CCIR/ZVEI2/EEA)

081 6. digit: number of tones for ID-Mode 1,2,9 (RK,KR,R) (3-7)

082 1.+ 2. digit: encoder: tone duration 1. Ton nn * 10ms

082 3. digit: encoder: tone duration all other tones n * 10ms

082 4.+ 5. digit: pause time between call and identification nn * 10ms

320 - 329 key tones for decoder T1 to T10

330 - 339 configuration for decoder T1 to T10

33x 1. digit: number of tones

33x 2. digit: type of decoder:

0: decoder off

1: starting call

2: short dial

3: direct dialing

4: night mode

9: termination call

further configuration for starting call (2. digit = 1):

3. digit:

0: starting call only, no function during call

1: also termination call during a call in progress

4. digit: transmit confirmation tone y/n (1/0)

(must not be activated for block dialing)

further configuration for short dial (2. digit = 2):

3. digit: position in tone sequence for "100" range short dial number (0=default)

- 4. digit: position in tone sequence for "10" range short dial number (0=default)
- 5. digit: position in tone sequence for "1" range short dial number (0=default)
- 6. digit: "100" range short dial number default
- 7. digit: "10" range short dial number default
- 8. digit: "1" range short dial number default

At the 3.-5. digit the digit in the tone sequence is programmed whose value is used as the short dial number. If 0 is programmed, then the value which is programmed at the 6.-8. digit will be used.

Example: received tone sequence 987654, register 33x=62045100 = dialed short dial number 165

- 3. digit 0: "100" range short dial number is derived from 6. digit in register (1)
- 4. digit 4: "10" range short dial number is derived from 4. digit of the tone sequence (6)
- 5. digit 5: "1" range short dial number is derived from 5. digit of the tone sequence (5)

further configuration for direct dialing (2. digit = 3):

- 3. digit: position in the tone sequence, with the 1. direct dialing number
- 4. digit: lowest permitted value for the 1. direct dialing number
- 5. digit: highest permitted value for the 1. direct dialing number
- 6. digit: number of prefix numbers to telephone (0-2)
- 7.- 8. digit: prefix numbers 1 and 2

At the 3. digit the digit in the tone sequence is programmed which contains the 1. direct dialing number. The range for a valid 1. direct dialing number can be limited at the 4. and 5. digit. All following numbers of the tone sequence are dialed. If in addition one or two specified prefix numbers are to be dialed before the direct dialing numbers, this can be programmed at the 6. digit. These numbers are programmed at the 7. and 8. digit.

Example: received tone sequence 987654, register 33x=63427120 = dialed call number 2654

- 3. digit 4: 1. direct dialing number is at the 4. digit of the tone sequence (6)
- 4. digit 2: min. value of the 1. direct dialing number
- 5. digit 7: max. value of the 1. direct dialing number (valid range 2-7)
- 6. digit 1: a prefix number of the 7. digit in register (2)
- 7. digit 2: 1. prefix number (2)

further configuration for night mode (2. digit = 4):

- 3. digit: 0=off, 1=on, 2=corresponding to 4.-7. digit, 3=on/off toggling
- 4. digit: digit in the tone sequence for night mode configuration
- 5. digit: value for turning on the night mode
- 6. digit: value for turning off the night mode
- 7. digit: value for toggling of the night mode

At the 3. digit the new status of the night mode is programmed. The turning on or off of the night mode can be determined or it can be switched back and forth between the two kinds of status. Alternatively a digit in the tone sequence can also determine the new status.

Example: received tone sequence 98760 for off, 98761 for on, register 33x=542510F0

- 3. digit 2: new status is stated in the tone sequence
- 4. digit 5: new status is stated at the 5. digit of the tone sequence
- 5. digit 1: xxxx1 (98761) for activating night mode
- 6. digit 0: xxxx0 (98760) for deactivating night mode
- 7. digit F: xxxxF (9876F) no toggling allowed (9876F does not exist)

Dial-up - telephone -> radio

Reg. Function

360 4. digit: T11-55 for dial-up telephone to radio y/n (1/0)

367 5. digit: number of ring tones until line seizure

Access code - telephone -> radio

For software V1.12 and newer the UELE can be programmed to request an access code. In this case the UELE sends a tone when a call is supposed to start. From now on all DTMF tones from the telephone are saved and compared to the access code. If the code is wrong an error beep is returned and one has to retry. After 3 erroneous codes the UELE disconnects. After reception of the right code, one can proceed in the usual way.

The access code can consist of up to 7 DTMF tones (see register 356).

Automatic connection - telephone -> radio

An incoming telephone call effects the automatic line seizure after the N-th ring tone. Two signal tones at intervals of 1s are transmitted to the telephone. After that the connection to the radio is connected through. If the function T11-55 is activated, then the 2. signal tone will be delayed until the channel is free. If the channel is busy for longer than 45 seconds the connection will be terminated. For information on the function of T11-55 please read section T11-55. The phone call is ended automatically by modulation monitoring and time monitoring or manually by an termination call.

Reg. Function

363 1. digit: F=immediate automatic connection

Direct dialing by DTMF - telephone -> radio

An incoming telephone call effects the automatic line seizure after the N-th ring tone and a signal tone is transmitted to the telephone. 0 to 7 numbers are preselected in the EEPROM-Register 361 and the missing numbers (coded with "F" in the EEPROM) are completed by DTMF numbers. The call input always takes place until all 7 digits have either been preselected or entered. If e.g. a 5-tone sequence is to be transmitted then the 6. and 7. digits must not be programmed with 'F'. Otherwise additional (unused) DTMF numbers must be entered. After complete call input the call is either started with the end key on the telephone (normally the #-key) or automatically. If not all numbers have been entered when the end key is pressed, then the telephone subscriber receives an error message (2 short signal tones). If the function T11-55 is activated, then the call transmission will be delayed until the channel is free. But if the channel is busy for more than 45 seconds the connection set-up is terminated. For information on the function of T11-55 please read section T11-55. After transmitting the call a second signal tone is transmitted to the telephone and the connection will be set up. If a wrong number is entered the complete number can be deleted with the delete key on the telephone (normally the *-key). Then the input begins anew.

Within 15s after sending a call the last call can be sent again by using the end key. Also several radio participants can be called (consecutive dialing), to do this delete the last

entry with the delete key during the call and begin a new entry.

5s after the entry of the last DTMF number the input mode is automatically terminated. If no call has been transmitted to the radio before, then the connection will be terminated. The call is automatically terminated by modulation monitoring and time monitoring or manually by an termination call.

Reg. Function

- 361 1.-7. digit: preset digits for tone sequence for direct dialing Tel>Radio
- 361 8. digit: begin call with end key y/n (1/0)
- 363 1. digit: ID-mode of the tone sequence for direct dialing Tel>Radio
- 363 2. digit: link tone for double tone sequence

Automatic call forwarding with direct call - tel -> radio

The automatic transfer is a special case of direct dialing by DTMF if all digits of the tone sequence are preprogrammed. An incoming phone call effects the automatic line seizure after the N-th ring tone, a signal tone is transmitted to the telephone and the programmed call is transmitted to the radio. If the function T11-55 is activated then the call will be delayed until the channel is free. But if the channel is busy for longer than 45 seconds, then the connection will be terminated.. For information on the function of T11-55 please read section T11-55. After transmission of the call a second signal tone is transmitted to the telephone and the connection is set up.

The phone call is automatically terminated by modulation monitoring and time monitoring or manually by an termination call.

Night mode - telephone -> radio

Night mode is an alternative possibility to make a connection from phone to two-way-radio. As in normal operation all 3 possibilities for making a connection are possible (automatic connection, direct dialing with DTMF and automatic transfer with direct call). The only difference between night mode and normal operation is the use of different registers. Switching from normal operation to night mode is done by a tone sequence from the radio or by a switching input.

Reg. Function

- 362 1.-7. digit: night mode: preset digits for tone sequence when direct dialing Tel>Radio
- 362 8. digit: night mode active y/n (1/0)
- 363 3. digit: night mode: ID-mode of the tone sequence when direct dialing Tel>Radio
- 363 4. digit: night mode: link tone for double tone sequence

Radio -> telephone

Reg. Function

- 320-339 tone sequence decoder and corresponding configuration
- 360 1.-3. digit: T11-55 at connection setup two-way radio to telephone y/n (1/0)
- 360 1. digit: on starting call + dialing with DTMF
- 360 2. digit: on speed dial
- 360 3. digit: on direct dialing with DTMF

Direct dialing with DTMF - radio -> telephone

For direct dialing with DTMF any telephone number can be dialed. The radio user can initiate the direct dialing procedure (radio --> telephone) by two different kinds of starting calls: either by transmitting a tone sequence or by transmitting a sequence of DTMF-tones. The pause between 2 DTMF-tones must not be longer than 5 seconds.

Both starting call variants can be used alternatively or together. The UELE will acknowledge the starting call with a key tone if programmed. After the starting call the DTMF-dial tones which include the telephone number must follow. For this the first DTMF-dial tone has to be received not later than after 15 seconds and each further tone not later than after 5 seconds. All DTMF-tones received from the radio user are buffered so that fast incoming DTMF-tones can be processed. After entering the telephone number completely the dialing process is started by pressing the END key (normally the #-key). If the function T11-55 is activated the start of the dialing will be delayed until the channel is free. But if the channel is busy for more than 45 seconds the connection setup will be terminated. For information on the function of T11-55 please read section T11-55. Before the start of the dialing a key tone (acknowledging tone) is transmitted to the radio user (see section Signal tone delay). The line will be seized and depending on the configuration it will be checked if there is a dial tone (see section Call tone detection).

Then the telephone number which has been entered will automatically be dialed in the desired dialing method. If a wrong number is entered the complete number can be deleted by using the delete key (normally the *-key) and the entry begins anew. The phone call is automatically terminated by modulation monitoring and time monitoring or manually by an termination call.

Hint: The signal tone after decoding the starting call must not be activated, if the dialing is to be done by block dialing. When block dialing, the starting call and the DTMF-tones of the telephone number are transmitted by the two-way radio as a block without longer pauses.

Reg. Function

357 5. digit: transmit confirmation tone after DTMF starting call y/n (1/0)

358 1. digit: number of digits in the DTMF starting call (0-7)

358 2.-8. digit: code for starting call by DTMF

Direct dialing with tone sequence - radio -> telephone

When dialing directly with tone sequence telephone numbers with a defined length are dialed. The length of the telephone number is limited by the maximum length of the tone sequence of 15 digits minus the fixed digits and plus the prefix numbers. Additionally a range for the first dial number can be defined. The incoming tone sequence must have the length which has been programmed in the configuration register and must correspond with the key tones in the decoding register. Also the 1. dial number must be within the programmed range. If the function T11-55 is activated then the start of the dialing will be delayed until the channel is free. But if the channel is busy for more than 45 seconds the connection setup will be terminated. For information on the function of T11-55 please read section T11-55.

Before the start of the dialing a signal tone (acknowledging tone) is transmitted to the radio user (see section Signal tone delay). The line will be seized and depending on the configuration it will be checked if there is a dial tone (see section Call tone detection). Then the telephone number which has been entered will automatically be dialed in the desired

dialing method. The telephone number consists of the programmed prefix numbers and then all numbers of the tone sequence of the programmed 1. direct dialing number. The phone call is automatically terminated by modulation monitoring and time monitoring or manually by an termination call.

Speed dial - radio -> telephone

The FT635UELE has a speed dial memory of 1000 entries with 16 digits each. For speed dialing a 3-digit speed dial number has to be generated from the tone sequence. The content of this speed dial memory will then be dialed. The speed dial number can either be completely comprised in the tone sequence or it is composed of variable digits in the tone sequence and fixed digits in the register. After the tone sequence has been identified correctly the line is seized and according to the configuration it will be checked if there is a call tone (see section Call tone detection). Then a signal tone is transmitted to the radio subscriber (see section Signal tone delay) and the number saved in the speed dial memory is automatically dialed in the desired dial mode.

The call is automatically terminated by modulation monitoring and time monitoring or manually by an termination call.

Speed dial memory

The speed dial memory has 1000 entries with a length of 16 digits each. It is read and programmed by the RS232 interface. The reading can be done either separately or as a block. Also the output can be done as plaintext or as a list for editing and uploading. With the help of a terminal program the outputs of the FT635UELE can be saved as a text file and can be processed later. When uploading the speed dialing list the terminal program has to wait 10ms after each line before the next line can be transmitted.

The speed dial memory can contain all characters for forming the telephone number. They are simply ignored when dialing. The numbers 0-9 are used as dial numbers and P as 1s dial pause. For DTMF-dial the DTMF-tones A-F are also allowed.

Speed dial functions:

WRxxx-yyy...display speed dial memory xxx (-yyy) (in plaintext)

WLxxx-yyy...display speed dial memory xxx (-yyy) (as a list for uploading)

WPxxx:yyy...y..prog. speed dial memory xxx with y (max. 16 digits)

WCxxx-yyy....delete speed dial memory xxx-yyy

Call monitoring

Maximum duration of a call

All connections are terminated after N seconds at the latest, if they have not been terminated before. At the beginning of the last 30 seconds an alarm tone is transmitted to the telephone subscriber. The maximum duration of a call is adjustable from 1 to 9999s or can be turned off with 0. Ex factory it is set at 5 minutes (300s).

Reg. Function

365 1.- 4. digit: maximum duration of call nnnn * 1s

Maximum transmission time for Simplex

If the maximum transmission time is exceeded, for example by loud noises in the telephone line, the telephone call will be terminated automatically. It is adjustable from 1 to 990s or can be turned off with 0. Ex factory it is set at 45s.

Reg. Function

366 1.- 3. digit: maximum transmission time for Simplex nnn * 1s

Maximum receiving time for Simplex

If the maximum receiving time is exceeded, for example by a constantly active carrier the telephone call will be terminated automatically. It is adjustable from 1 to 990s or can be turned off with 0. Ex factory it is set at 45s.

Reg. Function

367 1.- 3. digit: maximum receiving time for Simplex nnn * 1s

Modulation monitoring

The connection is disconnected after N seconds without speech modulation and the line is free. The maximum duration of a call without speech modulation is adjustable from 1 to 99s or can be turned off with 0.

Ex factory it is set at 10s.

Reg. Function

365 5.- 6. digit: maximum length of call without modulation nn * 1s

Disconnection by termination call

The radio user can disconnect an existing telephone connection with two different kinds of termination calls:

either by transmitting a tone sequence which has been configured as ending tone in one of the telephone decoders T1-T10 or by transmitting a sequence of 7 DTMF-tones maximum which have been programmed as termination call.

The pause between 2 DTMF-tones must not exceed 5 seconds. Both termination call variants can be used together or alternatively.

The telephone can also retract an active connection by using a DTMF termination call.

Reg. Function

320-339 tone sequence decoder and corresponding configuration

355 1. digit: number of digits in the DTMF termination call by the telephone (0-7)

355 2.-8. digit: code for termination call by DTMF by the telephone

359 1. digit: number of digits in the DTMF termination call by the telephone (0-7)

359 2.-8. digit: code for termination call by DTMF by the telephone

Signal tone delay

With all variants of connection setup (radio ==> telephone) a signal tone (acknowledging tone) is transmitted to the radio subscriber. If the radio subscriber is not ready to receive immediately after transmission of the signaling which releases dialing (tone sequence resp.DTMF-tone) , maybe the signal tone cannot be received. In this case a signal tone delay in steps of 100ms can be programmed.

Reg. Function

369 2. digit: signal tone delay to radio n * 100ms

Operating mode

The FT635UELE supports 3 operating modes for transmitter control (**Simplex (VOX)**, **Simplex (carrier)**, **Simplex (pilot-tone)**, **Duplex**, **Duplex (VOX)** and **Duplex (carrier)**).

With **Simplex (Vox)** speech is decoded by telephone and radio. If one direction is activated it will stay active as long as there is speech. Only afterwards the other direction can be

activated.

The delay times and levels for Vox are preset, but can be adjusted in the TIM.

With **Simplex (carrier)** the radio does not decode speech but the carrier input. The following procedure is the same as with Simplex (Vox).

With **Simplex (pilot-tone)** the transmitter is keyed by a pilot-tone from the telephone (a special telephone is necessary).

For the simplex modes maximum times for continuous transmitting and receiving can be set. If these times are exceeded the call will be terminated.

With **Duplex** the transmitter stays busy till the end of the connection.

With **Duplex (VOX)** the transmitter is activated by the voice.

With **Duplex (DTMF)** DTMF tones are used for transmitter activation/deactivation.

A certain amount of time is needed to recognize speech and activate the transmitter. Because of this, a part of the first word is lost. To avoid this the UELE can delay speech from telephone to radio. If a longer delay time is needed the speech can be compressed during the delay. There are two different ways of compressing speech. The A-Law compression halves the resolution from 16 Bit to 8 Bit and half the Baud rate reduces the sampling rate from 28,8kHz to 14,4kHz. For especially long delays both compression methods can be combined. Ex factory the operation mode "Simplex (Vox)" and no delay is set.

Reg. Function

- 366 1.- 3. digit: max. transmitting time for Simplex $nnn * 1s$
366 5. digit: operation mode 0=Simplex (VOX), 1=Duplex, 2=Simplex (carrier)
3=Duplex (VOX), 4=Duplex (DTMF), 5=Simplex (pilot-tone)
6. digit: DTMF-tone for PTT activation (*) (for Duplex (DTMF))
7. digit: DTMF-tone for PTT deactivation (#) (for Duplex (DTMF))
367 1.- 3. digit: max. receiving time for Simplex $nnn * 1s$
617 1.- 4. digit: speech delay telephone > radio $nnnn * 1ms$
617 5. digit: compression: 0 = none (max. 740ms delay time)
1 = A-law (max. 1480ms delay time)
2 = half the Baud rate (max. 1480ms delay time)
3 = A-law and half the Baud rate (max. 2960ms delay time)

Coding for old DAA module (V1.xx):

- 617 1.- 3. digit: speech delay telephone > radio $nnn * 1ms$
617 4. digit: compression: 0 = none (max. 55ms delay time)
1 = A-law (max. 110ms delay time)
2 = half the Baud rate (max. 110ms delay time)
3 = A-law and half the Baud rate (max. 220ms delay time)

Voice announcement (option)

When connecting to the telephone network the then required voice announcements to the telephone subscriber can be switched if the FT635UELE is additionally equipped with the option VMM.

Recording of texts

The recording is controlled by the RS232 and can be made by radio or telephone. Enter the text number and the recording source in the monitor command. If you want to record the texts from the telephone, the telephone connection must be set up beforehand. Then you start and end the recording with the blank key on the terminal.

The maximum number of texts is 240 and is also limited by the total memory capacity of 4 minutes (240 seconds). The UELE only uses the texts 1 and 2. Ex factory both announcements have been recorded with the following texts:

Text 1 (with setup telephone --> radio):

„Please wait - the desired subscriber has been called via the public radio network
(text is in German)

Text 2 (with setup radio --> telephone):

„You are now connected to the subscriber via the public radio network!“ (text in German)

When connecting between radio network and telephone network both texts no 1 and no 2 can be switched to the telephone subscriber as voice announcements.

Reg. Function

369 3. digit: voice announcement (text 1) with connection setup telephone --> radio

369 4. digit: voice announcement (text 2) with connection setup radio --> telephone

For both digits the following applies:

0 = no voice announcement

1 = during voice announcement no AF audible from the radio

2 = during voice announcement AF from the radio additionally audible

Example for the configuration

1. 5-Tone sequence system with mixed vehicle- and telephone numbers and dialing from the speed dial memory

- mobile call ID 12100-12149, two digit input
- telephone numbers 12150-12199, speed dialing register 050-099
- register 320 = 121FFFFF: decodes all tone sequences which begin with 121
- register 330 = 52045000: 1. digit: 5-tone sequence is decoded
 - 2. digit: speed dialing
 - 3. digit: "100" range speed dialing number is fixed and at the 6. digit
 - 4. digit: "10" range speed dialing is at the 4. digit of the tone sequence
 - 5. digit: "1" range speed dialing is at the 5. digit of the tone sequence
 - 6. digit: "100" range speed dialing = 0
 - 7.+8. digit: unused as the digits come from the tone sequence
- speed dial memory 000-049: must be empty (mobile call ID)
- speed dial memory 050-099: contains the telephone numbers

2. 8-Tone sequence system for telephone numbers and three digit dial from the speed dial memory

- telephone numbers 12345000-12345999, speed dialing register 000-999
- register 320 = 12345FFF: decodes all tone sequences which begin with 12345
- register 330 = 82678000: 1. digit: 8-tone sequence is decoded
 - 2. digit: speed dialing
 - 3. digit: "100" range speed dialing number is at the 6. digit of the tone sequence
 - 4. digit: "10" range speed dialing is at the 7. digit of the tone sequence
 - 5. digit: "1" range speed dialing is at the 8. digit of the tone sequence
 - 6.-8. digit: unused as the digits come from the tone sequence
- speed dial memory 000-999: contains the telephone numbers

3. 5-Tone sequence system with mixed mobile call ID and telephone numbers,

direct dialing with tone sequence and DTMF

- mobile call ID 12100-12109 and 12130-12198, two digit input
- telephone numbers 12110-12129, extensions 510-529
- free dialing of the telephone number with 12199 and DTMF consecutive dialing
- register 320 = 12199FFF: decodes all tone sequences which begin with 12199
- register 330 = 51010000: 1. digit: 5-tone sequence is decoded
2. digit: starting call
3. digit : no termination call with 12199
4. digit: transmit confirmation tone to radio
- register 321 = 121FFFFF: decodes all tone sequences which begin with 121
- register 331 = 53412150: 1. digit: 5-tone sequence is decoded
2. digit: direct dialing
3. digit: 4. digit of the tone sequence is 1. dial number
4. digit: the 1. dial number must be 1 or higher
5. digit: the 1. dial number must be 2 or lower
6. digit: a prefix number
7. digit: first dial 5
8. digit: unused as only one prefix number is used

Notice: As only the highest decoder with matching number of tones and key tones is processed, the starting call must be programmed before direct dialing. If they were programmed vice versa, then the starting call 12199 would be decoded as direct dialing tone sequence and would be discarded, because it does not fulfill the condition for the 1. dialing number. A further comparison with the lower decoders 2-10 will not take place after that.

Call progress tone detection

Call progress tone detection is of special importance when setting up the connection automatically. Which call progress tones the UELE detects and for what purpose is described below.

Dial tone detection before dialing

Dial tone detection before dialing effects the whole dialing process to begin only after detection of the dial tone when there is an automatic connection setup. The waiting period for the dial tone is 18 seconds, after that the connection setup is terminated. If using extension systems this function has to be turned off. In this case the dialing process begins automatically 3-4 seconds after the line is seized according to the selected dialing process (MFV or IWV). Ex factory call tone detection is turned off. Call tone detection is only active, when no prefix number for an external line has been programmed.

Dial tone detection after connecting to an external line

If, when setting up a connection automatically, an external line is needed (only possible for extensions with which external calls can be made) the prefix number for an external line (numbers 0...9) has to precede the telephone number (for direct dialing and speed dialing). Dial tone detection after connecting to an external line has the effect that a dialing process beginning with the prefix number for an external line is only continued after the dial tone has been detected.

Ex factory dial tone detection is turned off.

Reg. Function

367 4. digit: dial tone detection on/off (1/0)

369 1. digit: prefix number for connecting to an external line (0-9, F=no connection to an external line)

Busy tone detection

If a busy tone is detected an existing radio-telephone connection will be terminated. This ensures that the call is terminated when the telephone user replaces the handset. If Simplex operation was used the busy tone would activate the transmitter until time-out. In the section Configuration table for call progress tones there are several busy tones mentioned which have already been programmed ex factory. Customized busy tone types can easily be added to this table.

Dial tone detection

After automatic dialing the dial tone is transmitted to the wireless network, if the dialed telephone connection is free (for more information on the tone/pause ratio of the free line signal also see section Configuration table for call progress tones). If the callee does not answer the call, the transmitter is almost continuously activated by the dial tone when Simplex is used. This makes it almost impossible to transmit an termination call. To avoid keeping the transmitter activated until time-out, a certain period of time can be preselected during which the callee must have answered the call. If this period is exceeded, the connection will be terminated. It is adjustable from 1 to 999s or can be turned off with 0. Ex factory it is set at 45s.

Reg. Function

368 1.- 3. digit: maximum duration of dial tone nnn * 1s

Configuration table for call progress tones

There is a configuration table for call progress tone detection in the EEPROM. In this table you can define which tone/pause ratio will be detected as dial tone or busy tone.

Ex factory this table has already been programmed with two possible dial tones and with four possible busy tones. In rare cases with some PABXs (Private Automatic Branch Exchanges) or with certain AF noises on the telephone line there can be problems with call progress tone detection. These usually can be solved by reprogramming or complementing this configuration table. The table consists of maximally 19 entries (registers), each of which shows a tone/pause ratio. By combining several entries complex call progress tones can be decoded which consist of a combination of different tone/pause ratios. In this way it is also possible to program the detecting of tones only after they have been decoded several times in sequence.

If new call progress tones are to be programmed the exact periods of time of the new call progress tones must be known. To facilitate this the UELE can output the current times.

Ex factory the following tones have been programmed:

dial tone: - 1s tone / 4s pause
 - 1s tone / 5s pause

busy signal: - 400ms tone / 400ms pause / 400ms tone / 400ms pause
 - 500ms tone / 500ms pause / 500ms tone / 500ms pause
 - 240ms tone / 240ms pause / 240ms tone / 240ms pause
 - 160ms tone / 480ms pause / 160ms tone / 480ms pause

Reg. Function

380 1. digit : exchange tone decoder n * 3,125%

380 2.- 4. digit: tone duration for continuous tone decoding nnn * 10ms

380 5.- 7. digit pause duration for pause decoding nnn * 10ms

380 8. digit: indicate decoded exchange tone times y/n (1/0)

381 - 399:

1. digit: type of exchange tone:

0=continued line

1=dial tone

2=busy tone, F=free

2.- 4. digit: tone duration nnn * 10ms

5.- 7. digit: pause duration nnn * 10ms

As examples the ex factory preset tones are described here:

Register	Content - Meaning	Tone duration	Pause duration
381	11004000 dial tone	1s	4s
382	11005000 dial tone	1s	5s
383	20400400 busy tone	400ms	400ms
384	00400400 continuation	400ms	400ms
385	20500500 busy tone	500ms	500ms
386	00500500 continuation	500ms	500ms
387	20240240 busy tone	240ms	240ms
388	00240240 continuation	240ms	240ms
389	20160480 busy tone	160ms	480ms
390	00160480 continuation	160ms	480ms

391-399 FFFFFFFF empty entries

T11-55

T11-55 prevents the start of a new call on an already busy radio channel. An additional receiver is necessary for Duplex or Semi-Duplex operation, which monitors the transmitting channel. Carrier detection on the transmitting channel has to be read via an input. The normal carrier input can be used for Simplex operation. For Duplex or Semi-Duplex operation a different input has to be used when the normal carrier input is needed (see section In and outputs). If T11-55 is active then UELE will delay the beginning of the call when the transmitting channel is busy until the channel is free. After maximum 45s hold time the call will be terminated. The function can be activated separately for all varieties of call setup.

Reg. function

360 1. digit: T11-55 for radio>tel: starting call + dialing with DTMF y/n (1/0)

360 2. digit: T11-55 for radio>tel: speed dialing y/n (1/0)

360 3. digit: T11-55 for radio>tel: direct dialing with tone sequence y/n (1/0)

360 4. digit: T11-55 for tel>radio: direct dialing with DTMF y/n (1/0)

EEPROM register layout

010	00000000	transmission time limit without telephone call 1.-3. digit $nnn * 1s$ transmission time limit
015	12100FFF	own identification when transmitting identification
030	EEEEEEFF	switching output control with 8-tone sequence (5 defined + 3 bit pattern 000-255 for IO 8-15)
031	FFFFFFFF	acknowledgement for decoder reg.030
055	10100000	transmitter activation for tone sequence 1.+2. digit $nn * 10ms$ transmitter advance time 3.+4. digit $nn * 10ms$ transmitter delay time
056	00300000	carrier configuration 1. digit carrier mode 0:low active, pullup on 1:high active, pullup off 2:AF carrier 3:phantom 4:low active, pullup off 5:high active, pullup on 2. digit config for carrier input for AF- or phantom carrier (1. digit = 2 or 3) 0:low active, pullup on 1:high active, pullup off 4:low active, pullup off 5:high active, pullup on 3.+4. digit $nn * 10ms$ follow-up time AF-carrier
059	11110100	activation of the RS232 outputs always / when monitor active / never (2/1/0) 1. digit TX 2. digit SQL 3. digit DTMF 4. digit tone sequence 5. digit TIM 6. digit telephone functions
080	01810112	reference values for decoding 1.-3. digit maximum tone duration 1. tone $nnn * 5ms$ 4.+5. digit minimum tone duration of all tones $nn * 5ms$ 6. digit tone sequence decoder at: 1=radio, 2=discriminator 7. digit FFSK decoder at: 1=radio, 2=discriminator 8. digit CTCSS decoder (CTCSS is only an option) at: 1=radio, 2=discriminator
081	01810500	reference values for decoding

		1.-3. digit	maximum tone duration remaining tones $nnn * 5ms$
		4. digit	decoder blocking time after transmitting tone sequence $n * 100ms$
		5. digit	tone series encoder and decoder (ZVEI1 / CCIR / ZVEI2 / EEA / ZVEI3)
		6. digit	number of tones for ID-Mode 1,2,9 (RK,KR,R) (3-7)
082	07707000	configuration for encoder	
		1.+2. digit	tone duration 1.tone $nn * 10ms$
		3. digit	tone duration remaining tones $n * 10ms$ (0-9,A-F = 0-9,10-15)
		4.+5. digit	pause time between call and identification $*10ms$
095	00000000	I/O-configuration 1 (I/O 0-7) 0=output, 1=input	
096	11111111	I/O-configuration 2 (I/O 8-15) 0=output, 1=input	
097		switching function	
		1. digit	switching function 1
		2. digit	switching output for switching function 1
		3.+4. digit	switching output and switching function 2
		5.+6. digit	switching output and switching function 3
		7.+8. digit	switching output and switching function 4
		possible functions at 1./ 3./ 5./ 7. digit:	
		0: no function	
		1: PTT output normal	
		2: PTT output inverted	
		3: TEL output normal	
		4: TEL output inverted	
		5: RING output normal	
		6: RING output inverted	
		7: CALL output normal	
		8: CALL output inverted	
		possible switching outputs at 2./ 4./ 6./ 8. digit:	
		0-9,A-F: In/Out 0-9,10-15	
108	00000000	function input 0 passive>active	
109	00000000	function input 0 active>passive	
110	00000000	function input 1 passive>active	
111	00000000	function input 1 active>passive	
112	00000000	function input 2 passive>active	
113	00000000	function input 2 active>passive	
114	00000000	function input 3 passive>active	
115	00000000	function input 3 active>passive	
116	00000000	function input 4 passive>active	
117	00000000	function input 4 active>passive	
118	00000000	function input 5 passive>active	
119	00000000	function input 5 active>passive	
120	00000000	function input 6 passive>active	

121	00000000	function input 6 active>passive
122	00000000	function input 7 passive>active
123	00000000	function input 7 active>passive
124	00000000	function input 8 passive>active
125	00000000	function input 8 active>passive
126	00000000	function input 9 passive>active
127	00000000	function input 9 active>passive
128	00000000	function input 10 passive>active
129	00000000	function input 10 active>passive
130	00000000	function input 11 passive>active
131	00000000	function input 11 active>passive
132	00000000	function input 12 passive>active
133	00000000	function input 12 active>passive
134	00000000	function input 13 passive>active
135	00000000	function input 13 active>passive
136	00000000	function input 14 passive>active
137	00000000	function input 14 active>passive
138	00000000	function input 15 passive>active
139	00000000	function input 15 active>passive
140	00000000	function input SQL passive>active
141	00000000	function input SQL active>passive
108-141		1. digit = function type 0: no function 3: T11-55 input 9: night mode input function 3: T11-55 input 2. digit: active/passive (1/0) function 9: night mode input 2. digit: on/off (1/0)
310	00000000	transmitting time limit during a telephone call 1.-3. digit = nnn * 1s transmitting time limit in telephone mode
320	12399FFF	telephone decoder 1
321	123FFFFF	telephone decoder 2
322	88FFFFFF	telephone decoder 3
323	EEEEFFFF	telephone decoder 4
324	EEEEFFFF	telephone decoder 5
325	EEEEFFFF	telephone decoder 6
326	EEEEFFFF	telephone decoder 7
327	EEEEFFFF	telephone decoder 8
328	EEEEFFFF	telephone decoder 9
329	EEEEFFFF	telephone decoder 10
320-329		1.-8. digit = tone sequence to be decoded program unused and variable digits with 'F'
330	51110000	configuration for telephone decoder 1
331	52045000	configuration for telephone decoder 2

332	53309000	configuration for telephone decoder 3
333	00000000	configuration for telephone decoder 4
334	00000000	configuration for telephone decoder 5
335	00000000	configuration for telephone decoder 6
336	00000000	configuration for telephone decoder 7
337	00000000	configuration for telephone decoder 8
338	00000000	configuration for telephone decoder 9
339	00000000	configuration for telephone decoder 10
330-339		1. digit: number of tones (3-9,A-F=3-9,10-15)e.g. for 5-tone sequence 2. digit: type of decoder: 0: nothing, no decoding 1: starting call 2: speed dialing 3: direct dialing 4: night mode 9: termination call
on starting call:		3. digit: 0 = starting call only 1 = termination call, when call exists 4. digit: - transmit confirmation tone y/n (1/0) not on block dialing!!!
on speed dialing:		3. digit: digit in the tone sequence for "100" range short dialing number, (0=default, number of digit 6) 4. digit: digit in the tone sequence for "10" range short dialing number, (0=default, number of digit 7) 5. digit: digit in the tone sequence for "1" range short dialing number, (0=default, number of digit 8) 6. digit: "100" range speed dialing number default 7. digit: "10" range speed dialing number default 8. digit: "1" range speed dialing number default
on direct dialing:		3. digit: digit in the tone sequence, with the 1. direct dialing number 4. digit: lowest permitted value for the 1. direct dialing number 5. digit: highest permitted value for the 1. direct dialing number 6. digit: number of prefix numbers to the telephone (0-2) 7.-8. digit.: prefix numbers 1 and 2
on night mode:		3. digit: 0=off, 1=on, 2=see 4.-7.digit, 3=toggle, 4. digit: digit in the tone sequence for night mode 5. digit: value for switching on the night mode 6. digit: value for switching off the night mode 7. digit: value for toggling the night mode
353	00005500	Motorola SLR5500 Repeater (long calls) 1. digit: max. number of continuations 0=none, 1-E=1-14, F=infinite 2.-4. digit.: time until disconnection of the call to the repeater nnn*1s (000=no disconnection) 5. digit: time until re-dial (n*1s)

		6. digit: beep to the telephone upon disconnection (n*100ms)
354	40411010	Motorola Repeater (short/improved dialling Tel ==> Radio) 1. digit: number of DTMF tones to send (1-7) 3.+4. digit: min. waiting time until first DTMF tone (nn*100ms) 5.+6. digit: DTMF tone length (nn*10ms) 7.+8. digit: length of break in DTMF (nn*10ms)
355	00000000	DTMF termination call from the telephone 1. digit: number of digits (1-7, 0=off) 2.-8. digit: DTMF tones to decode
356	00000000	access code from the telephone 1. digit: number of digits (1-7, 0 = no access code) 2.-8. St.: access code (digits 1-7)
357	EFEF0000	DTMF configuration 1. digit delete key of radio (0-F=0-9,A-D,*,#) 2. digit ending key of radio (0-F=0-9,A-D,*,#) 3. digit delete key of telephone (0-F=0-9,A-D,*,#) 4. digit ending key of telephone (0-F=0-9,A-D,*,#) 5. digit transmit confirmation tone on DTMF-starting call y/n (1/0) 6. digit starting call directly reserves the line y/n (1/0) (direct DTMF call)
358	00000000	starting call by DTMF
359	00000000	termination call by DTMF
358-359		1. digit number of digits (1-7, 0=off) 2.-7. digit DTMF-tones which are to be decoded (0-F=0-9,A-D,*,#)
360	00000000	configuration for T11-55 for telephone y/n (1/0) 1. digit T11-55 on radio>tel: starting call + dialing with DTMF 2. digit T11-55 on radio>tel: speed dialing 3. digit T11-55 on radio>tel: direct dialing with tone sequence 4. digit T11-55 on tel>radio: direct dialing with DTMF
361	121FF001	direct dialing with DTMF (tel>radio) 1.-7. digit tone sequence, digits with F are entered in the telephone 8. digit start of call with ending key (#) y/n (1/0)
362	EEEEEEEE0	night mode (tel>radio) 1.-7. digit tone sequence, digits with F are entered in the telephone 8. digit night mode tel>radio on/off (1/0)
363	0F0F0000	configuration dialing tel>radio 1.+2. valid for direct dialing with DTMF (register 361) 1. digit ID-mode: 0=5-tone sequence, 1=call>ID, 2=ID>call, 3=6-tone sequence, 4=7-tone sequence 5=8-tone sequence, 8=4-tone sequence, 9=X-tone sequence,

		D=DTMF (Repeater) F=no tone sequence
		2. digit link tone on call>ID and ID>call
		3.+4. digit valid for night mode (register 362)
		3. digit ID-Mode:
		0=5-tone sequence, 1=call>ID,
		2=ID>call, 3=6-tone sequence, 4=7-tone sequence
		5=8-tone sequence, 8=4-tone sequence, 9=X-tone sequence,
		F=no tone sequence
		4. digit link tone on call>ID and ID>call
		5. digit 0 = no acknowledgement tones to the telephone
		1 = acknowledgement tone when reserving the line
		2 = acknowledgement tones upon complete input and upon complete dial
		3 = all acknowledgement tones (1+2)
		6. digit acknowledgement tone to the radio: 0=none
		1 = upon reservation of the (public) line
365	03004500	configuration telephone mode
		1.-4. digit nnnn*1s max. duration of call
		5.-6. digit nn * 1s max. duration of call without modulation
366	04510000	configuration telephone mode
		1.-3. digit nnn*1s max. transmitting time on Simplex
		4. digit dialing method 0=impulse, 1=DTMF
		5. digit operating type
		0=Simplex (VOX), 1=Duplex, 2=Simplex (carrier),
		3=Duplex (VOX), 4=Duplex (DTMF), 5=Simplex (pilot-tone)
		6. digit DTMF tone for PTT activation (*) (for Duplex (DTMF))
		7. digit DTMF tone for PTT deactivation (#) (for Duplex (DTMF))
367	04503000	configuration telephone mode
		1.-3. digit nnn*1s max. receiving time on Simplex
		4. digit dial tone detection on/off (1/0)
		5. digit number of ring tones until line seizure
		6. digit ring tones to the radio y/n (1/0)
		7.+8. St. nn*100ms waiting time before dial start
368	04500000	configuration telephone mode
		1.-3. digit nnn*1s max. hold time for dial tone at the remote station
369	00000000	configuration telephone mode
		1. digit prefix for an external line (only for dial tone detection) F = no prefix
		2. digit key tone delay (lead time for BEEP to radio) n*100ms
		3. digit voice announcement text1 on connection buildup tel>radio on(+radio)/on/off (2/1/0)
		4. digit voice announcement text2 on connection buildup radio>tel on(+radio)/on/off (2/1/0)
380	41405000	exchange tone decoder

- 1. digit n*3,125% tolerance for exchange tone decoder
- 2.-4. digit nnn*10ms tone duration for continuous tone decoding
- 5.-7. digit nnn*10ms pause duration for no tone decoding
- 8. digit indicate decoded exchange tone periods, y/n (1/0)

381-399

exchange tone decoder table

- 1. digit exchange tone type:
0=continued line, 1=dial tone,
2=busy tone, F=free
- 2.-4. digit nnn*10ms tone duration
- 5.-7. digit nnn*10ms pause period

Registers in TIM (Telefon Interface Modul)

DTMF encoder/decoder

- 600 00200020 duration of DTMF encoder
 - 1.-4. digit DTMF tone duration nnnn * 5ms
 - 5.-8. digit DTMF pause duration nnnn * 5ms
- 601 00200020 duration of DTMF encoder
 - 1.-4. digit DTMF lead time nnnn * 5ms
 - 5.-8. digit DTMF duration of follow-up time nnnn * 5ms
- 602 00000000 4.-8. digit output level DTMF high tone to radio (0-32768)
- 603 00006000 4.-8. digit output level DTMF low tone to radio (0-32768)
- 604 00008000 4.-8. digit output level DTMF high tone to telephone
(0-32768)
- 605 00006000 4.-8. digit output level DTMF low tone to telephone
(0-32768)
- 606A4200128 configuration DTMF decoder radio
 - 1. digit max. allowed level difference between
DTMF low and high (0=does not matter, 1-F=1-15dB)
 - 2. digit DTMF detection, n*10ms decoding until on
 - 3. digit DTMF detection, n*10ms no decoding until off
 - 4.-8. digit DTMF detection, min.level (0-32767)
00128=standard level-12dB, *2=-3dB;/2=+3dB
sensitivity
- 607 A4200128 configuration DTMF decoder telephone
 - 1. digit max. allowed level difference between DTMF
low and high (0=does not matter, 1-F=1-15dB)
 - 2. : DTMF detection, n*10ms decoding until on
 - 3. digit: DTMF detection, n*10ms no decoding until off
 - 4.-8. digit: DTMF detection, min.level (0-32767)
00128=standard level-12dB, *2=-3dB;/2=+3dB
sensitivity

Pulse encoder

- 610 12080200 duration of pulse dialing
- 1.+2. digit pulse duration nn*5ms (on hook time)

3.+4. digit pulse duration $nn \cdot 5\text{ms}$ (off hook time)
 5.-8. digit pause between 2 dial numbers $nnnn \cdot 5\text{ms}$
 611 00200020 duration of pulse dialing
 1.-4. digit pulse dialing duration of advance time $nnnn \cdot 5\text{ms}$
 5.-8. digit pulse dialing duration of follow-up time $nnnn \cdot 5\text{ms}$

Line drop decoder

613 20000000 1.-3. digit min. time for line drop recognition ($nnn \cdot 5\text{ms}$)

Exchange tone decoder

614 05500128 configuration for exchange tone decoder
 2. digit exchange tone detection, $n \cdot 10\text{ms}$ decoding until on
 3. digit exchange tone detection, $n \cdot 10\text{ms}$ no decoding until off
 4.-8. digit exchange tone detection, min.level (0-32767)
 00128=standard level-12dB, *2=-3dB;/2=+3dB
 sensitivity

Ring decoder

615 00301200 duration for ring decoder
 1.-4. digit min. ring duration for valid ring $nnnn \cdot 5\text{ms}$
 5.-8. digit max. ring pause between 2 rings $nnnn \cdot 5\text{ms}$

Telephone configuration

616 16210100 configuration data for IA3222B
 1. digit transmit voltage headroom and DC voltage drop
 (0=high, 1=normal, 2=low, 3=lowest)
 2. digit termination
 0=600R or 600R+2,16 μF
 1=600R+1 μF
 2=900R
 3=900R+1 μF
 4=ES203021 (Zr:Australia or China)
 5=Zr:New Zealand
 6=TBR21
 7=reserved
 3. digit transmit again
 0=normal, 1=+6dB
 2=+6dB bei DTMF
 3=+6dB for DTMF external line (Wx))
 4. digit current sensor (0=enabled, 1=disabled)
 5. digit ring threshold
 0=10/20V
 1=12.5/25V
 2=15/30V
 3=20/40V)
 6. digit line in use threshold
 0=22.5+/-7.5
 1=30+/-10, 2=15+/-5
 3=2.5 (line disconnect)

AF delay

617 00000000 configuration AFdelay telephone > radio
1.-4. digit: nnnn * 1ms AF delay telephone > radio
5. digit: compression
0 = none (max. 740ms)
1 = A-law (max. 1480ms)
2 = half the Baud rate (max. 1480ms)
3 = A-law and half the Baud rate (max. 2960ms)

(617 03500000 for DMR version)

These values are valid for the new DAA2 module. For DAA modules V 1.XX, see section

Operation Mode

VOX

618 20051010 configuration VOX radio
1.+2. digit minimum level for threshold
AF gone ==> AF present (00-99)
3.+4. digit minimum duration level above threshold
until AF present (00-99, nn*5ms)
5.+6. digit: minimum level for threshold
AF present ==> AF gone (00-99)
7.+8. digit: minimum duration level below threshold until AF gone
(00-99, nn*10ms)
619 20051010 configuration VOX telephone
1.+2. digit minimum level for threshold AF gone ==> AF present
(00-99)
3.+4. digit minimum duration level above threshold until AF present
(00-99, nn*5ms)
5.+6. digit minimum level for threshold AF present ==> AF gone
(00-99)
7.+8. digit minimum duration level below threshold until AF gone
(00-99, nn*10ms)

(619 20051040 for DMR version)

AF level

620 00032768 4.-8. digit: output level telephone>radio (0-65536)
621 00032768 4.-8. digit: output level radio>telephone (0-65536)
622 00010000 4.-8. digit: output level tone>radio (0-32768)
623 00010000 4.-8. digit: output level tone>telephone (0-32768)
624 00000000 4.-8. digit: output level pilot tone>radio (0-32768)
625 00006400 4.-8. digit: output level pilot tone>telephone (0-32768)

627 06000000 telephone input level adjustment in 0,1dB steps
1. -3 digit: 000 (-6dB) ... 060 (0dB) ... 255 (+19,5dB)

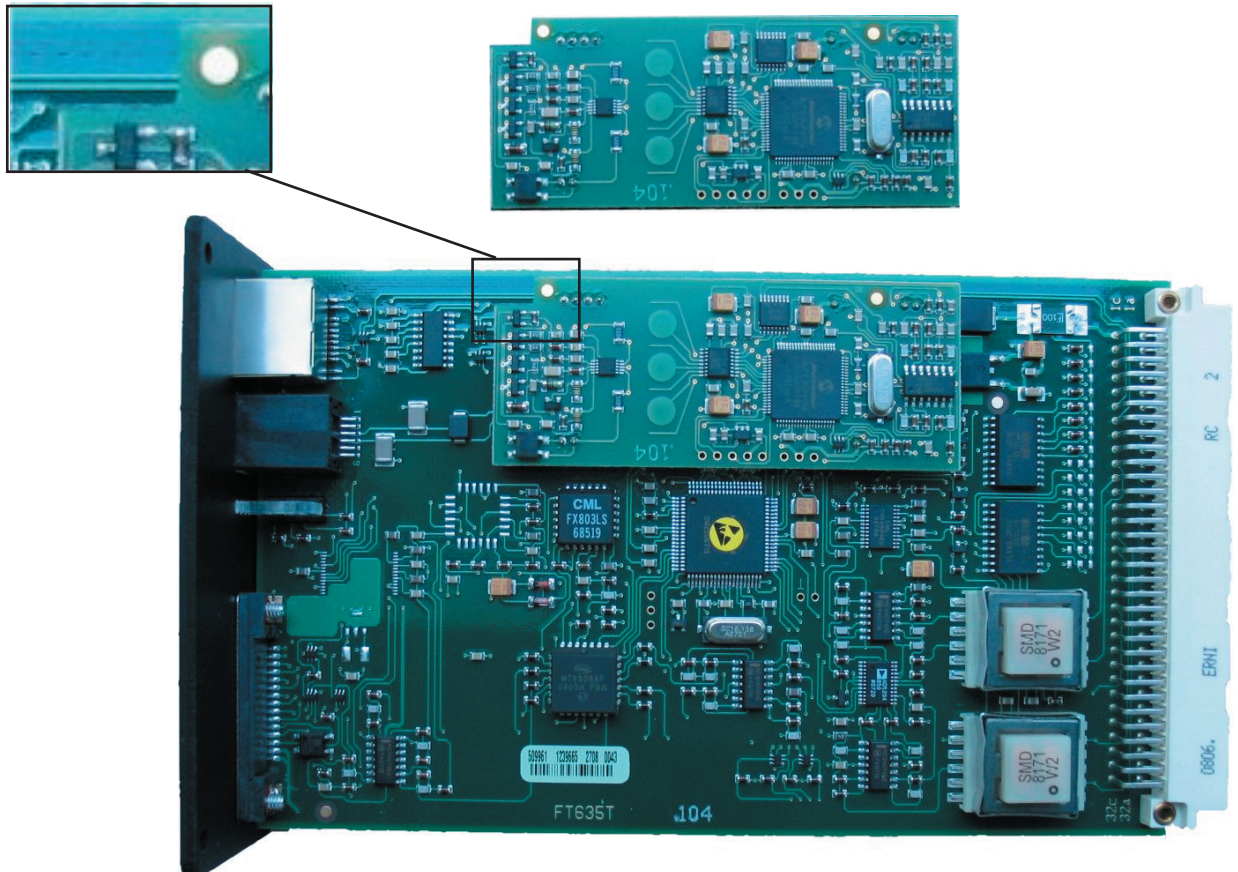
650 00000000 threshold AF mute
1.+2 digit nn * 0,9mV tel > radio on
3.+4 digit nn * 0,9mV tel > radio off
5.+6 digit nn * 0,9mV radio > tel on
7.+8 digit nn * 0,9mV radio > tel off

Installation TIM (Telephone Interface Module)

If it is necessary to replace a TIM ensure the exact alignment and placement on the connector sockets of the motherboard when installing it.

To do this the TIM should be aligned as shown in the following pictures.

- front plate is on the left
- recess of the TIM circuit board at the top on the left
- align the upper multiway connector flush with the front



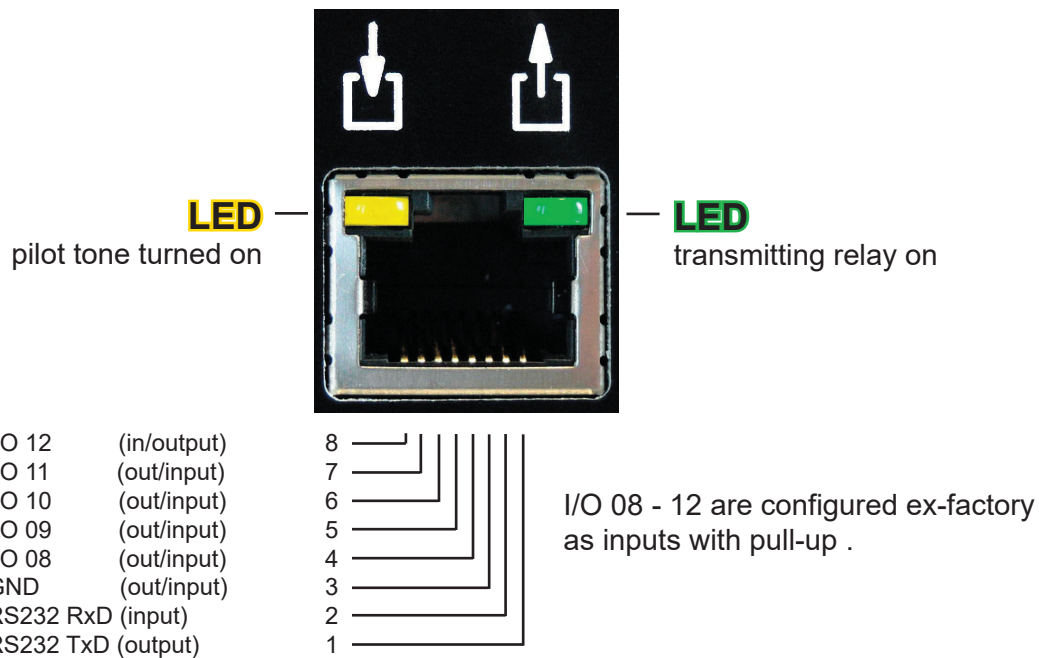
Looking from the side, as shown here, the front connectors have to be aligned flush left



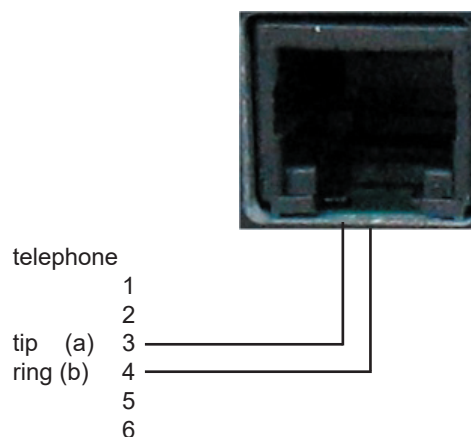
Connector pinout



8-pole RJ45-"Western" socket (RS232)

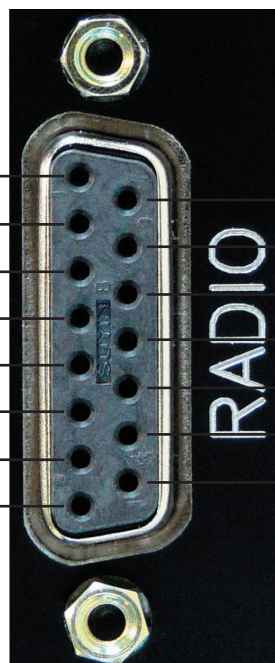


6-pole RJ11-socket (telephone)



15-pole sub-D socket (RADIO)

IN : + 12 V	1		9	IN: + 12 V
OUT: PTT relay	2		10	IN: squelch
OUT: PTT relay	3		11	IN: radio, AF in
OUT: radio, AF out	4		12	IN: radio, AF in
OUT: radio, AF out	5		13	I/O: I/O 2 (o.C.)
I/O: I/O 0 (o.C.)	6		14	I/O: I/O 3 (o.C.)
I/O: I/O 1 (o.C.)	7		15	I/O: GND
I/O: GND	8			



I/o 0-3 are configured ex factory as open collector outputs

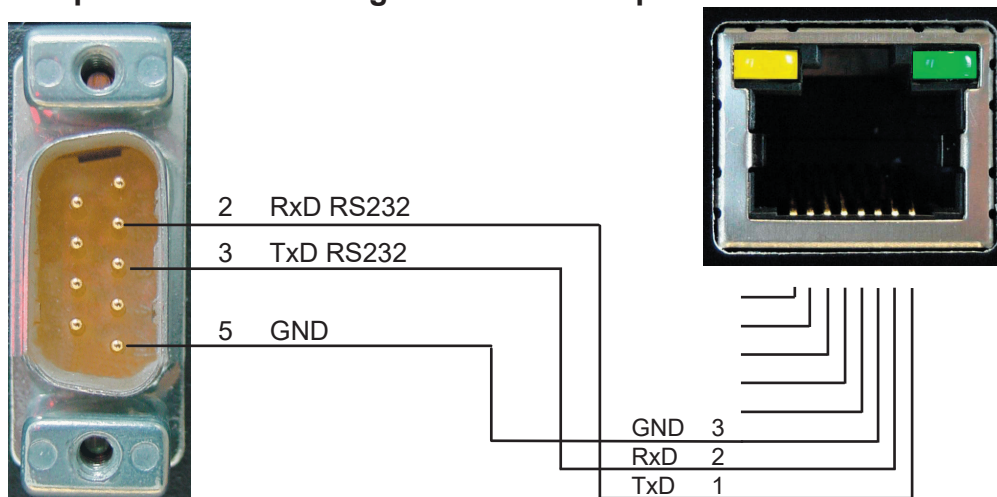
64-pole bus connector, 19 inch version

Pin	A	C
1	IN : + 12 Volt	IN: + 12 Volt
2	IN : analogue 1 (0-7V)	IN: analogue 2 (0-7V)
3	I/O: I/O 08 (pull-up 5V)	
4	I/O: I/O 09 (pull-up 5V)	IN : radio, GND for 7c
5	I/O: I/O 10 (pull-up 5V)	OUT: radio, GND for 6c
6	I/O: I/O 11 (pull-up 5V)	OUT: radio, CTCSS
7	I/O: I/O 12 (pull-up 5V)	IN: radio, discriminator
8	I/O: I/O 13 (pull-up 5V)	OUT: bus, AF RADIO>BUS
9	I/O: I/O 14 (pull-up 5V)	
10	I/O: I/O 15 (pull-up 5V)	IN : radio, AF in
11	I/O: I/O 0 (o.C.)	IN : radio, AF in
12	I/O: I/O 1 (o.C.)	
13	I/O: I/O 2 (o.C.)	
14	I/O: I/O 3 (o.C.)	
15	I/O: I/O 4 (o.C.)	OUT: radio, AF out
16	I/O: I/O 5 (o.C.)	OUT: radio, AF out
17	I/O: I/O 6 (o.C.)	I/O: I/O 7 (o.C.)
18	IN : slot configuration 1	
19	IN : slot configuration 2	
20	IN : slot configuration 3	IN : bus, AF BUS>RADIO
21	IN : slot configuration 4	
22	IN : RXD (RS232_ext)	OUT: TXD (RS232_ext)
23	I/O: SDA (I2C)	I/O: SCL (I2C)
24	OUT: PTT relay	OUT: PTT relay
25		
26	IN : squelch	
27		
28		
29		
30		
31		OUT: +5V
32	I/O: GND	I/O: GND

RS232-Connection cable

RS232 9-pole connector integrated in the computer

RS232 socket at the FT634



Service program and setting

FT 635Uele has a RS-232 interface with the following specifications:

**9600 Baud, 1 start bit, 8 data bits, no parity, 1 stop bit,
no protocol or Xon/Xoff**

To communicate with Windows you can use a terminal program such as "HyperTerminal"
. For Linux we recommend the program minicom.

After pressing ENTER the terminal program answers with the following display:

```
Online-Monitor FT 635 UELE
```

```
-----
```

```
Pxxx:yyyyyyyy...Prog EEPROM Adr. xxx to yyyyyyyy
Rxxx.....Read EEPROM Adr. xxx
A.....Adjust Poti
Ixxxxy.....Inbandtone xxxxHz 0 = off, y=T/F (tel/radio)
Tx.....Transmitter (x= 0:off, 1:on)
$xxxxx.....Transmit 5-Tone xxxxx
Cxx.....CTCSS-Ton xx (00-3F, 30=off)
Hx.....H0: Hang up, H1: Pick up
Wxxx...xxx.....Dial the telephone number xxx...xxx (max. 16
St.)
Wbxxx.....Speed Dial Memory Command b (help: W?)

X.....Exit
```

By selecting 'A' the poti setting is started.

#A

Which poti is to be adjusted?

1: input of radio
2: output to radio
3: input of discriminator
4: output to SUBout
x: end

Selecting '1' allows the setting of the radio input.

Poti adjusted (input of radio)

Enter 1000Hz at radio input with nominal level.

Adjust at internal measuring point ,MP1' to 300mV .

Starting value: 047 (min:000 max:255) level: 0002 mV nominal

level: 300 mV

activate:

<+> : poti+1
<*> : poti+10
<-> : poti-1
<_> : poti-10
<a> : auto-adjustment
<p> : program
<x> : termination

currently: 047 level: 0002 mV

Selecting '2' allows the setting of the radio input

poti adjustment (output to radio)

starting value: 053 (min:000 max:255)

activate:

<+> : poti+1
<*> : poti+10
<-> : poti-1
<_> : poti-10
<p> : program
<x> : termination

currently: 053

Selecting '3' allows the setting of the discriminator input.

poti adjustment (input of discriminator)

Enter 1000Hz at discriminator input with nominal level.

Adjust to 300mV.

Starting value: 047 (min:000 max:255) level: 0002 mV nominal

level: 300 mV

activate:

<+> : poti+1

<*> : poti+10

<-> : poti-1

<_> : poti-10

<a> : auto-adjustment

<p> : program

<x> : termination

currently: 047 level: 0002 mV

Selecting '4' allows the setting of the output to SUBout.

poti adjustment (output to SUBout)

starting value: 053 (min:000 max:255)

activate:

<+> : poti+1

<*> : poti+10

<-> : poti-1

<_> : poti-10

<p> : program

<x> : termination

currently: 053

Technical data

supply voltage	12 V
weight	ca. 525 g
dimensions width x depth x height	104 x 44 x 175 mm
19" dimensions	3 HE, 7 TE
input impedance radio	600 Ohm
output impedance radio	600 Ohm
output level radio	-30 ... +3 dBm, preset -10 dBm
input level radio	-22 ... +4 dBm, preset -17 dBm

Ordering information

Order no	item
635315	FT635-UELE
635325	FT635-UELE-19"

General Safety Instructions

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.

Factory 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**

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

February 2nd, 2006

Subject to change, Errors excepted

Revision remarks

Modifications made are only mentioned in note form in this section. For detailed information please read the corresponding chapters.

- 28.10.08 - register assignment revised in accordance with the latest software release
- 10.11.08 - connection examples added
- 14.11.08 - connection examples added
- 23.06.09 - table of contents corrected
- 24.06.09 - service program and adjustment added
- 16.07.09 - picture of UELE 19" added
- 19.11.10 - register corrected
- 25.02.11 - hint installation TIM
- 20.09.11 - description of carrier detection revised
- 18.01.16 - Connection examples PABX included
- 08.08.16 - new function added, registers added/corrected