Technical Description

Multifunctional Desk-Top Call Station
Digital Version 8, 16 Keys
L.No. 1 760 4, 1 761 5

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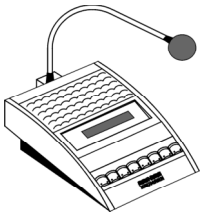
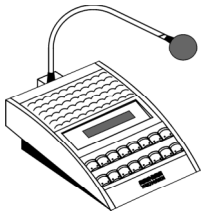


Desk-top call station
8 keys
L.No. 1 760 4



Desk-top call station
16 keys
L.No. 1 761 5

1. General remarks

This multi-functional digital desktop call station is incorporated into intercom systems with a multi-functional digital communication centre (MDK). It can be used to establish direct voice communication with other call stations, transmit announcements over loudspeaker systems and for programmable local functions. Display is in plain text. The 8 to 16 key versions described here have 8 to 16 line keys. Also available: alternative configurations and matching accessory cases, smaller and larger call stations with up to 208 keys. An identically designed special-feature telephone has also been developed.

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The keys can be freely assigned as WL destination keys or for local functions such as volume or pitch setting. The call station is connected to the MDK system by way of a separately available wall connecting box and a pluggable connecting cable.

In addition to the built-in loudspeaker, the call station also features an analog VF output connection for an external power amplifier which can operate a local loudspeaker circuit. This LK circuit can transmit WL calls to the call station station which can then be heard over a wider area around the station, and it can transmit local loudspeaker announcements from the call station. Moreover, the call station is fitted with an analog injectable VF input connection to listen to radio communications; the reproduction volume can be separately controlled.

There are two prepared installation points for the incorporation of text memories (D4 = text memory 1; D2 = text memory 2). Each one can hold frequently required announcements or sound sequences in a digital form so that they can be called at the depression of a key. You cannot record or delete yourself, but the texts and sounds you require can be produced at your request.

2. Design

The call station consists of a grey-white plastic case with built-in loudspeaker, swan neck microphone, 2-line illuminated LC display, and with 8 to16 line keys and LED signalling. The keys can be provided with their own inscription labels. The 25-pin connecting socket and a key-operated switch is located at the back of the call station. The two pc-boards in the station case incorporate all analog and digital electronic components. The control elements for microphone sensitivity, text memory scanning rate and volume are accommodated on the top pc-board.

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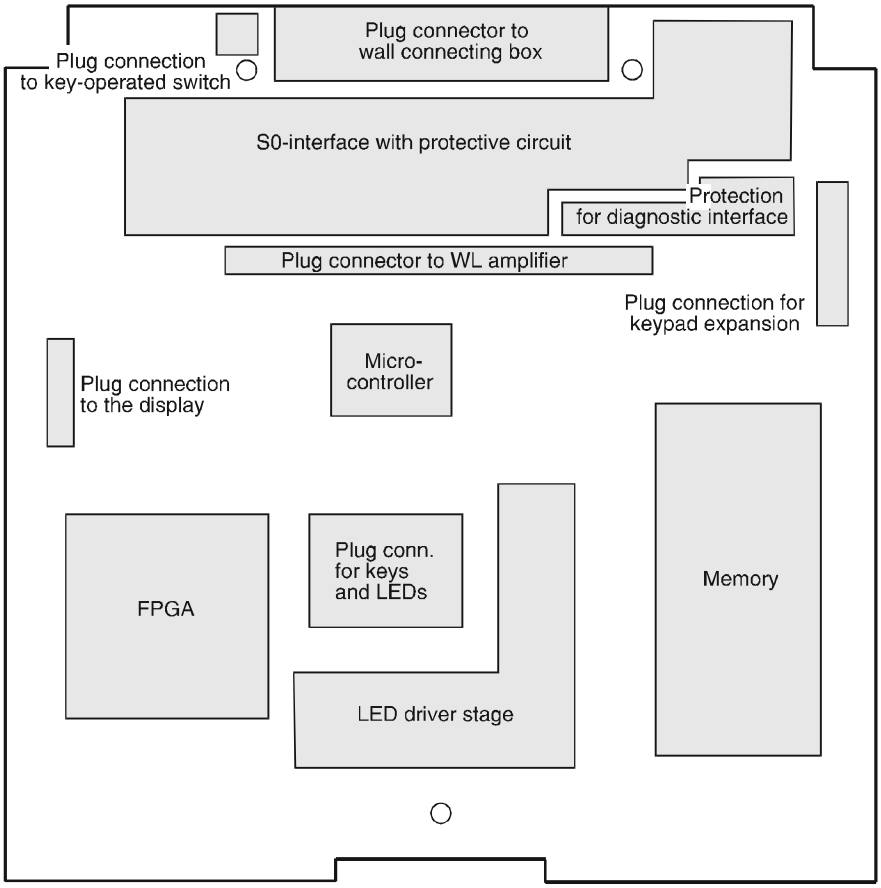
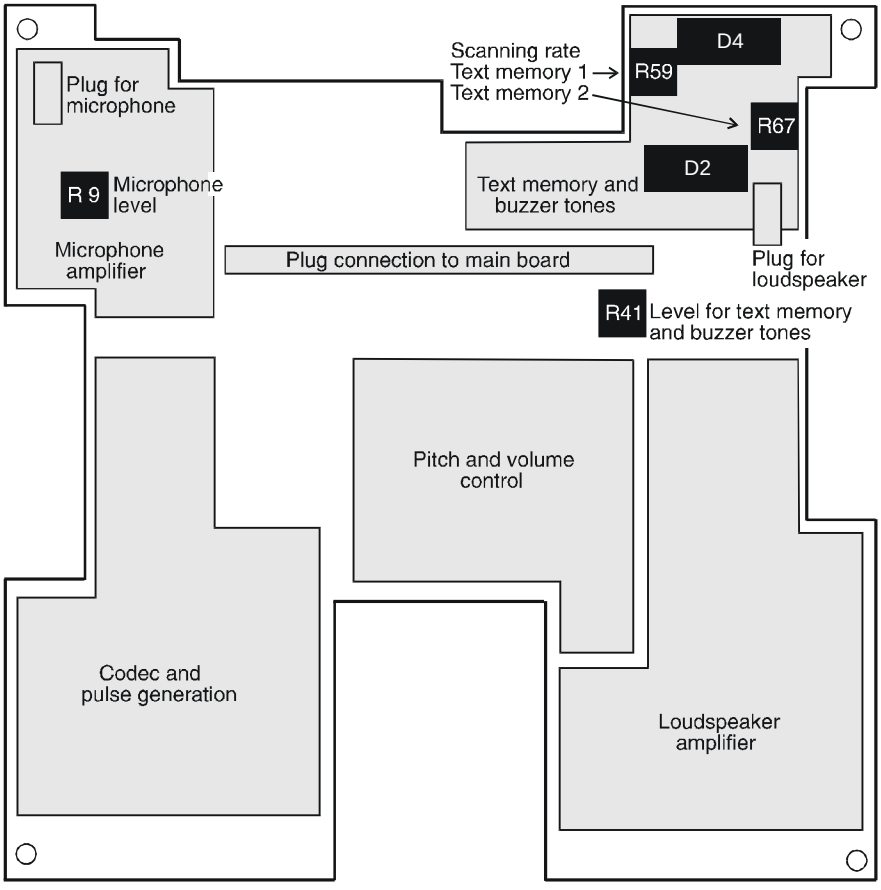
MTSD-
call station
main board



WL-
amplifier



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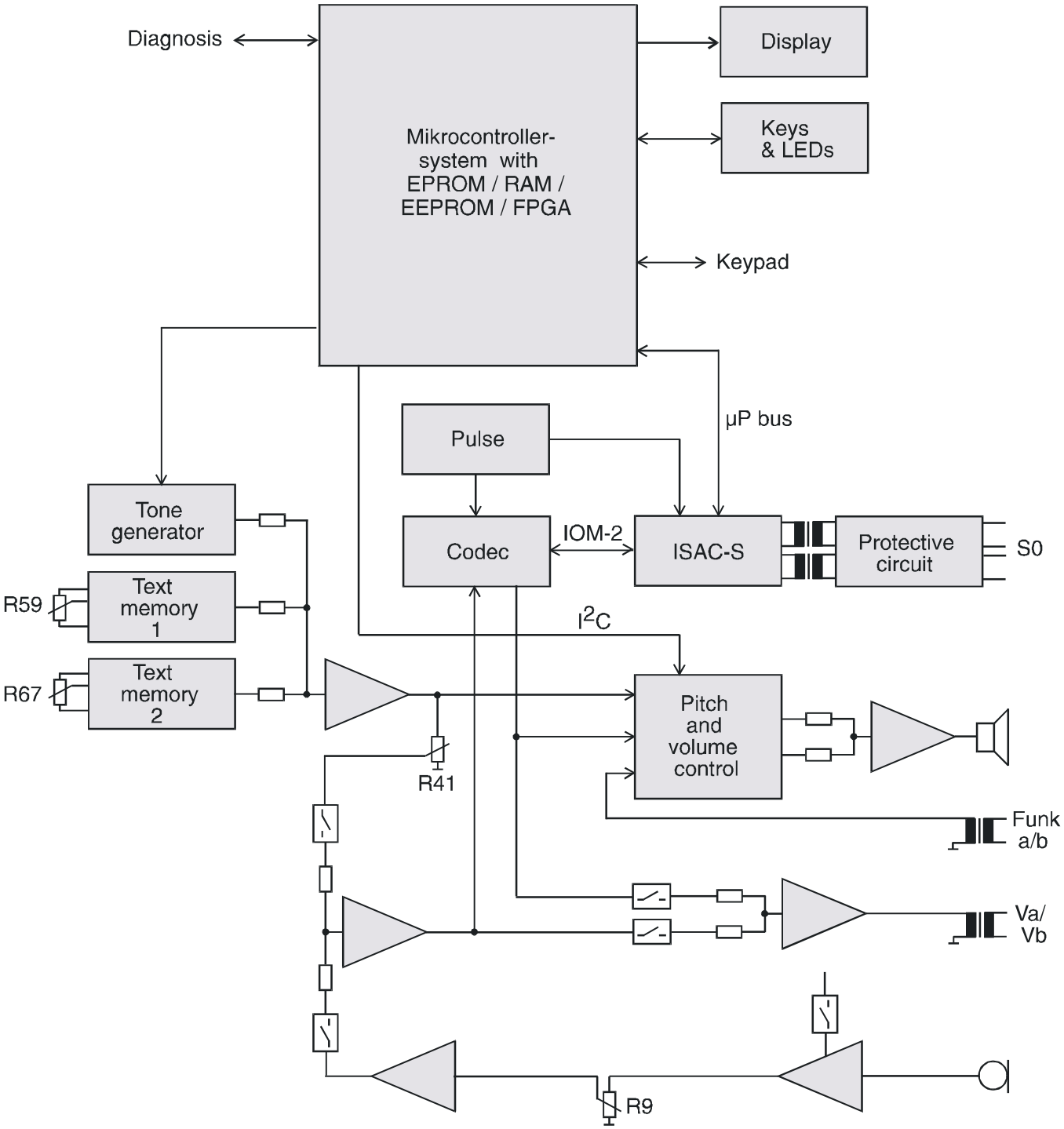
3. Block diagram



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4. Functions

The internal call station functions are roughly subdivided into four functional blocks which are subsequently described:

4.1 Controller System with Display

The controller system is based on an 8/16-bit controller and controls all functions of the all station. The system consists of the actual controller, together with an EPROM for the program code, a static RAM for tables and variables, and an EEPROM to store non-volatile parameters, as well as address coding and bus interface logics with port expansion. The last mentioned functions are implemented with the help of an FPGA (free programmable gate array). A 1-MBit type is used as program EPROM. 2-, 4- and 8-MBit versions are also possible. The controller's UART interface is conducted to a plug connector of the call station for diagnostic purposes so that a terminal or PC can be connected via a switching box (with timing generator and level converter). A pluggable serial bus system with corresponding protocol is available for coupling add-on keyboard modules which have their own controller. The backlit LC display is supplied with data and control signals by the controller via port signals.

4.2 S0-interface with Codec

The S0-interface functions as an interface for the transmission line linking the call station with the corresponding connecting circuits and the network terminator (NT) in the wall connecting box. The S0-interface consists of the highly integrated ISAC-S interface module which performs both layer-1 and layer-2 functions. A module for line matching and to protect the circuit from overvoltages is interposed between the interface module and the line. The protective circuit consists of two stages - The primary protection stage between line and transformer consisting of overvoltage protectors, and the second protection stage between transformer and ISAC-S consisting of a rectifier and Schottky diodes.

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The ISAC-S contains a microprocessor interface which is programmed by way of the controller. D-channel data transfer between the call station and connecting circuit is interrupt controlled via this interface. The B-channel data (speech channels) are transmitted between ISAC-S and the Codec via an IOM-2 interface at a data rate of 768 kBits/s.
The purpose of the Codec is to digitize the analog speech signal with a 16 kHz scanning rate, converting it into a serial data format, and converts digital B-channel data back into an analog VF signal.
Codec and ISAC-S have a joint timing source with a frequency of 15.36 MHz from which all pulses are derived with the help of counters and GALs. An output signal of the ISAC-S synchronizes the Codec timing pattern with the IOM-2 interface.

4.3 Analog circuit

The analog circuit of the call station consists of a level-controlled microphone amplifier with adjustable sensitivity, a loudspeaker amplifier, the two text memories (if configured), a process-controlled PWM sound generator and a pitch and volume control system with an I2C-bus that is controlled by the controller. The block diagram indicates the structure of the analog circuit.

The VF signals are software controlled by the controller via port signals and analog switch in conformity with the current call station function. The radio VF signal is injected in a transformer and conducted to the loudspeaker amplifier by way of the pitch and volume control module. The VF signal for the local LK circuit is extracted by way of an operational amplifier and transformer.

4.4 Keypad with LEDs

The keypad consists of key strips, each one with eight keys. The keypad is connected to a few port connections of the controller and the port extensions in FPGA. Two yellow LEDs are assigned to each key to indicate the assignment states, call flashes and call memory. The LEDs are coupled with the FPGA via transistor stages. The key-operated switch can be used to prevent normal (unauthorized) users gaining access to special functions of the call station, thereby ensuring that these can only be accessed by authorized people.

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5. Plug assignment

Assignment of the 25-pin Submin-D plug at the back of the case:

plug pin	Designation	Meaning
1	Funk a	Conductor a } Analog VF input connection for
14	Funk b	Conductor b } radio listen-in signal, level 775 mV
2	Va	Conductor a } Analog VF output connection for
15	Vb	Conductor b } additional loudspeaker amplifier
3	LED GND	} Ground feeder for key LEDs
16	LED GND	
4	LED SPG	} Operating voltage supply for key LEDs (+5V)
17	LED SPG	
5	S00	Conductor 0 } S0 interface
18	S01	Conductor 1
6	S02	Conductor 2
19	S03	Conductor 3
7	-5V	Operating voltage supply for analog section (-5V)
20	AGND	Ground for analog section
8	+5V	Operating voltage supply for analog section (+5V)
21	SSI	Handshake signal for diagnostic interface
9	SIN	Data input signal for diagnostic interface
22	SOUT	Data output signal for diagnostic interface
10	SCLK	Timing signal for diagnostic interface
23	SSO	Handshake signal for diagnostic interface
11	Reset L	Reset signal for diagnostic interface (active LOW)
24	GND	} Ground feeder for digital section
12	GND	
25	VCC	} Operating voltage supply for digital section (+5V)
13	VCC	

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6. Operation

The call station must be supplied with the necessary data so that it can be used for WL intercommunication in an MDK installation. This is completed by the software within the framework of an initialisation phase. The MDK Centre transmits the initialisation data to the call station via a corresponding interface plug-in unit. The data are integrated in socalled telegrams which are transmitted together with the safeguarding and protocol information.
The initialisation data include: Key assignment, display texts and fixed values (various telephone station parameters; see list).
Further information is given in the separate operating instructions 16 40001 377 .

Fixed values in the digital desktop telephone:

No. of byte	Function		
03	WL volume	min / max / basic	[00... FF]
03	Radio volume	min / max / basic	[00... FF]
03	Text memory volume	min / max / basic	[00... FF]
03	Buzzer volume	min / max / basic	[00... FF]
03	Pitch setting, bass	min / max / basic	[00... FF]
03	Pitch setting, treble	min / max / basic	[00... FF]
01	Text memory module 1,	passive / active	[00... 01]
01	Text memory module 2,	passive / active	[00... 01]
01	Time in German / American 24 hrs / English 12 hrs (am/pm)		[00... 02]
01	Language dialog text in local mode German / English / French / Spanish		[00... 03]
01	Display lighting	OFF / Automatic / ON	[00... 02]
41	Reserved		

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No. of byte	Text of first display line:
24	Display text from WL, e.g. "Call from tel."
24	Display text to WL, e.g. "Connection to tel."
24	Display text WL call waiting, e.g. "Call waiting from tel."
24	Reserved
24	Reserved
24	Reserved
24	Reserved
24	Display text of tel. turned off "Tel. disp. off"

Functions can be individually assigned to the keys of the call station. WL destination subscribers, group destinations and local call station functions can be associated with the keys. If local functions are assigned to the call station keys, then these functions will be continuously available during WL mode. A second method to call local functions involves adjusting the call station to "Local Mode" with the key-operated switch. The dialog-controlled local functions are then available. The local functions include:

Group VF setting

Number	Function
00 01	WL volume +
00 02	WL volume -
00 03	Radio volume +
00 04	Radio volume -
00 05	Text memory volume +
00 06	Text memory volume -
00 07	Buzzer volume +
00 08	Buzzer volume -
00 09	Ideal key (basic parameter setting)
00 10	Pitch setting bass +
00 11	Pitch setting bass -
00 12	Pitch setting treble +
00 13	Pitch setting treble -

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Group preparation

01 01...99 Buzzer preparation

02 01 Text memory 1 preparation

02 02 Text memory 2 preparation

Group test

03 00...99 Buzzer test

04 00 EL local

04 01 Text memory 1 test

04 02 Text memory 2 test

04 03 Display test

04 04 LED test

04 05 Call station test

The call station features a controller controlled tone generator which controls the acoustic signalling tones. These signalling tones, and the contents of the two text memories, can be faded into the VF signal.
The following signalling tones can be defined and selected by way of a telegram:

Signalling tones

ART 0: OFF

ART 1: 750Hz (1) clocked 1_1_1_1_...

ART 2: 1500Hz (1) clocked 1_1_1_1_...

ART 3: 375Hz (1) / 750Hz (2) dual tone clocked 11112___11112___11112___...

ART 4: 375Hz (1) / 750Hz (2) / 1500Hz (3) 112233__112233__112233__...

ART 5: 750Hz 0,5 seconds

ART 6: 750Hz (1) Pause 750Hz (1) 1_1

ART 7: 375Hz (1) Pause 750Hz (2) 1_2

ART 8: 750Hz (1) Pause 375Hz (2) 1_2

ART 9: 375Hz (1) / 750Hz (2) / 1500Hz (3) 123

ART 10: (0A) 375Hz 1 second / Pause 3 seconds

ART 11: (0B) triple tone 800Hz (1) / 1067Hz (2) / 1333Hz (3) 123123123

ART 12: (0C) triple tone 800Hz (1) / 1067Hz (2) / 1333Hz (3) 123123123_____123123123

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During WL mode the caller of an incoming call is shown in the LCD display. "Call Waiting" is briefly displayed if a call is already being conducted. If the call station is not participating in the WL service, then the date and time are displayed. One of three display formats can be selected. In the "local mode" the dialog texts for user prompting are displayed. The language for these texts can be selected within the framework of the fixed values.

7. Technical data

Operating voltages and currents: **L.-Nr. 1 760 4**	+5V (VCC), +5V (LED SPG), +5V (analog), -5V (analog)	200 mA 50 mA 150 mA 170 mA	total +5V: 400mA
Operating voltages and currents: **L.-Nr. 1 761 5**	+5V (VCC), +5V (LED SPG), +5V (analog), -5V (analog)	200 mA 100 mA 150 mA 170 mA	total +5V: 450mA

Permissible voltage tolerance:	5 %
Speaker amplifier:	max. 1 W at 8 Ω
VF bandwidth:	approx. 7 kHz
Microphone:	Electret microphone
Microphone amplifier:	Sensitivity approx. 1 mV
Radio listen-in input:	max. 0 dB, highohmic
LK output:	max. 0 dB at 600 Ω
Line interface:	S0-interface acc. to CCITT
Transmission protocol:	Neumann-WL protocol
Duration of text memory contents:	4... 16 seconds (adjustable), depending upon the scanning rate (f_{SAM} = 16... 4 kHz)
Ambient temperature range:	0 ... +50°C
Housing dimensions H x W x D:	88 x 183 x 260 mm
Weight:	approx. 1,1 kg

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