

SL 1000 Mark II

SYSTEM MANUAL

KOP109LE
Ver 20130909

Pääkonttori/Tehdas:

Head Office/Factory:

LEVELTEC OY

Hirvihaarantie 368

FIN 04680 HIRVIHAARA

Puh. 019-6888 270

Fax 019-6888 240

Tel. +358 19 6888 270

Fax +358 19 6888 240

Internet:

www.leveltec.fi

leveltec@leveltec.fi

TABLE OF CONTENTS

1. INTRODUCTION	4
2. SYSTEM STRUCTURE	5
2.1 THE SL 1000 Mark II Central	6
2.1.1 Technical specifications	6
2.1.2 General	7
2.1.3 Standard parts of the central	8
2.1.3.1 Basic rack with backboards	8
2.1.3.2 Flat cable for multi-module centrals	8
2.1.3.3 Power supply unit	9
2.1.3.4 Processor card	9
2.1.3.5 Connection card for the terminals	10
2.1.4 Optional parts of the central	10
2.1.4.1 Relay card	10
2.1.4.2 IPU-card (Interface Processor Unit)	10
2.1.4.3 Traffic between two centrals	11
2.2 The Cable Network	11
2.3 The Terminals and The Special Connection Units	13
2.3.1 General	13
2.3.2 Terminal models	13
2.3.3 TAR-A unit (Terminal Auxiliary Relay)	14
2.3.4 Special connection units (AIC-D & AOC-R)	14
2.3.5 Remote connection unit SL 1000 HEL-A and HEL-B	16
2.3.6 SL 1000 LP over-voltage protector	16
3. INSTALLATION, CONNECTING AND TAKING INTO USE	17
3.1 Installation	17
3.1.1 Installation schemes and requirements	17
3.1.2 The internal wiring of the centrals	20
3.2 Connecting of the Units	21
3.2.1 The power supply unit	21
3.2.2 The processor card	22
3.2.3 The connection cards	22
3.2.4 The user terminal	23
3.2.5 The programming terminal and the maintenance terminal	23
3.2.6 The optional relay card(s)	24
3.2.7 The optional IPU (Interface Processor Unit)	24
3.3 Taking into use	24
4. TROUBLESHOOTING	27
5. SYSTEM FUNCTIONS	27
5.1 Basic Functions	27
5.2 Special Functions and Features of the Terminals	30
5.3 Group Calls	33
5.4 Blocking of Calls	35
5.5 Optional Function: Free numbering using an IPU-card	35

6. USER PROGRAMMING OF THE PROCESSOR CARD(S)	36
Starting and ending key sequences of the programming	
6.1 Programming instructions	37
6.1.1 Special features of a connection number	38
6.1.2 Group calls	40
6.1.3 Blocking of calls	41
6.1.3.1 Using the blocking groups	41
6.1.3.2 Blocking calls to gate terminals	42
6.1.3.3 Blocking the controlling of relays	43
6.1.4 Real time clock	43
6.1.5 Some special system features	44
6.1.5.1 Clearing of all programming	44
6.1.5.2 Preventing the "follow me" function	44
6.1.5.3 Inverting the groups for group calls 78 and 79	45
6.1.5.4 Inverting the code from the paging adapter	45
6.1.6 Last connection number of the module	46
6.1.7 Paging card included in the central	47
6.1.8 Short code and transfer numbers	47
6.2 Programming examples	48
7. USER PROGRAMMING OF THE IPU FOR FREE NUMBERING	50
8. APPENDIXES	59
A1 System Definition and Cross Connection Diagram	59-60
A2 User Programming Diagram	61
A3 Programming examples	62
A4 Start-up Protocol	64

1. INTRODUCTION

The SL 1000 Mark II multicom system is an advanced multipurpose intercom system which consists of a central and a required number (up to 448) of user terminals. When two centrals are linked together the maximum amount of terminals is 896.

If bigger systems are needed, up to 7 centrals can be interconnected to give a system with a maximum of $7 \times 448 = 3136$ user terminals. Multicentral systems are described in a separate manual.

Besides handling the speech communication between the user terminals, the central can also transmit numeric messages from any one terminal to another one with the help of the 4-digit display unit that some models have. The display shows which terminal you are in contact with, the time of the day, stored call requests or information codes, which for instance tell the expected time of return or the reason for absence.

Thanks to the possibility of leaving call requests and storing information codes, the SL 1000 Mark II system services the user also in cases where the normal telephone or a standard intercom do not, that is when the person one is trying to reach is busy or not present. Because the probability for this can be very high, in certain types of organizations even 80 percent, the SL 1000 system increases the efficiency of your work and gives you more undisturbed working time than traditional systems.

The SL 1000 Mark II system replaces, as such, partly or in whole several such systems that usually are bought separately, for instance messenger call systems, nurse call systems, gate(door station systems, absence registration systems, public address (PA) and program distribution systems, and audible paging systems with an answer back possibility.

By using a special interface card, a peripheral device, such as a monitor, can be connected for certain applications, or the system can be coupled to a system for e.g. flexible working time registration or wireless paging. Relay cards can be used to control for instance tape recorders, video cameras or electrical door locks, and in this way a very efficient integrated solution can be found to fulfill the internal communication and surveillance needs of most organizations of today.

The SL 1000 Mark II central consists of 7 to 7 basic racks or modules, each of which contains one processor card and 1 to 8 connection cards. Eight user terminals can be connected to each connection card, so the maximum number of terminals connected to module is 64, and the maximum capacity of the central is 448 terminals. The first module gives the system 14 two-way speech channels, and each additional module 4 more, so the number of speech channels in a 7-module system is 38. This unusually high number of speech channels means that the probability of all channels being in use at the same time is extremely low. And even if they sometimes were, the transmission of the numeric messages will still work, which means that call requests can be left and information codes will be displayed.

The system functions are on a program stored into the PROM memory of the processor card(s). A big number of special functions and features are included in the standard program, such as determining the members of group calls, giving the priority right to desired terminals, defining the way the optional relays are to operate, and defining the blockings, that is determining which terminals are not allowed to call certain other terminals. All these special features can be defined or connected on or off at the customer. This so called user programming does not require special equipment, but is done using a normal user terminal of the system, which for the duration of the programming is connected to the programming connector of the module. All programming performed is stored in the battery backed-up RAM memory of the processor card, where it will be kept even during power breaks up to two weeks long. The user programmability of the SL 1000 Mark II system makes it very flexible and modifiable according to the needs of the customer.

2. SYSTEM STRUCTURE

The system consists of the following main parts, see figure 1:

- A central, consisting of 1 to 7 modules, each equipped with at least the following standard parts: a power supply unit, a processor card and the required number (1 to 8) of connection cards, to each of which 8 user terminals can be connected.

The optional parts of the central are the relay and the interface processor unit IPU. The relay cards are used for different types of control functions, and the IPU is needed for interfacing to peripheral devices or other systems, or if one wants to freely program the calling numbers of the terminals.

Another optional part is the interconnection card ICC, which is needed together with the IPU if several centrals are connected together. This is described in a separate manual.

- A cable network, which interconnects the central and the terminals. The network is a standard star-formed network, where each terminal is connected to the powering of the terminals and the two-way speech communication and two-way data transmission are done via these 4 wires.

- Terminals through which the users communicate. There are several different terminal models for different needs and environments. The most important terminal models is the desk top model with display, intended for office-type use.

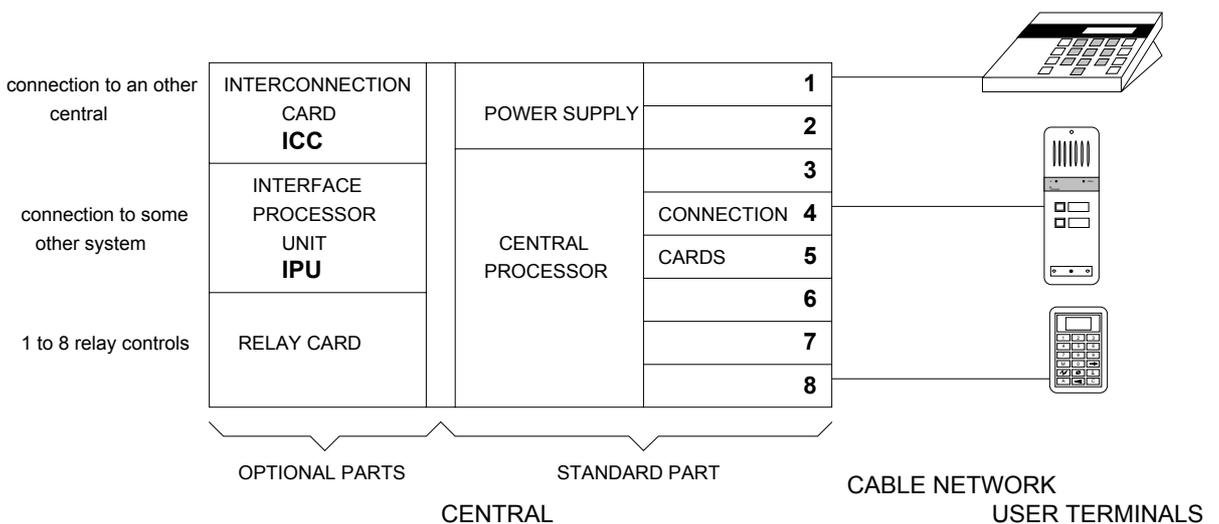


Figure 1

2.1 THE SL 1000 Mark II Central

2.1.1 TECHNICAL SPECIFICATIONS

Environment conditions	temperature	relative humidity
	16 - 22 degrees centigrade	40 - 80 %
	60 - 72 degrees Fahrenheit	

Mechanical dimensions (mm = millimeters)

	height	width	depth
1 module central	300	520	400
2 - 3 module central	1000	600	600
4 - 7 module central	2200	600	600

Card size double size Euro standard (Euro-2)

Mains (PSU = Power Supply Unit model)

PSU: SL 1000 P 64 - 1; 110 V ± 10 %, 60 Hz, 300 W

PSU: SL 1000 P 64 - 2; 230 V ± 10 %, 50 Hz, 300 W

Length of detachable mains cable of the PSU 2,5 m

Smallest central size	8 terminals
Expansion step	8 terminals
Maximum module capacity	64 terminals
Maximum central size	7 modules, 448 terminals

Number of speech channels (and listening channels)

First module	14 channels
Each additional module	+ 4 channels
Maximum number (with 7 modules)	38 channels

In a multi-module central each module has 4 internal speech channels and 10 channels for use between the modules. If one-way listening channels are in use, each takes up 1/2 speech channel. A maximum of 10 listening channels can simultaneously be in use.

Cable type between central and terminal MMS 1x4x0,5 or equivalent

Maximum cable length (max. loop resistance 200 ohms) 1 km (3300 ft.)

Frequency response 250 - 3500 Hz ± 3 dB
Maximum transmission level 0 dBm (600 ohm)

Switching method Time multiplexed PCM
(PCM = Pulse Code Modulation)

Storing of user programming RAM with battery back-up

The calling numbers of the terminals 10 - 73
or freely programmable 2, 3 or 4 digits long with the IPU.

2.1.2 GENERAL

The central unit of the SL 1000 Mark II system is built up of so called modules of basic racks, see figure 2. Each module is an independent unit with its own power supply unit, processor card and 1 to 8 connection cards, to each of which 8 user terminals can be connected. The maximum capacity of one module is thus 64 user terminals.

Up to 7 modules can in a simple way, that is without using any extra interface electronics, be interconnected to form a central with a maximum capacity of 448 user terminals.

The central is, depending on the number of modules that is included, delivered in three different types of cabinets as follows:

- a one module central is delivered in a light aluminum cabinet with the dimensions (HxWxD) 300 x 520 x 400
- a central with 2 - 3 modules is delivered in a light aluminum cabinet, with the dimensions 1000 x 600 x 600
- a central with 4 - 7 modules is delivered in a 2200x600x600 aluminum cabinet equipped with a protective door and two fans

A one module central has 14 two-way speech channels, which means that a maximum of 28 users can be communicating at the same time.

A central with N modules has $10 + 4 \times N$ speech channels, so a central with 2, 3, 4, 5, 6 and 7 modules has 18, 22, 26, 30, 34 and 38 speech channels, respectively. Each module has 4 channels for its internal use, and the remaining 10 are for use between the modules.

If one or several connection numbers are defined to be used as one-way listening channels, to which a radio or some other program source is connected, such a channel takes half a speech channel, meaning that two listening channels can be packed into one speech channel. All terminals in the system can be listening to the same program channel at the same time. A maximum of 64 connection numbers, which however all will have to be located in the same module, can be defined as listening channels, but not more than 10 can be listened to at the same time. Thus a maximum of 5 speech channels are used as listening channels, leaving at least 5 speech channels for use between the modules.

The central is fully electronic, and the speech connections are based on time multiplexed pulse code modulation 8PCM, where the analog speech signal is digitized with a sampling frequency of 8 kHz. The processor card of the module controls the converting from analog to the central, and from the central to the terminals, are thus analog.

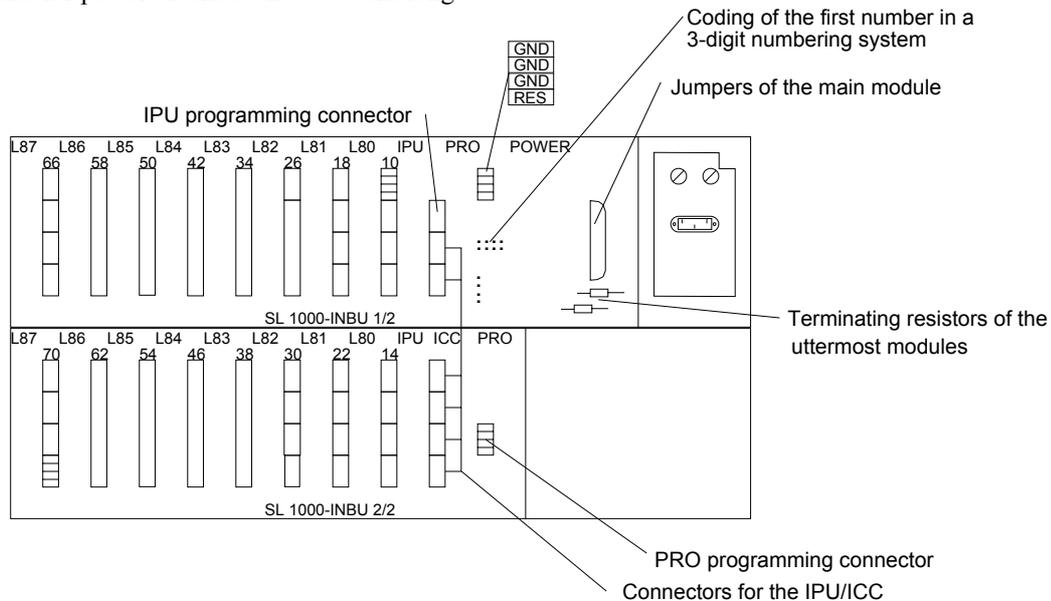
The data transmission, or signalling, between the central and the terminals is handled via a current loop. The signalling includes reading the buttons depressed at the terminals, turning the LED (light emitting diode) indicators of the terminals on and off, and sending the numeric characters to the display of the terminals.

Optional parts of the central are the relay card and the interface processor unit card (IPU).

The relay card, which holds 8 relays, can be put into the place of any connection card, and each relay card thus decreases the maximum number of user terminals in a module by 8. The relays can be used for external control (of e.g. electrical door locks, cameras, audible or visual alarms) directly from the buttons of the user terminals, or automatically during a call. The functioning is determined through user programming from the programming terminal.

The interface processor unit IPU, which has its own special slot location in the basic rack, and does not take up space of connection cards, is needed for free numbering of the user terminals are as standard N10-N73, where N is the module number 1-7, or, as an alternative, "nothing" is a 1-module system. By adding an IPU to any of the modules, the connection numbers become freely programmable, except that they cannot begin with a 0: The numbers can thus be selected in one of the ranges 10-99, 100-999 or 1000-9999.

The IPU card is also needed for interfacing to peripheral devices, such as a CRT monitor, or to other systems, e.g. wireless paging or flexible working time registration systems. Such applications are described in separate manuals. The SL 1000 Mark II system will, after connecting power on for the first time, function in its basic mode, meaning that all the customer has to do is to set the system real time clock from the programming terminal. A lot of other special features and functions can, if desired, be programmed by the user, such as group calls, call blockings, priority rights, relay controls, etc. All these user programmings done from the programming terminal, as well as the short code numbers, transfer address, call requests, information codes and alarm times set from the user terminals, are stored in the RAM memory of the processor card. The memory has a battery back-up that retains the memory contents for power breaks even two weeks long.



2.1.3 THE STANDARD PARTS OF THE CENTRAL

The standard parts of the central are the basic rack (module) with its backboards, the flat cable connecting the modules if there are more one in the central, and the standard parts of each module: the power supply unit, the processor card and the connection cards.

2.1.3.1 THE BASIC RACK WITH BACKBOARDS

The lightweight sturdy aluminum rack is on IEC standard 19" wide rack, with a height of 267 mm (6U). The cards used in the rack are of double size Euro standard. The rack can hold one power supply unit and 10 card units: one processor card, one IPU card and 8 connection or relay cards; see figure 2A. The units slide into the rack on plastic guides and connect to the backboards with one or two 32 pin connectors.

The rear of the rack consist of an upper and a lower backboard, see figure 2B. The 4-wire cables from the user terminals are connected to the 4-pole screw connectors on the backboards. The lower backboards also holds the 5-pole screw connector for the programming terminal that connects to the processor card, and the upper backboard the 5-pole screw connector needed when programming the IPU e.g. for free numbering. The connector for the flat cable needed between the modules in a multi-module central is also located on the upper backboard, as are some jumpers needed for the coding of the module number (first digit in the connection number), and for the synchronizing of the PCM-clock.

2.1.3.2 THE FLAT CABLE FOR MULTI-MODULE CENTRALS

All interface electronics needed to interconnect 2 to 7 modules in a central, are included on the processor cards: the only thing that is needed is a 40-wire flat cable that is chained from module 1 to module 2, from module 2 to module 3, and so on. The flat cable is connected between the backboards of the modules.

Additionally must in one of the modules, located as close to the middle of the chain as possible, a few jumpers on the backboards be connected.

For details see section 3.1.2.

2.1.3.3 THE POWER SUPPLY UNIT

The power supply unit (PSU) is a plug-in unit that supplies power to all cards and all user terminals connected to the module. There are two different versions of the PSU:

- SL 1000 P 64-1 for a mains of 110 V AC \pm 10 %, 50 Hz, 300 W
- SL 1000 P 64-2 for a mains of 230 V AC \pm 10 %, 50 Hz, 300 W

The PSU is equipped with a mains switch at the front and a mains filter, and connects to mains via a 2,5 m long detachable cable. The supply voltages and maximum currents are the following:

- + 42 V DC/5A unstabilized
- + 9,5 V DC/4A unstabilized
- + 5 V DC/1,5 A stabilized
- + 8 V DC/1,5 A stabilized
- 8 V DC/1,5 A stabilized

2.1.3.4 THE PROCESSOR CARD

There is processor card SL 1000 PRO in each module of the SL 1000 Mark II central. The processor card is the controlling unit for all 64 user terminals that can be connected to the module, in addition to which it also handles the communication to the other modules in the central.

The main functional part of the processor card are the 8085A microprocessor, the EPROM program memory, the CMOS RAM data memory, a timer/real time clock, the control circuitry for the connection cards, and the interface circuitry to other modules.

The size of the program memory is 16 or 12 kbytes, depending on whether the program version is intended for free numbering of the user terminals with the help of the optional IPU processor card (16 k) or not (12 k).

The 2 kbytes data memory has a battery back-up, which will keep the contents of the memory unchanged during power breaks up to 2 weeks long. The data memory is, among other things, used for storing of all user programing, and for storing the information codes and call requests which have been set at the user terminals.

The real time clock is used for displaying the time at the user terminals, and for alarming the users at set times. Each modules has its own clock, so there might be a small difference between the real times of the modules in a multi-module central, when the system has been in use for a longer period of time. The setting of the time in any one of the modules, which is done from the programming terminal, will however synchronize the time in all modules.

The speech switching is based on rime multiplexed pulse code modulation on a PCM link with 32 time slots. Four of the time slots are used for the connection, busy, alarm and group call announcement tones, which leaves 28 time slots, of which 14 two-way speech channels are formed. Four of these are for the internal use of each module, and 10 foe use between the modules. The PCM conversion is performed by codes (coders(decoders) on the connection cards, so the microprocessor only has to control the selection of a vacant time slot pair for each speech connection.

2.1.3.5 THE CONNECTION CARD FOR THE TERMINALS

The connection card SL 1000 L8A connects up to 8 user terminals to the central. A maximum of 8 connection cards can be put into one module, meaning a maximum of 64 user terminals per module. The user terminals are connected to the connection card via 4-pole screw connectors on the backboards of the module rack.

Any terminal(s) can be replaced with a program source (radio, CD-player, etc.), which is connected to the connection card via an Audio Input Connection Unit (AIC-D), or with an amplifier and loudspeakers for announcement purposes, which is connected via an Audio Output Connection Unit, which also has a Relay included (AOC-R).

The analog speech signals from a user terminal is coded into digital PCM signals by the code circuits of the connection card, and then decoded back into analog form by the same circuitry before transmission to the other user terminals of the call. The PCM conversion is done using 8 bits (256 digitized levels) and an 8 kHz sampling frequency, which means that the frequency response is cut off at about 3 kHz (the frequency response is 250-3500 Hz \pm 3 dB, and the maximum transmission level is 0 dBm on both directions at 600 ohms).

The connection card also holds the circuitry for interfacing to the reading of the buttons depressed at the user terminal, and to the sending of the numeric characters to the display and of the on/off information to the LED indicators of the terminal.

2.1.4 THE OPTIONAL PARTS OF THE CENTRAL

The optional parts of the central are the relay card and the interface processor unit.

2.1.4.1 THE RELAY CARD

The relay card SL 1000 R8, which is put in the place of any connection card, contains 8 relays. The relays can through user programming be defined to operate in different ways, e.g. during the whole duration of a call, if a certain number is selected, or if a certain button is depressed at the terminal during a call.

The relays can be used to control e.g. electrical door locks, video cameras, tape recorders or alarm bells. There is no restriction on the number of relay cards that can be included in a central, except that there can be a maximum of 8 per module, and each relay card replaces one connection card.

Each relay has as standard two potential free closing contacts, but these can easily be modified to two opening contacts or one switching contact.

As each relay card decreases the maximum user terminal capacity of a module by 8, an alternative is provided, which can be used in some applications: Terminals can be equipped with a relay unit called the TAR-A (Terminal Auxiliary Relay), see section 2.3.3.

2.1.4.2 THE IPU (Interface Processor Unit)

The interface processor unit SL 1000 IPU has its own slot location in the basic rack, and so it does not take up space of connection cards. The IPU is needed for free numbering of the user terminals.

The connection numbers for the terminals in a 1-module central are as standard 10-73 or N10-N73, where N is contact number between 1 and 7. In a multi-module the connection numbers are 110-173, 210-273, ..., 710-773, depending on the number of modules.

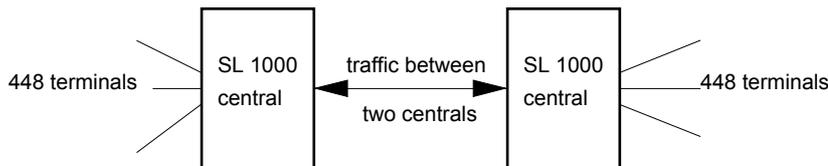
By adding an IPU to any of the modules, the connection numbers become freely programmable, except that key cannot begin with a 0: The numbers can thus be selected in one of the ranges 10-99, 100-999 or 1000-9999. Each connection number can be given two free numbers, a main number and a parallel number.

The free numbering option is explained in more detail in section 5.5, and the free numbering programming in chapter 7.

The IPU is also needed for interfacing to peripheral devices, such as a CRT monitor, or to other systems, e.g. wireless paging or flexible working time registration systems. Such applications are described in separate manuals.

2.1.4.3 TRAFFIC BETWEEN TWO CENTRALS

The SL 1000 multicom system can have max. 448 terminals. If more than that is needed traffic between two centrals enables 896 terminals to be connected.



The auxiliary devices to connect two centrals together:

While connecting two centrals the following auxiliary devices are needed for both SL 1000 central:

- 1 pc IPU processor card
- 1-3 pcs ICC cards (4 speech channels/card)
- 1-10 pcs LCU line connection units (1/speech channel)

Speech channels between the centrals:

- speech channels 1-10 pcs
- each ICC card includes 4 speech channels

Cabling:

The cabling is similar in the traffic between two centrals and in the network central system. Each speech channel needs 2 pairs. 2 pairs/central is also needed for signalling. In case the distance is less than 5 km the current loop signalling can be used. While using CO lines of the telephone company the signalling must be connected to the cable with a modem. LCU line connection unit is approved to be connected to the CO lines in Finland. While using own cables the suitable cable type is e.g. MHS n x 0,5.

2.2 THE CABLE NETWORK

The cable network is a standard 4-wire star-configuration network of the same type as used in all telephone installations. Each user terminal is connected to the central with its own 2 twisted pairs. The cable type is e.g. MHS 1x4x0,5 or equivalent, where the wire diameter 0,5 mm means that the maximum cable distance between the central and the terminals is about 1 km (3300 ft.), based on a maximum loop resistance of 200 ohms.

The star wiring saves installation costs, because multicables containing several twisted pairs can be used between the central and junction boxes located in different parts of the building. From the junction boxes onwards 2-pair cabling is used for branching to the individual user terminals. The biggest advantage of a star-former network, as compared to a ring network, that the malfunction of one user terminal or its cable does not prevent the rest of the system from working.

The cabling terminated at the user terminal end, in case of desk terminals, with a RJ-45 wall socket. The wall terminals have a 4-pole screw connector for the connecting of the cable.

At the central the cables are connected directly to the backboard of the module rack, or via a cross connection frame located next to the central cabinet. The latter alternative is recommended at least in systems with more than 24 user terminals, because the cross connection makes future expansions and alternations of the network easier.

The number of wires needed per user terminal does not depend on the terminal model or features: two pairs are always enough. It is, however, a good habit to provide a little more cables than actually needed during the initial installation, and thus preparing for possible wire damages and future expansions of the system. This extra cabling represents a minor cost increase compared to the cost of having to add cables later.

It is a major importance that the twisted pairs are used correctly, since connecting the pairs wrongly may lead to overhearing of the calls or bad functioning of the speech switching. One pair (A, B or 1, 2) is used for powering the terminal, and for feeding the speech signal from the central to the terminal. The other pair (C, D or 3, 4) is used for transmission or signalling: the key inputs, and the output to the numeric display and the LEDs of the terminals.

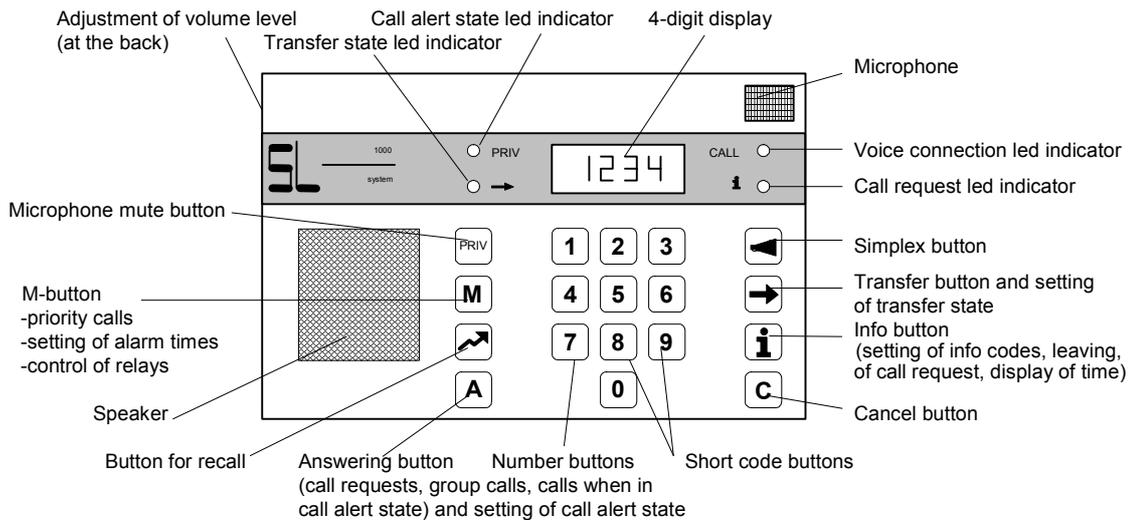


Figure 3

Signal tones

Start	_____
Start of group call	—
Busy	_____ — — — — —
Leaving of call request	—
Time alarm	— — — — —
Queuing	— — —
Alert state call	_____ — — — — —

2.3 THE TERMINALS AND THE SPECIAL CONNECTION UNITS

2.3.1 GENERAL

The SL 1000 Mark II system offers several terminal models for different purposes and environments.

There are two terminal models with display, both intended for indoor use: the SL 1002 D or SL 1002 DH which is a desk top model, and the SL 1008 or SL 1008 H for wall mounting: the H-models have a handset. Both models have an 18-key keyboard with 10 number and 8 function buttons, a 4-digit display, and 4 LED indicators (see figure 3 of the desk top model SL 1002 D on the previous page).

Simpler terminal models, from which the display and part of the buttons and/or LEDs are missing, are the desk top model SL 1001, the door terminals SL 1003 for indoor and SL 1006 for outdoor use, and the wall mounted SL 1004 for industry or outdoor use. Completely without buttons are the loudspeaker terminal SL 1011 intended for announcement purposes, and the passive subterminal SL 1013, which has both a loudspeaker and a microphone.

Terminals can be equipped with a relay unit called the TAR-A (Terminal Auxiliary Relay) as an alternative to having optional relay cards in the central.

The special connection units are the audio input unit SL 1000-AIC-D for connecting a program source to the central, and the audio output unit SL 1000-AOC-R with a relay, for connecting to an amplifier with loudspeakers.

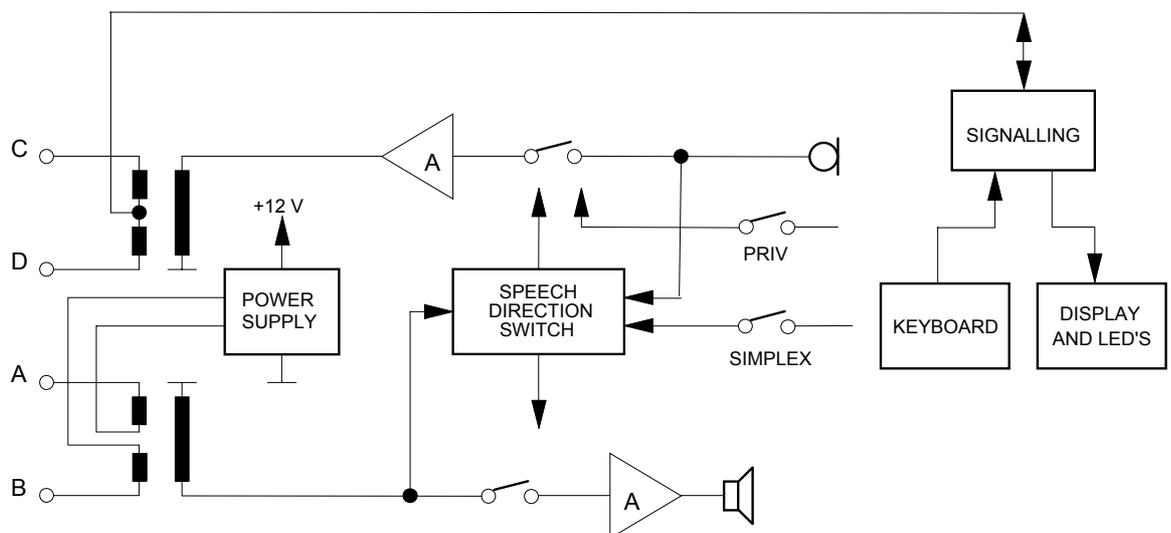
2.3.2 TERMINAL MODELS

The desk top models SL 1001 and SL 1002 D are equipped with a two meter (approx. 7 ft.) long connection cable and a 8-pin RJ-45 plug. The wall mounted models have a 4-pole screw connector for the connecting of the cable.

The speech connection between the user terminals is half duplex with automatic speech direction switching. When both parties of the call are using a handset the connection is full duplex. The simplex button, which some of the terminals have, can be used for manual control of the speech direction.

Figure 4 shows the block diagram of the terminal models which have the display unit. From the simpler models the display, the keyboard partly or wholly, and part of the LED indicators are missing.

On the next page there is a list of the different terminal models and of their main purpose of use, and a table, which tells the main features of the models. More detailed information can be found from the data sheets of the individual models.



2.3.3 THE TAR-A UNIT (Terminal Auxiliary Relay)

The TAR-A relay unit can be put into a terminal as an alternative to having relay cards in the central. The TAR-A can be used in two different ways:

- 1) The TAR-A is connected to the CALL-LED of the terminal, and will operate whenever a call is on.
- 2) The TAR-A is connected to the A-LED of the terminal, and will operate whenever the M-button is depressed at a terminal which has a call going on with this terminal, provided that the special feature "a relay of type 3 belongs to the terminal" is set for the terminal in question (see section 5.2.H and the user programming in chapter 6).

SL 1001	Simple desk top model for office or similar use without display unit.
SL 1002 D	Desk top model with display for office or similar use.
SL 1002 DH	Same with handset.
SL 1003	Door terminal without display for indoor use. Has 2-4 call buttons or 3 call buttons and an answering button for group calls. Flush or surface mounted.
SL 1004	Factory floor or outdoor model without display for wall mounting in industrial environment (protection class IP 65).
SL 1006	Front door or gate terminal without display for outdoor use. Has 1 or 2 call buttons (protection class IP 65).
SL 1008	Terminal with display for wall mounting in office type environment. Complete set of buttons. Flush or surface mounted.
SL 1008 H	Same with handset.
SL 1011	Loudspeaker terminal without microphone and buttons.
SL 1011 K	Loudspeaker, extension to SL 1011.
SL 1013	Passive subterminal with microphone and loudspeaker, but without call buttons. Flush or surface mounted.

2.3.4 SPECIAL CONNECTION UNITS (The AIC-D and AOC-R)

The audio input connection unit SL 1000-AIC-D and the audio output connection unit SL 1000-AOC-R can be connected to any connection number instead of a user terminal.

The AIC-D

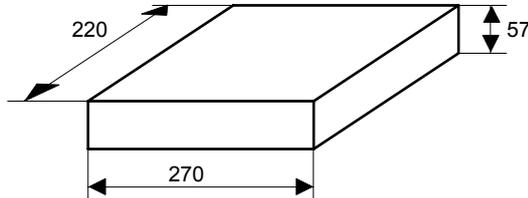
The AIC-D is needed when a program source, such as a radio or CD-player, is to be connected to the central.

The AIC-D unit is placed in a small box with the dimensions 150 x 80 x 50 mm (approximately 6 x 3 x 2 inches). Inside the box there are screw connectors for connecting to the SL 1000 Mark II system and the program source.

When the AIC-D is used, the number of the central to which it is connected must be defined to be a program source, see section 5.2 and the programming instructions in chapter 6.

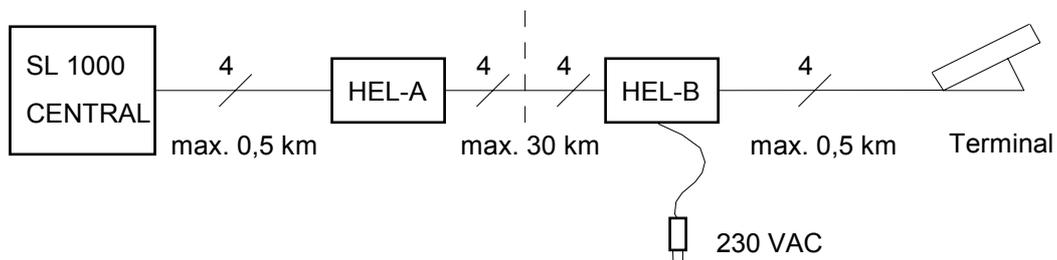
2.3.5 REMOTE CONNECTION UNIT SL 1000 HEL-A AND HEL-B

With the HEL remote connection a terminal can be connected to the central when the cable length is longer than 1 km. The HEL remote connection consists of two units; HEL-A and HEL-B. HEL-A is near the central unit and HEL-B is near the terminal. The HEL remote connection can be used both in the Mark II and Compact system.



Cabling:

Cable for the connection is two twisted pairs between the central, the HEL units and the terminal (e.g. MHS 1 x 4 x 0,5). The maximum cable length of the remote connection depends on the cable type (10 - 30 km). The power supply for the HEL-B is 230 V and must be available in the far end. The HEL-A is supplied by the central.

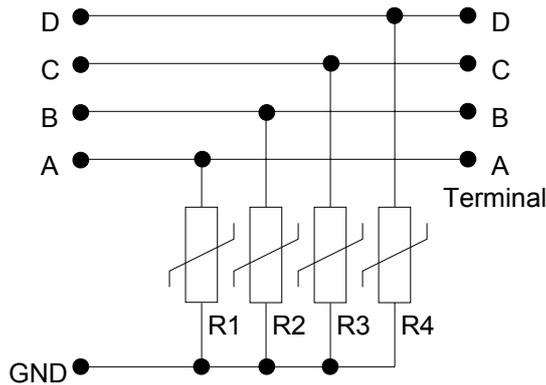


2.3.6 SL 1000 LP OVER VOLTAGE PROTECTOR

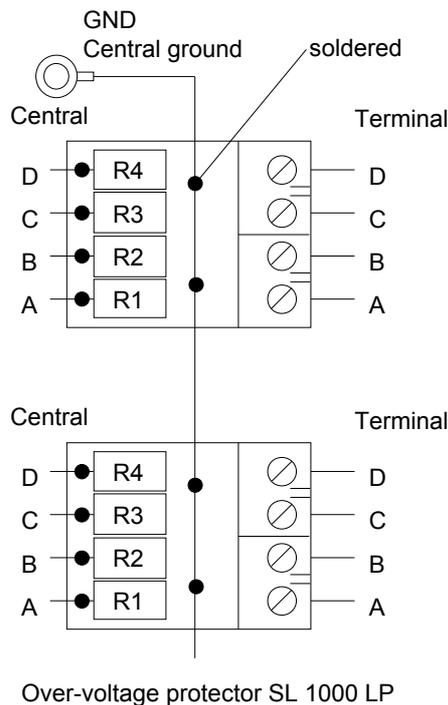
SL 1000 LP is the overvoltage protector of the SL 1000 multicom systems. The overvoltage protector is connected to the line between the terminal and the central.

All overvoltage protectors must be connected to the central ground. The grounding wire 1 mm² is soldered together with overvoltage protectors.

In Mark II centrals the protectors are installed to the connectors on the back board.



Picture 1



Picture 2

3. INSTALLATION, CONNECTING AND TAKING INTO USE

3.1 INSTALLATION

3.1.1 INSTALLATION SCHEMES AND REQUIREMENTS

It is recommended that the SL 1000 Mark II central is placed in a room which is clean and dustfree with a relative humidity of 40-90 % and a temperature between 16-22 degrees centigrade (60-72 degrees Fahrenheit).

The central will operate in a slightly wider temperature range, but big fluctuations in the temperature or a constantly higher temperature will shorten equipment life and lead to higher service and maintenance costs.

Air circulation through the central cabinet should be sufficient, and entrance to the room should be allowed only for authorized persons. Good illumination, a mains outlet for maintenance purposes, a chair and a table for making the connection and cross connection lists should be available.

The 1-module central delivered in a light aluminium cabinet can be put on a table or a shelf, the minimum size of which is recommended to be 700 mm wide and 450 mm deep. The cable entry is at the back of the cabinet, and the cables should be left long enough to allow for turning the exchange on the shelf. The cabinet has ventilation grates at the top and the bottom, and at least 50 mm free space should be left above the cabinet for ventilation.

The cabinet for 2-3 and 4-7 modules are to be put on the floor. They have an open bottom, through which the cables and the cooling air is taken. Each module has a mains cable of its own. With the help of an additional extension cable the central can be connected to a single grounded mains socket.

The cross connection frame for terminating the terminal network should be installed next to the central cabinet, and the connections should be done as shown in figure 5. In 1-module system, with say 24 user terminals or less, one can do without the intermediate cross connection termination by bringing the cables from the terminals directly to the backboards of the module, but this will make future expansions or alterations of the numbering system more difficult.

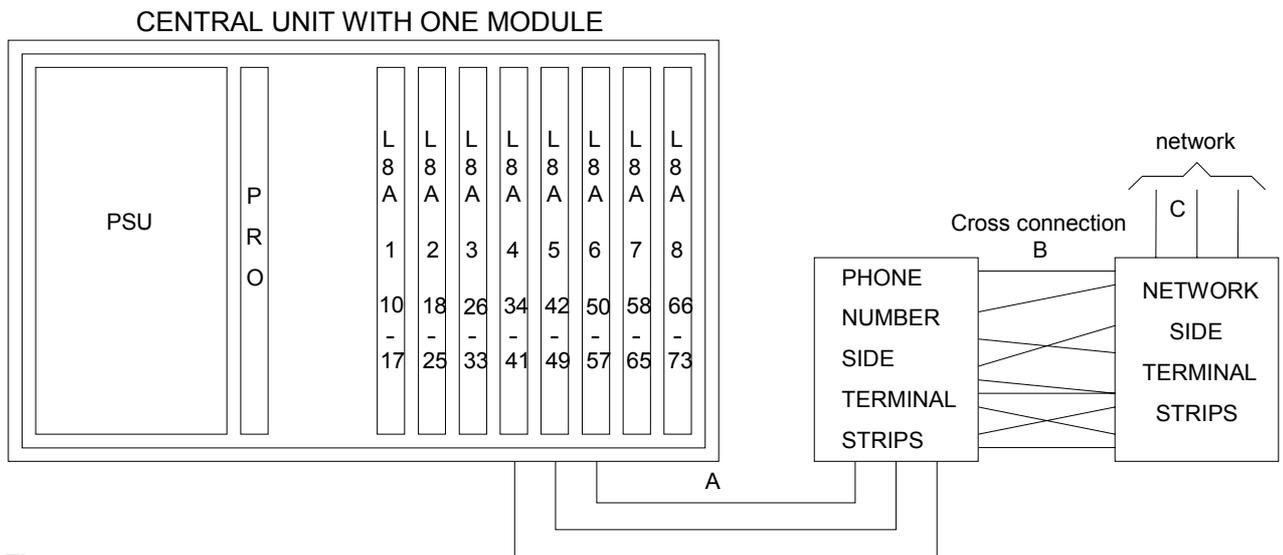


Figure 5

The 4-wire cables from the user terminals are connected to the 4-pole screw connectors on the backboards of the module racks, see figure 7.

It is convenient to install two user terminal sockets for each module of the exchange just next to the central cabinet: one to function as the socket for the programming terminal, and one to function as the socket for a maintenance terminal, see section 3.2.5. If an IPU card is included in the system for e.g. free numbering, it will need a programming socket of its own, see section 3.2.7.

Standard telephone installation practices should be followed in the cabling. All wire joints should be done by a skilled telephone installer, since the transmission resistance must not be higher than the corresponding resistance in a telephone network. It is often useful to ask the local telephone plant or a specialized company to do the job or check the network. The cable network should be planned to be about 30 % larger than the terminal cables initially require, to provide for possible cable damage and future expansion of the system.

The cables should be laid so that they are protected against physical damage and against interference from high frequency, heavy current or high voltage cables and devices.

The shield of the central should be connected to the ground of the building, and so should the cross connection frame.

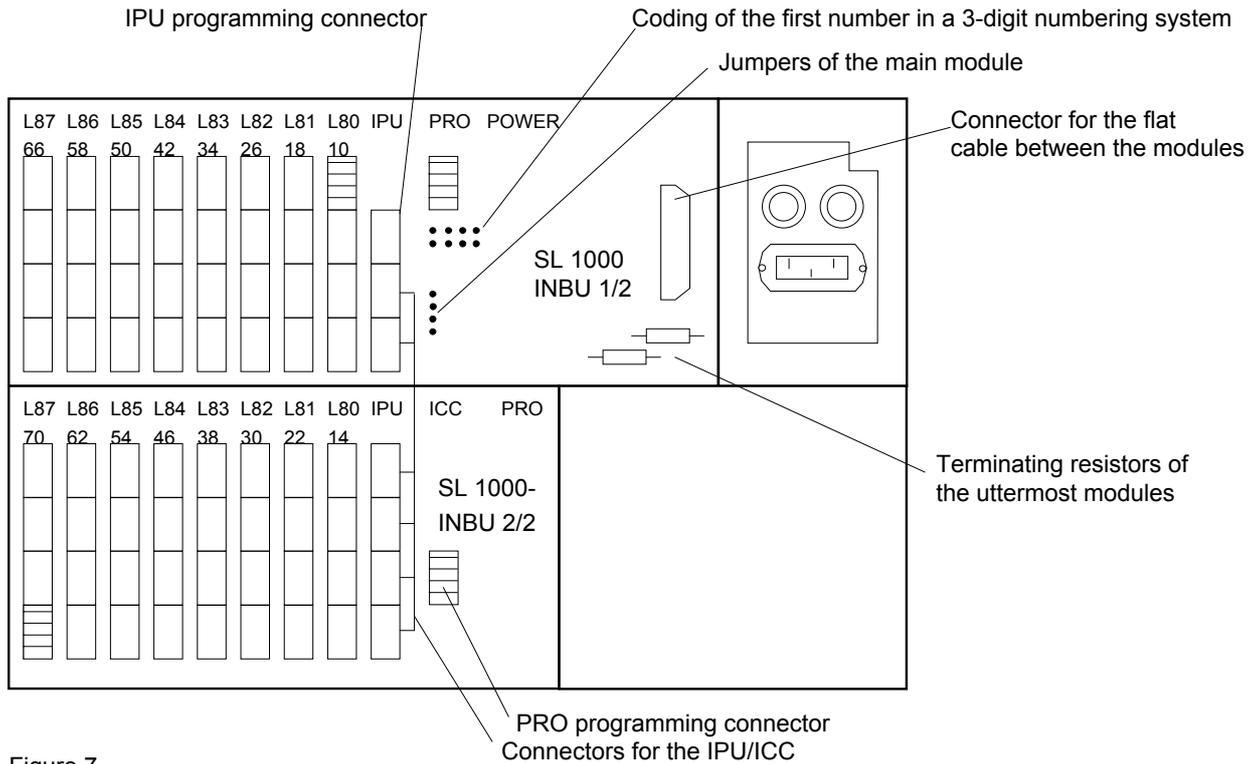


Figure 7

Shielded cables should be used in conditions with interfering disturbances. The protecting shield of the cables should be grounded, but *only* at the central's end. At the sockets the shield are connected together if shielded cables are used all the way to the user terminal sockets. Multiwire cables may have a common shield, or have each wire or each wire pair shielded: The important thing is that the shield *is not* grounded in any junction box nor in any socket.

Industrial environments may be especially problematic, at least if they contain thyristor controlled equipment, and so are environments with radio frequency (RF) sources.

Cables that might be exposed to lightning discharges, e.g. long ground cables, should be equipped with some kind of protection near to the central cabinet, for instance at the cross connection frame. As protecting elements 70 - 100 V varistors or gas discharging tubes can be used, connected from each wire (A, B, C, D) to the ground of the central.

3.1.2 THE INTERNAL WIRING OF THE CENTRAL

Besides the connecting of the 4 wires from each user terminal to the backboards of the module(s), either directly or via the cross connection frame, some internal wiring of the central is needed.

These wirings, which are done on and between the backboards of the modules, are done at the factory when the system to be shipped is assembled. If the customer later wants to expand the system himself, he should, however, check the following 5 things on the upper backboard of the module(s) (refer to figure 7):

- 1) The terminal resistors (two 220 ohm resistors)
- 2) The jumpers of the main module for the PCM synchronization (2 vertical pairs of pins)
- 3) The jumpers for coding the module number (the first number of the physical connection number) (4 horizontal pairs of pins)
- 4) The reset button of the system
- 5) The flat cable between the modules in a multi-module system

1-module system

- 1) The two resistors should be installed.
- 2) The lower jumper should be installed, as shown in figure 8A.
- 3) If 2-digit numbers are desired (10-73), the jumpers should be connected as in figure 8B.

If 3-digit numbers are desired (N10-N73), the first digit N is selected according to figure 9B.

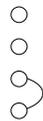


Figure 8A

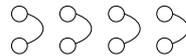


Figure 8B

- 4) The reset button is not needed, as connecting the power of the module off using the switch on the front panel of the power supply, will function as a reset.
- 5) No flat cable is needed in a 1-module system.

Multi-module systems

- 1) Only two modules at the end of the chain (the first and the last module) must and should have these two resistors installed. The resistors are for the correct termination of the PCM-link and the PCM-clock.
- 2) One of the modules should be chosen to be the main module of the system. This is the module in the middle of the chain, or as close to that as possible. The main module should have both of the jumpers installed, as shown in figure 9A.
- 3) The determination of the first physical connection number of each module is determined with the jumpers as shown in figure 9B. It does not matter in which order the modules are located in the cabinet when giving each its first number: The upper one can be module number 3, the next one number 7, and so on.

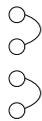


Figure 9A

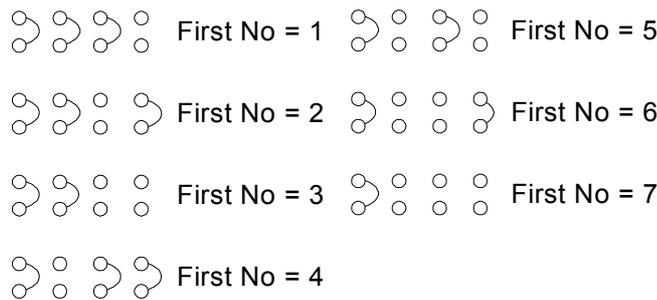


Figure 9B

- 4) A reset button should be connected between the ground (GND) and reset (RES) pins of all modules in parallel, so that all modules can be reset at the same time if needed.
- 5) A 40-wire flat cable is needed, chained from each module to the next one.

3.2 CONNECTING OF THE UNITS

3.2.1 THE POWER SUPPLY UNIT

Each module of the central has its own power supply unit (PSU) located at the left end of the module. The PSU is a plug-in unit which has a mains switch and a LED indicator at the front, two 4A primary fuses at the back, and a detachable mains cable which connects to the socket at the back.

There are two different models of the PSU; SL 1000-P64-1 for a mains of 110 V AC, and SL 1000-P64-2 for a mains of 230 V AC. Please make sure that the PSU's are of the correct type.

3.2.2 THE PROCESSOR CARD

The first card position (card location no 1) next to the PSU is for the processor card SL 1000-PRO. There is a processor card for every module, and these are completely similar and interchangeable at start-up. Later, if same user programming has been done, the RAM contents of the processor cards will differ. This mean that the programming will have to be reset and done again for the module in question, if a processor card is moved from one module to another. See chapter 6, User programming system.

The processor card should never be put on a conductive surface, since the poles of the NiCd battery of the card, which is for keeping the RAM contents unchanged during power breaks, will be short-circuited. The RAM contents will be lost, and the battery might get damaged.

There are two different basic versions of the program for the processor card; one for the standard "physical" numbering system, and one for the free numbering system, which additionally needs the optional IPU card.

The standard numbering version is supplied in three 4 kbytes EPROM circuits (type 2732). The free numbering program is supplied in two 8 kbytes EPROMs (type 2764), which are marked with an "F" for "Free numbering". Please check that your processor cards have the correct program version.

3.2.3 THE CONNECTION CARDS

Card locations no 3-10 are for the connection cards. Please note that the card location next of the processor card (location no 2) is reserved for the optional IPU card: ***a connection card must never be put into that location!***

A module can hold up to 8 connection cards SL 1000-L8A, to each of which 8 user terminals can be connected. Of the number of connection cards is less than 8, empty card slots can be left wherever desired, but the system response is faster if the card locations are taken into use in rising order (the processor scans for key inputs at the terminals beginning with the first terminal on the first connection card).

The connection cards are numbered from 0 to 7 seen from the front (the markings L8-0, L8-1, ..., L8-7 are found on the backboards of the module).

The physical connection numbers for the terminals connected to the connection cards are:

10 - 17	on connection card number	0
18 - 25	"	1
26 - 33	"	2
34 - 41	"	3
42 - 49	"	4
50 - 57	"	5
58 - 65	"	6
66 - 73	"	7

If an optional IPU card is not used for free numbering of the system, these connection numbers are also the calling numbers of the terminals.

The user terminals connect tot he connection cards via the 64 4-pole screw connectors on the backboards of the module, named A, B, C, D from the top.

3.2.4 THE USER TERMINALS

Desk top terminals

The 4-wire cable is at the user terminal end connected to 8-pin RJ-45 wall socket.

RJ-45 connector's pin-number	TIA 568A colors in RJ-45 connector	Connection number of central
1	Green/White	
2	Green	
3	Orange/White	A
4	Blue	B
5	Blue/White	C
6	Orange	D
7	Brown/White	
8	Brown	

Table 1

Wall terminals

The cable is connected directly to a 4-pole screw connector inside the terminal. The poles are, depending on the terminal model, marked A B C D, 1 2 3 4 or 1 2 1 2 from left to right.

3.2.5 THE PROGRAMMING TERMINAL AND THE MAINTENANCE TERMINAL

Close to the central cabinet two 8-pin RJ-45 wall sockets (see table 1) are installed per module, and an additional one if the optional IPU card is included in the system.

One of the two sockets is for the user programming terminal of each module, and the other one for use during the taking into use of the system, and later for use during maintenance.

The user terminal socket is connected to the backboard connector marked "PRO programming connector" or "design phone", see figure 7, and the maintenance socket to one of the connection numbers in the module, e.g. connection number 17 (the last connection number of the first connection card), as shown in figure 11.

If an IPU is included in the system, its programming socket is connected to the 4-pole screw connector on the upper backboard of the module marked, "IPU programing connector", see figure 7.

3.2.6 THE OPTIONAL RELAY CARD(S)

Relay cards SL 1000-R8 can be put into the card locations no 3 to no 10 in the place of connection cards. There are 8 relays on the card, and each has two potential-free contacts, which normally are open: one between screw connectors C and D of the corresponding connection number.

The relay contacts are rated for 10 million operations with a maximum current of 1A and a maximum voltage of 48 V. It is recommended to keep the connection power as low as possible to prevent interfering transients in the system.

The relays can be programmed to function in several different ways, see chapters 5 and 6.

Each relay card decreases the maximum number of user terminals that can be connected to the module by 8.

An alternative to a relay card is in some applications to equip a user terminal with a relay, in which case the maximum capacity of the module is not decreased: see chapters 5 and 6.

3.2.7 THE OPTIONAL IPU (Interface Processor Unit)

The optional interface processor unit SL 1000-IPU has its own special card location no 2 in the module rack.

The IPU is used for e.g. free numbering of the connection numbers (see chapter 7), or for interfacing to peripheral devices, such as CRT terminals and printers, or to other systems, such as wireless paging systems, and systems for flexible working time registration (see separate application notes and installation manual).

Only one IPU card is usually needed, and it can be put into any module. The IPU needs a programming socket of its own, which is connected to the screw connectors on the backboard at card location no 2, see figure 7.

As the processor cards, the IPU is programmed using a standard desk top terminal with display (SL 1002 D or DH). The programming instructions for the IPU used for free numbering are found in chapter 7.

3.3 TAKING INTO USE

During the taking into use of the SL 1000 Mark II system, and later during replacement or addition of cards, it is important that card are not removed or added when power of the system is on.

It is convenient to have two persons available during the taking into use: one stays at the central, and uses a terminal connected directly to the backboard of each module. The other one moves around the building, connects the terminals one by one to theirs sockets, and calls the terminal the first person is using.

The taking into use procedures are the following:

1. Before any cards are put into the modules:
Slide each power supply unit into its own position at the left of the empty module rack, and make sure it goes all the way into the backboard connector. Connect it to mains, connect power on, and check the following DC voltages between the following pins on the backboard:

+40 - 45 V	unstabilized between pins A/C	-24 and -22
+9.5V	unstabilized	-12 and -10
+5V	stabilized	-4 and -2
+8V	stabilized	-14 and -20
-8V	stabilized	-18 and -16

If all voltages are missing, check the primary fuses at the back of the PSU.

If one voltage is missing, check the secondary fuses inside the PSU, and that the corresponding pin of the connector of the PSU is not bent.

2. Then connect power off before inserting any cards into the module racks.
3. Check that all internal wirings of the central on the backboards of the modules are done, see section 3.1.2.
4. Put the processor card and the first connection card into the first module M, and connect its power on.
5. If the cabling hasn't been checked, it is recommended that the polarity of the supply voltage, which should be about +48 V DC, is checked before the user terminals are plugged into the wall sockets (pole 1 = +48 V, pole 3 = 0 V, see figure 10 in section 3.2.4).

-Both the connection cards and the terminals will tolerate an inversed polarity for a short time period, but this should be avoided.

6. Connect terminal number 17 of the module directly to the backboard of the module by using the maintenance terminal socket (see section 3.2.5), and connect terminal number 10 of the module to its own socket at its final location.

Check that the connection between these two works both ways:

-First the person at terminal M10 calls number M17, where M = the module number in question = 1-7, as determined with the backboard jumpers, see figures 8B and 9B in section.

-Then M17 calls M10.

The terminal number of the other person should be seen in the display of the terminals, if they have the display, and a two-way speech connection should be preceded by a 1 second long calling tone. The CALL LED of both terminals should be lit.

-If the connections are not working, try another pair of terminals, another connection number instead of number M10, another connection card, or another processor card (if the system is a multi-module system). If this does not help, try to clear the RAM memory of the processor card (see section 6.1.5).

For details how to proceed, see chapter 4 Faultfinding.

7. Check that connections M11-M17, M12-M17, ..., M16-M17 in the module work both ways.
8. Connect the power of the module off.
9. Add connection card number 2 of the module (connection numbers M18-M25), and connect power back on.
10. Check that the connections M18-M17, M19-M17, ..., M25-M17 work both ways.
11. Repeat steps 8-10 for connection cards 3-8 of the module (connection numbers M28-M73), depending on the size of the module.
12. Repeat steps 4-11 for all modules of the system.
13. Check the connection bothways between numbers 17 of each module, which can be done at the central with the help of the maintenance sockets of each module.
14. Disconnect terminals number 17 from the maintenance sockets, and connect the 4-wire cables for the final user locations to the sockets (see figure 11 in section 3.2.5).
15. Check that the terminal 17 of each module works at its final location.
16. If optional relay cards and/or an optional IPU-card are included in the system, disconnect the power of the central, put the cards in their places, and connect power back on.

17. Connect an SL 1002 terminal to the programming socket of the first module, and perform the user programming of the system according to the instructions in chapter 6.

Even if no special programming is needed, the clock of the system should be set (except if all user terminals are without display). The setting of the clock in one module is sufficient; the time of the clock is sent to all the other modules in the central.

18. Check the functioning of the relay card(s), if there are any, according to the user programming one.
19. If the IPU is included for free numbering: Connect the programming terminal with display to the IPU programming connector, and perform the free numbering as explained in chapter 7.

Reset the whole system, either by using the reset button connected to all modules in parallel (see section 3.1.2), or by turning the power of the system off for about 15 seconds.

Then check that the programmed "free numbers" of the system work: These should from now on be used, the physical connection numbers will no longer work.

Note that the free number programming of the IPU should be done before the system is being used, that is before any call requests have been left from the user terminals; If call requests are in memory as physical connection numbers when the free numbers are programmed, these requests to the physical numbers are never found, but will remain in the memory "forever".

If call requests have been left, they should be cleared by clearing all user programming of the processor cards, and by reprogramming them, see chapter 6.

20. Fill in the Warranty Certificates of all units of the system and the Taking Into Use Form:

The person carrying out the taking into use of the system fills in the Taking Into Use Form, paying special attention to the program version and the special features of the system, because these are important for future expansions and possible maintenance.

The various parts of the taking into use are marked as accepted, or the observed malfunctions or defects are noted. If there are no such, or if these are minor and the time of repairing them as agreed on and put on the Form, the Form is marked with the date, and both the customer and the person who has taken the system into use as a representative of the supplier, sign the Form, thus accepting the taking into use.

The warranty period of the system begins from the signature date, or a date separately agreed on and marked on the Form. The Warranty Certificates of all units are collected and filled in with the date. The originals of the Certificates are left with the customer, the copies are sent to the manufacturer together with the last page of the Taking Into Use Form. The first page of the Form stays with the customer, the second page is given to the supplier.

4. TROUBLESHOOTING

With the help of this troubleshooting guide you can quickly locate the most probable faults in your SL 1000 system. The faults can be roughly divided in three categories:

1. A single terminal does not work.
2. Few of the terminals are not working.
3. Whole module or several modules are not working.

The fault can be found easily by replacing the suspected unit with a functioning unit. Normally you have functioning units due to the modular construction of the system. When you are replacing any unit to the module, be sure that the power is off. If there is several modules in your system, it is best to cut the power off from the whole central.

1. A single terminal does not work:
Plug out the terminal connector. Take another, functioning terminal, and plug it in. If the new terminal is working, the fault was in the terminal. Send it to the service.

If the terminal is not working, cut the power off and replace the interface card, where the terminal is connected. If the terminal starts working, the fault was in the interface card, send it to the service. Test the suspected terminal again, and if it is still not working, send it to the service too.

If the replacing of the interface card does not help, check the cables to the terminal.

2. Several terminals are not working:
Check first, if all terminals are connected to the same interface card, or in few interface card or cards with functioning ones. If the terminals are now working, the fault was in the interface card or cards, send it or them to the service.

If there are still some terminals, which are not working, check each terminal as above, in the case 1.

3. Whole module or several modules are not working:
First check the mains connectors and mains fuses. If the main power is coming to the power supply unit, check the fuses in the PSU. If there is nothing wrong with the power supply unit, then check the processor card. First try to reset the processor by cutting the power off and after a moment connecting the power on. If this does not help, cut the power off and replace the processor card with a new one. If the new processor is working well, the fault was in the old one, send it to the service.

5. SYSTEM FUNCTIONS

When considering the system functions, please note that part of the functions work only with user terminal models that have the display. Terminals with and without display are completely interchangeable, the central unit doesn't even know which alternative is connected to a specific connection number.

5.1 THE BASIC FUNCTIONS

The main part of the basic functions work in the basic mode of the system, that is without any user programming, but part of the functions require programming from the programming terminal. Any terminal with display can be used as the programming terminal by connecting it to the programming connector of each module for the time of the programming.

Normal use of the terminal that is things that can be set from the user terminal itself, is not considered as programming. These settings are explained in chapter 8 Instructions for use.

Some settings or programmings can be done either from the programming terminal or from the user terminal in question, provided that it is one with a display. These functions are marked with a single slash (/).

The function numbers marked with a double slash (") require programming from the programming terminal, which is explained in chapter 6.

1. Normal call

Automatic speech connection between two terminals after number selection. The speech connection is half duplex with automatic speech direction switching. Manual speech direction control with simplex button is also possible. The connection is full duplex if both parties of the call use the optional handset of the terminal.

The number of the two-way speech channels depend on the number of modules in the central, as can be seen from the next table:

Number of modules	Maximum user terminal capacity	Number of two-way speech channels
1	64	14
2	128	18
3	192	22
4	256	26
5	320	30
6	384	34
7	448	38

2. Short code dialling

Two short code dialling numbers can be programmed for each normal terminal. Door terminals may have up to 10 one-button short code numbers.

3. Display unit and LED indicators

The 4-digit numeric display unit of the terminals shows:

- the dialled number
- the number of the caller
- the transfer number (of the terminals itself or of the called terminal)
- the number of the caller who has left a call back request
- the stored information code (of the terminal itself or of the called terminal)
- the time

The 4 LEDs of the terminal show:

- CALL** a voice connection (the microphone) is on
- i** a call back request has been left
- A** the terminal is in the call alert state
- >** the terminal is in the transfer state

4. Storing of information show

A 4-digit numeric information code (info code) can be stored into the display of the terminal. The info code tells e.g. the estimated time or date of return, or the reason for absence. The info code is seen by every caller on his or her own terminal display when calling this terminal.

5. Leaving of information codes

A call back request can be left in a terminal when the called person is busy or absent. and has left an info code or not. The call request is kept in memory until it is answered or cleared. A call back request can also be cancelled by the person who left it.

Several call back requests can be left in any terminal, but the maximum number of call back requests is 64 per module.

6. Answering a call back request

Answering the call back request is a one-button function.

7. Recall

Redialling the previous connection or the last call attempt number is a one-button function.

8. Undisturbed working

Versatile possibilities of not being overheard or disturbed by callers:

-Momentary microphone mute: The caller can not hear private conversation in the room of the person to whom he has a call going on.

-Setting the terminal into the call alert state: Incoming calls are not connected, but start to alarm. The number of the caller is seen on the display, and the call can be accepted or cleared.

-Setting the terminal into the "busy" or "do not disturb" state (info code 7777): Incoming calls are not connected, group and all calls are not heard.

9. Time display

The time of the system clock is momentarily displayed by the depressing of one button.

10. Alarm times

Alarm times can be programmed into the terminals. The time is displayed when the alarm sounds. A maximum of 64 alarm times can be programmed per module, and a terminal can have several alarm times set at the same time.

11. Emergency all call

The emergency all call, which can be initiated from priority terminals only, is connected to all terminals of the system.

12. All call with answering possibility (one for each module, one for the whole system)

The all call is connected to all terminals of a module or all terminals of the whole system, except if they have a speech connection on or are in the "do not disturb" state.

13. Five programmable group calls per module, with answering possibility

As the all call, but the members of each group can be selected by the customer through user programming. All five groups may have 2 to 32 members, or three may have 3 to 32 and two 32 to 63 members.

The corresponding group calls in different modules can be combined into programmable group calls of the whole central.

14. Answering an all call or group call

Answering a group or an all call is a one-button function. A speech connection is established between the answerer and the caller. This can be used as a simple but efficient paging method.

15. Enquiry call

An enquiry call can be made during a call without breaking the existing connection.

16. Transferring an ongoing call

An ongoing call can be transferred to the enquiry call number without breaking the existing connection.

17. Preprogrammed call transfer

All incoming calls can automatically be set to be transferred to any preprogrammed number.

18. Follow me function

The preprogrammed call transfer can be remotely set from another terminal, so that the incoming calls follow the person who does the setting to the location where he is at present.

19. Priority call

Terminals, to which the priority right has been given,

- can interrupt an ongoing call
- can get through when calling terminals which are in the alert state
- can make terminals in the "do not disturb" state (info code 7777) alarm
- can make the emergency all call (also from terminals without display; the 3 other listed possibilities need a terminal with display).

20. Group hunting

Automatic call transfer to the first unengaged terminal a hunt group. The number and size of the hunt groups are not limited, but each terminal can belong to only one hunt group.

21. Conference

A conference group consisting of a maximum of 17 terminal numbers (one chairman, who selects the participants + 16 participants). The right to speak alternates between the participants at the pressing of a button, but the chairman has every other turn, and can thus preside over the conference, but everybody can continuously listen in.

22. Call blocking

Calls can be blocked (prevented) from two programmable groups of successive terminals (subgroups 2 and 3) to a third group of successive terminals (subgroup 1). The right to make group calls and all calls can also be blocked.

There are 6 such blocking groups (consisting of three subgroups) in each module.

23. Remote setting of the info code

The info code of any terminal can be remotely set or changed from another terminal.

24. Chief-secretary function

An unlimited automatic chief-secretary function is programmable for any pairs of terminals, through the use of preprogrammed call transfer, call enquiry and transferring of an ongoing call.

5.2 THE SPECIAL FUNCTIONS AND FEATURES OF THE TERMINALS

In addition to the basic functions of the system, there are several special functions and features of the individual terminals. These can be connected on or off, or defined in more detail from the programming terminal.

The functions and features are described below, and the programming instructions can be found in section 6.1.1.

A Type of connection number

1. an ordinary terminal
2. a gate or door terminal
3. an audio channel (a program source)
4. a relay
5. a relay with timeout

1. The ordinary terminal is the initial value for all connection numbers if no user programming is performed. The terminal functions in the "normal" way.

2. The gate or door terminal differs from the ordinary terminals so, that all its call buttons (1-109 are one-button short code buttons, and that every other depressing of any call button works as the missing cancelling button C.

If the gate terminal has 1 to 3 call buttons, the connection numbers the corresponding calls go to are programmed as

- the short code number 8
- the short code number 9
- the transfer number of the terminal.

If the gate terminal has more than 3 call buttons (maximum is 10), the extra buttons will make calls to the numbers that follow the transfer number. As an example, if the transfer number is programmed to equal 66, call button number 4 will make a call to connection number 67, call button 5 to connection number 68, and so on.

3. Defining a connection number to be an audio channel or a program source, means that only one-way connections can be made to this number, so the number works as a listening channel.

When listening to a number defined as an audio channel, the listening is interrupted by all incoming calls, but restored automatically when the call ends.

Because of their one-way nature, two audio channels can use the same time slot pair or speech channel. All audio channels of a central must be located in the same module. All 64 connection numbers of a module can be defined as audio channels, but a maximum of 10 can be listened to simultaneously. Ten such channels use 5 speech channels of the 10 that exist between the modules, so at least 5 speech channels will be for available for use as normal speech a channels.

A program source, such as a radio or tape recorder, is usually connected to the central via an SL 1000-AIC-D unit, see section 2.3.3.

4. If a relay card SL 1000-R8 is put into the place of a connection card SL 1000-L8, the corresponding connection numbers must be defined to be relays.

Only then will the relays operate for the duration of a call, or for the remaining part of the call, that is from the moment the M-button is depressed at the terminal that is in connection with the terminal to which the relay, through user programming, belongs. And only then will the relays not operate if an all call is made.

Relays that operate for the whole duration of a call can be used e.g. to control video cameras, or video or audio tape recorders.

Relays that start to operate when the M-button is depressed at a terminal are suitable for controlling electrical door locks, for instance.

Relays can also be operate simply by calling the number to which they are connected. This might be useful for controlling e.g. motors or audible alarms at and for a certain time.

5. Relays on a relay card can alternatively be defined to be "relays with time-out", in which cased they do not operate until the end of the call, but for a 10 second time period.

This alternative is convenient for the controlling of door locks, if one wants to make sure that the control signal is not left on for an indefinite period of time, or for visible or audible alarms that should operate only to attract attention at the beginning of a call.

B Priority right

Terminals, to which the priority right has been given:

-can disconnect an on-going call with their M-button. The other party of the original call is put on hold, hearing a queuing tone. If the priority call ends within 30 seconds, the original call is reestablished. Otherwise it is disconnected, and the queuing tone ends.

-can get through a set call alert state of a terminal with their M-button, so that the connection is made without the called person having to answer it with his A-button.

-can, with their M-button, make terminals in the "do not disturb" state (info code 7777) alarm, but cannot make the connection, unless the called person answers with his A-button.

-can make the emergency all call 797.

Please note that a 1-module central, which with its backboard jumpers (see section 3.1.2) can be selected to have a 2- or 3-digit long numbering system, will have the emergency all call available only if the 3-digit alternative is chosen.

C All incoming calls are requests

Any terminals can be given the special feature "all incoming calls are requests". Such terminals cannot be called directly, but every call attempt leads to an automatic leaving of a call back request, which the called person can answer or clear when he wants to.

This feature is useful e.g. in messenger call applications.

D All outgoing calls are call requests

Any terminals can be given the special feature "all outgoing calls are call requests". Such terminals can call connection numbers defined as audio channels, and make (emergency) all calls and group calls, but every attempt to make a normal terminal to terminal call leads to an automatic call back request.

This feature is useful e.g. in nurse call applications: When the reception is called from a patient terminal, only a call request is left, which the staff can answer as soon as possible. But the patient can listen to the radio channels, and emergency or normal all or group calls can be made from the patient terminal.

E Automatic transfer to transfer number when busy

This feature, which has to do with the group hunting function, means that an incoming call will be transferred to the transfer number of the receiving terminal, if this terminal is busy or has an info code set when a call is received. If the terminal, to which the call was transferred, is also busy or has an info code set, the call will be transferred to the transfer number of that one, and so on. A maximum of 8 such transfers will, however, be made to prevent infinite transfer loops.

The number and the size of such hunt groups are not limited, but a terminal can belong to only one hunt group. The transfer address is the same as the normal transfer address of a terminal, so the reprogramming of this, which can be done from the programming terminal or from the terminal itself, might break the hunt group.

The "hunt group" or "automatic transfer to transfer number when busy" feature is convenient to use e.g. for terminals in the sales department or in the stock room, that is in cases where it does not matter which person of a certain group that answers.

F Call alert state on

The call alert state of a terminal, in which state the incoming calls do not connect directly, but start to alarm, can be set or cleared from the programming terminal.

The setting or clearing is parallel to setting or clearing from the terminal itself, so in practice it is usually not needed. It can, however, be used to set the call alert state as the initial state of the terminals, or for testing purposes.

G Transfer state on

When a terminal is in the transfer state, all incoming calls are transferred to the number programmed as the transfer number of the terminal.

The transfer state can be set or cleared from programming terminal or from the terminal itself. These settings are completely parallel, meaning that the one later performed will be active.

The possibility to set the transfer state from the programming terminal can be used for empty connection numbers e.g. in cases where the system later will be expanded, and the numbers that later will be added are put into the transfer state, with the transfer address going to secretary who can inform the callers of the situation.

H Relays belong to the terminal

Relays can belong to a terminal in three different ways, which depend both on where the relay is physically located and on how it operates:

1. The relay is of type 1, which means that it is located on an optional relay card of the central, and the address of the relay is programmed as the transfer address of the terminal to which it belongs. This also means, that such a terminal cannot any longer be put into the transfer state.

A relay of type 1 will operate whenever a call is made to or from the terminal to which it belongs.

2. The relay is of type 2, which means that it is located on a relay card, and the address of the relay is the address following the transfer address of the terminal to which it belongs.

A relay of type 2 will operate when the terminal to which it belongs has a call going on, and the M-button is depressed at the terminal of the other party.

3. The relay is type of 3, which means that it is a TAR-A-unit /Terminal Auxiliary Relay) located in, or close to, the terminal, and connected to its A-LED, see section 2.3.3.

A relay of type 3 operates as, and is an exclusive alternative to, a relay of type 2.

5.3 THE GROUP CALLS

There are five different types of all and group calls in an SL 1000 Mark II central. (The connection numbers mentioned below are the "physical numbers", which apply if free numbering of the system, by using an IPU-card for that purpose, is not included. See chapter 7 for free numbering.)

1. The emergency all call 797, which can be made from priority terminals only, and which connects to all terminal of the system.

If a 1-module system uses 2-digit long numbers, that is numbers 10-73 for the terminals and 74-79 for the group and all calls, there will be no emergency all call. If such a call is needed, the numbering of the module must be selected to be 3-digits long, which is done with jumpers on the backboard of the module, see section 3.1.2.

2. The system all call, connection number 77 in a 2-digit, and 787 in a 3-digit system, which connects to all terminals of the system which do not have a call going on when the all call is initiated. A call to an audio channel will, however, be interrupted for the duration of an all call.
3. The module all call, connection number M77, where M is the module number 1-7. Connects as the system all call, but only to terminals of the selected module.

The all calls of type 1-3 mentioned above do not need any user programming of the members of the call: All terminals, or all not engaged terminals, will receive the call. (Note, however that the emergency all call can be made only from terminals to which the priority right has been given from the programming terminal.) The following two group calls, on the other hand, need that the members of the groups are defined through user programming, which is explained in section 6.1.2.

4. The module group calls, of which there are 5 in each module, with call numbers M74, M75, M76, M78 and M79, where M is the module number 1-7. The group calls work as the normal all call, that is connect to all not engaged terminals.

These calls can be made from any terminal in any module. In a 1-module system the M is "nothing" if a 2-digit numbering system is selected, see section 3.1.2.

All 5 group calls of each module can either have 2-32 members, or group calls M74-M76 can have 2-32 members and group calls M78-M79 can have 32-63 members, see section 6.1.5.3.

5. The system group calls, which combine the corresponding module group calls of all modules of the system. This means that group call number 784 connects to all terminals that are defined as members of groups 174, 274, ..., 774 depending on the number of modules in the central, call number 785 to groups 175-775, and numbers 786, 788 and 789 similarly.

Any terminal can belong to any, or all, of the programmable group calls M74, M75, M76, M78 and M79.

The all call and the group calls have an answering back possibility, which serves as a very simple but efficient paging method: The depressing of the A-button in any terminal, from which the all call or group call is head, will establish a normal call between the caller and the answerer of the call, and all other terminals will be disengaged for normal calls or new all or group calls. The emergency announcement will not be terminated by someone trying to answer it.

The following table summarizes the all and group calls:

A	B	C	Function
74	M74	N74	
75	M75	N75	Group call with 2-32 chosen members
76	M76	N76	
77	M77	N77	Module all call
78	M78	N78	Group call with 2-32 or
79	M79	N79	32-63 chosen members
-	797	797	System emergency all call
-	-	787	System all call: 177 + 277 + ... + 777
-	-	784	(174 + 274 + ... + 774)
-	-	785	(175 + 275 + ... + 775)
-	-	786	Combined group call (176 + 276 + ... + 776)
-	-	788	(178 + 278 + ... + 778)
-	-	789	(179 + 279 + ... + 779)

A = 1-module system with 2-digit numbering

B = 1-module system with 3-digit numbering, where M = the selected first number = 1, 2, ... or 7

C = N-module system, where N = 1, 2, ... or 7.

5.4 THE BLOCKING OF CALLS

The initial status of the system is that any user terminal can call any other user terminal or audio channel, or make any group or all call. Only the emergency all call is blocked or prevented so, that it can be initiated only from terminals to which the priority right has been given through user programming.

The user can, however, define blockings, that is program the system so that a group of consecutive connection numbers cannot be called from one or two other groups of consecutive connection numbers.

There are six such blocking groups in every module of the central, and each blocking group 1-6 consists of three subgroups 1, 2 and 3 of consecutive connection numbers. In each blocking group a terminal belonging to subgroup 2 or 3 of consecutive connection numbers. In each blocking group a terminal belonging to subgroup 2 or 3 cannot call a connection number belonging to subgroup 1, but terminals in subgroup 1 can call subgroups 2 and 3.

As an example, if blocking group 5 consists of subgroups 1 = numbers 10-17, 2 = numbers 40-50 and 3 = numbers 66-73, it means that terminals 40-50 and 66-73 cannot make calls to connection numbers 10-17, but calls in the other direction are possible.

Using the same six blocking groups, calls can also be prevented between modules. For details about this possibility, and for details of how the blocking programming is done, refer to section 6.1.3.

There are, in addition to the programmable blocking groups, two special ways of blocking certain types of calls:

1. Calls to gate or door terminals can be prevented so, that only those terminals that are programmed as the two short code numbers and the transfer number of a gate terminal can call the terminals in question.
2. By programming the short code numbers and the transfer number for relays, only these terminal numbers can control the relay.

See section 6.1.3.3

5.5 OPTIONAL FUNCTION: FREE NUMBERING USING AN IPU CARD

The connection numbers in an SL 1000 Mark II system are, as standard, the so called physical connection numbers. These depend on to which connector on the backboards of which module the terminal is connected.

These physical connection numbers are:

- in a 1-module central: 10-73 or M10-M73, where M can be any number in the range 1-7
- in a multi-module central: N10-N73, where N is any number in the range 1-7, but must be different number for each module. The possible connection numbers are thus 110-173, 210-273, ..., 710-773.

By adding an IPU-card (Interface Processor Unit) to any module of the central, and by replacing the standard program of the processor card(s) with a special free numbering version, the connection numbers become freely programmable, except that they cannot begin with a zero (0), and all numbers must be of the same length; 2-, 3- or 4-digits long.

The connection numbers can thus, depending on the total central size, be programmed to be in one of the ranges 10-99, 100-999 or 1000-9999.

Zero (0) as the first digit is reserved for use as the first digit of the short code numbers, which become 08 and 09 instead of the standard 8 and 9. Zero is also used as the first digit of the all call and group call numbers, which however, can have free numbers programmed for use in parallel with the numbers beginning with a 0.

The Terminal numbers can thus be programmed to correspond to e.g. telephone numbers, room numbers or personal identification numbers. It is also, depending of course on the total system size and on the length selected for the numbers, possible to optionally use a dual numbering of the connection numbers, i.e to have both a main number and a parallel number that connect to the same terminal.

This feature is useful e.g. when two persons are sharing the same terminal. The main number is always seen at the receiving end of an outgoing call.

The programming of the IPU for free numbering use is explained in chapter 7.

6. USER PROGRAMMING OF THE PROCESSOR CARD(S)

When an SL 1000 Mark II system is delivered and installed, it functions in its basic mode, meaning that no programmable functions or special features are connected on. In practice this means, among other things, that

- all connection numbers are "ordinary terminals"
- no special features of the terminals are set
- all group calls are "empty"
- no blockings are set, meaning that any terminal can call any other terminal
- the real time clock of the central is not set

If the user doesn't have any special connection number types, such as gate terminals, relays or program sources, if he doesn't want to give the priority right or other special features to any terminals, nor does he want to form any group calls or define blockings, the system is ready for use as it is: If there, however, are terminals with display units in the system, the system clock should be set from the programming terminal. In a multi-module system the clock can be set from a programming terminal connected to any module of the system: The time set will be sent to all the other modules.

If, on the other hand, the user wants to do some special programming, this is done with a normal table top terminal with display, that is an SL 1002 D or SL 1002 DH-model, which for the time of the programming is connected to the programming connector of each module in turn.

The programming using the programming terminal is described in this chapter. Some programming can also be done from the user terminals, which is described in chapter 8 "Instructions for use".

Before starting the user programming, it is recommended that everything that is to be programmed is defined on the separate System Definition And Cross Connection Diagram, which is included in the delivery of the system. A copy of this two page diagram can be found in appendix A1.

This diagram should also be filled in with all information about the cabling, that is how the cables are connected from the central via the cross connection frame to the terminals.

Appendix A1 is a copy of the one page User Programming Diagram, which summarizes all programming instructions described below. Also this diagram is included in the delivery of the system, and when the user programming of the system has become familiar, with the help of this system manual, the User Programming Diagram is all that is needed for the programming.

The reserve side of the separate user programming diagram contains some simple, but typical, programming examples. A copy of these Programming Examples can be found in appendix 3. Section 6.2 also contains some programming examples.

The starting and ending key sequences of the programming

In some of the program versions a special starting key sequence is needed before the programming can start: When the programming terminal is connected to the programming socket, or at least when any of its keys is depressed, the display may show "9999".

If this is the case, the programming session must be started with the key sequence **C C i M ↖ A**

One 9 will disappear with each of the keyings **i**, **M**, **↖** and **A**. When the display is cleared, the programming can start.

It is good practice to start the programming of a new system with the clearing of the battery backed-up RAM memory, into which all user programming is stored, see section 6.1.5.1.

The programming session must be ended with the same key sequence **C C i M ↖ A**

Now each of the keyings **i**, **M**, **↖** and **A** will result in a 9 on the display. The programming terminal must not be disconnected until the display shows "9999". If it is, the whole system must be reset with the RESET-button, or by turning the power of the whole central off and back on again.

6.1 PROGRAMMING INSTRUCTIONS

The programming functions explained below in sections 6.1.1 - 6.1.3 have been discussed in detail in chapter 5, so in this chapter they will in most cases be treated only briefly from the programming point of view. The functions of sections 6.1.4 - 6.1.8 have not been dealt with earlier, so they will be discussed below. The programming instructions are explained with the help of some simple programming examples, more of which can be found in Appendix 3. Section 6.2 contains some more complicated programming examples, to further help the understanding of the user programming and the possibilities it offers.

The different functions and features of the individual terminals or connection numbers, or of the whole system, are programmed from the programming terminal with a key sequence that starts with the keying.

CxA where x = 1, 8, 9 or **↗**(transfer button) for functions involving individual connection numbers,
or
x = 2-7 for functions that affect the whole system.

The starting sequence for the programming of the different functions is the following:

C1A setting the features of the individual connection numbers
C2A determining the members of the group calls
C3A defining the blockings
C4A setting the real time clock
C5A setting some special system features
C6A setting the last connection number of the system
C7A defining where the paging adapter is located, if such an adapter is included in the system
C8A programming short code 8 (or 08) of a terminal
C9A programming short code 9 (or 09) of a terminal
C↗A programming the transfer number of a terminal

6.1.1 SPECIAL FEATURES OF A CONNECTION NUMBER

The special features of the individual terminals or connection numbers are discussed above in section 5.2, paragraphs A-H.

The features are set with a programming sequence

C1A WXYZ ↖ ↗ NNKK M

where -each of the 4 letters W, X, Y and Z represents a number 1, 1, ..., 9. Depending on the 4 numbers, a combination WXYZ of features is set

-NN is the first connection number that is given the combination WXYZ of features

-KK is the last connection number that is given the combination WXYZ of features

NN and KK = 10-73, and

NN = KK if one wants to set the features for a single connection number.

Example 1:

C1A WXYZ ↖ ↗ 1237M gives numbers 12-37 the features WXYZ

Example 2:

C1A WXYZ ↖ ↗ 4343M (or **C1A WXYZ ↖ ↗ 43M**) gives number 43 the chosen features WXYZ

Please note, that e.g. the following three alternative key sequences produce the same result:

Alternative 1

C1A 4310 ↖ ↗ 1015 M
C1A 4310 ↖ ↗ 2021M

Alternative 2

C1A 4310 ↖ ↗ 1015M
4310 ↖ ↗ 2021M

Alternative 3

C1A 4310 ↖ ↗ 1015M
2021M

This applies to all functions C1A, C2A, ..., C→A:

After the **M** is depressed, one can continue on three different "levels" if the function and/or settings stay the same for other connection numbers.

Please also note, that all special features that are to be set for a connection number, must be set at the same time, meaning that if one first programs:

C1A 0800 ↖ ↗ 1212M

and then

C1A 0020 ↖ ↗ 1212M

only the later settings will be active for connection number 12. So if one wants to set both features for connection number 12, one must program

C1A 0820 ↖ ↗ 1212M.

The features that can be set with the 4 numbers WXYZ are listed on the following pages.

W = 0, if none of the following 2 features is wanted
2, if a relay of type 3 belongs to the terminal

A relay of type 3 is a TAR-R-relay located inside, or close to, the terminal, and activated by the depressing of the M-button at the terminal in contact with this terminal.

- 4, if a relay of type 2 belongs to the terminal

A relay of type 2 is located on a relay card in the central, at the connection number that is equal to the transfer number + 1 programmed for the terminal (if the transfer number of the terminal is 66, the relay number 67 has been defined as being a relay, see field Y below).

A relay of type 2 is activated in the same way as a relay of type 3. These two alternatives are exclusive, meaning that only one of them is allowed for the same terminal. The setting $W = 2 + 4 = 6$ is thus not allowed.

- X =
- 0, if none of the following settings is wanted
 - 1, if the terminal is a gate or door terminal
 - 2, if a relay of type 1 belongs to the terminal

A relay of type 1 is located on a relay card in the central, at the address programmed as the transfer number for the terminal. The relay is automatically activated when a call is made to or from the terminal to which it belongs.

- 3, if features 1 + 2 are combined for the same terminal, meaning a gate or door terminal with a relay of type 1.
- 4, if all outgoing calls from the terminal should be call requests at the receiving terminal.
- 5, if features 1 + 4 are combined for a terminal
- 6, if features 2 + 4 are combined
- 7, if features 1 + 2 + 4 are combined
- 8, if the terminal is given the priority right
- 9, if features 1 + 8 are combined for a terminal (this is not a very logical combination)

- Y =
- 0, if none of the following features is wanted
 - 1, if all incoming calls to the terminal should be left as call requests.

If this setting $Y = 1$ is combined with the setting $X = 1$ for a terminal, this is a special case, see section 6.1.3.2.

- 2, if incoming calls received when the terminal is busy should be transferred to the transfer number of the terminal.
- 4, if this connection number is a relay (of type 1 or 2), meaning that a relay card SL 1000-R8 is located at this connection number.
- 6, as $Y = 4$, but the relay will function with a 10 second long time-out.

The relay will operate from the beginning of the call (type 1) or from the moment the M-button is depressed (type 2), but only for 1+ seconds, and not until the call ends, which is the case if $Y = 4$.
8, if the connection number is an audio or listening channel.

If this setting is left undone for an audio channel, only one person at a time can listen to the channel, and the incoming calls to this person will not interrupt the listening.

- Z = 0, if none of the following features is wanted
1, if the terminal is put into the call alert (A-) state (this can be cleared from the terminal itself).
2, if the terminal is put into the call transfer (->) state (this can be cleared from the terminal itself).
3, combines the settings 1 + 2.

Checking the features set for a connection number:

The keying **C1A NNi**, will display the settings WXYZ for connection number NN (NN = 10, 11, ..., 73).

6.1.2 GROUP CALLS

The five group calls of the module, 74, 75, 76, 78 and 79 are programmed with function C2A. Connection numbers are added to a group with the programming sequence

C2A GG00 ↖ NNKK M

and removed from the group with the sequence

C2A GG10 ↖ NNKK M

where GG = 74, 75, 76, 78 or 79
NN = the first number to add or remove
KK = the last number to add or remove (NN and KK are 10-74)

Note that the size of each group is 2-32 connection numbers. Groups 78 and 79 can, however, be programmed to contain 33-64 connection numbers, which is explained in section 6.1.5.3.

Example:

The programming **C2A 7400 ↖ 1020M**
4045M
7410 ↖ 15M

forms a group call 74, to which connection numbers 10-14, 16-20 and 40-45 belongs. (First are the numbers 10-20 and 40-45 put into the group, and then is number 15 removed.)

Checking if a connection number belongs to a group or not, and checking the remaining space in a group:
The key sequence

C2A GG00 ↖ NN i

will show if connection number NN belongs to the group GG or not, and if it doesn't for how many numbers there is still space in the group (0-32).

Example:

CC2A 7400 ↖ 17 i

will show "17 1" if number 17 belongs to group 74, but e.g. "12" if it does not, and there is still space for 12 connection numbers, meaning that the group size is 20.

6.1.3 BLOCKING OF CALLS

Calls can be prevented from certain groups of terminals to other groups by using the six blocking groups of the module, in addition to which there are special ways of preventing calls to gate terminals and to relays.

6.1.3.1 USING THE BLOCKING GROUPS

A Blocking of calls within a module

Calls between connection numbers in the same module can be prevented with the help of the so called blocking groups, of which there are six in the module.

Each blocking group (1-6) consists of three subgroups (1-3) of consecutive connection numbers. In each blocking group terminals of subgroups 2 and 3 can not call connection numbers of subgroup 1, but calls in the other direction are not prevented.

As an example, if blocking group 1 is programmed to contain the subgroups 1 = 10-19, 2 = 43-45 and 3 = 60-73, it means that terminals 43-45 and 60-73 can not call terminals 10-19, but terminals 10-19 can call the others.

Subgroup S of blocking group B is set with key sequence

C3A BS00 ↗ NNKK M

and cleared with the sequence

C3A BS10 NNKK M

where B = 1-6 = the blocking group number
S = 1-3 = the subgroup of group B
NN = the first number of the subgroup
KK = the last number of the subgroup

NN and KK can be = 10-74 in subgroups 2 and 3, but 10-79 in subgroup 1, if one wants to prevent calls to the group and all call numbers 75-79.

When a subgroup is cleared with the key sequence

C3A BS10 ↗ NNKK M

the value of the numbers NN and KK have no meaning, but must be set (to e.g. 1073): The whole subgroup will be cleared anyhow.

B Blocking calls between modules

Calls between connection numbers in different modules can also be prevented by using the blocking groups. In this case the contents of subgroup 2 will determine from which module(s) calls are not allowed, so there will only be one subgroup (number 3) which contains the numbers of consecutive terminals in the other module(s) not allowed to call the connection numbers of subgroup 1.

The 3 subgroups of blocking group B (= 1-6) should for intermodule blockings be programmed as:

```
C3A B100 ↗ NNKK M
C3A B200 ↗ 74FL M
C3A B300 ↗ PPQQ M
```

where NN and KK = are the first and last connection numbers in the module that is being programmed, to which calls are to be prevented (NN and KK = 10-79)

F = is the first module from which part (or all) of the calls are prevented

L = is the last module from which part (or all) of the calls are prevented

F and L = 1-7 depending on the module numbers that are included in the central

PP and QQ = are the first and last numbers 10-73 in modules F-L that are not allowed to call numbers NN-KK of that module.

The clearing of intermodule blockings is done in the same way as the clearing of blockings within the module, that is with the key sequence

```
C3A BS10 ↗ NNKK M
```

where NN and KK have no meaning, but can be set to e.g. 1073.

As an example, programming the module 1 with

```
C3A 1100 ↗ 1020M
      1200 ↗ 7424M
      1300 ↗ 6073M
```

means that terminals 260-273, 360-373 and 460-473 (terminals 60-73 in modules 2-4) are not allowed to call terminals 110-120 (10-20 of the module in which the programming is done).

Checking the contents of the blocking groups

The key sequence

```
C3A BS00 ↗ i
```

will show the contents "NNKK" of subgroup S = 1.3 of blocking group B = 1.6

6.1.3.2 BLOCKING CALLS TO GATE TERMINALS

Combining the two individual terminal features "gate or door terminal" and "incoming calls as call requests", which is not a logical combination since call requests cannot be answered from door terminals, as they (normally) do not have the answering button A, has a special meaning: If that setting is done, the door terminal can be called only by those 1-3 numbers that have been programmed as the two short code numbers and the transfer number of the terminal, see section 6.1.8.

6.1.3.3 BLOCKING THE CONTROLLING OF RELAYS

If short code numbers (short code 8 and 9) or a transfer number are programmed for relays, which is not a "logical" thing to do, this programming has a special meaning:

Only those 1-3 numbers, in the order mentioned, can call the relay, or generate a control signal which makes the relay operate.

If e.g. a relay of type 2 belongs to a certain terminal, such as a door terminal, the control signal for the relay originates from this door terminal, not from the terminal to which the M-button is depressed to control the electrical door lock.

This means that to protect unauthorized opening of the door, the following programming must be done:

- the number of the answering terminal is programmed as the short code 8 of the door terminal
- the number of the door terminal is programmed as the short code 8 of the relay
- the door terminal number is given the features "door terminal" and "incoming calls as call requests"

Furthermore should the system feature "prevent remote setting of transfer numbers" be set, see section 6.1.5.2.

6.1.4 REAL TIME CLOCK

The real time clock of the system is used for showing the correct time on the display of the terminal whenever the i-button is depressed, and for generating an alarm in the terminals into which alarm times have been programmed.

The system clock will stop during power breaks, and continue from the time at which the break occurred.

The time is set with the key sequence

C4A *hhmm* M

where *hh* = the hours 00-23 in a 24 hour system, *mm* = the minutes 00-59.

In a multi-module system, the time in the different modules may vary a minute or two after a few days or weeks, since each module has its own real time clock. the setting of the time in any of the module is, however, sufficient, since the time set will be sent to all the other modules in the central.

Checking the real time from the programming terminal

The time of the module clock can be checked with the key sequence

C4A 1 i

The key sequences

C4A 2i and C4A 3i

show in a special way which time slots are in use at the moment (this is only for advanced system diagnostics, and is normally not needed).

6.1.5 SOME SPECIAL SYSTEM FEATURES

Programming function 5A can be used to set any byte (memory location) of the RAM memory on the processor card, and should therefore be used with great care. In fact, all of the programming functions C1A, ... C->A do the same thing, that is change the contents of the RAM memory, but the other functions change only certain locations, and do it in a more "controlled" way.

The setting is done with the programming sequence

C5A HHHH ↗ LLLL M DDDD M

where H, L and D represent a number 0, 1, 2 or 3
HHHH = the high part of the address
LLLL = the low part of the address
DDDD = the new contents
of the memory location

There are 4 special system features that are set with this function:

6.1.5.1 CLEARING OF ALL PROGRAMMING

All the user programming that has been done, and stored into the RAM memory, can be cleared by keying

C5A 0300 ↗ 0000M 0000M + turning power OFF and ON

It is very important that the power is turned off for a few seconds:

If this is not done, all user programming will disappear when the first "normal" power break occurs!

This function is useful if one wants to start the programming all over again, e.g. because one wants the whole system to function in another way, or if one during the programming makes some erroneous settings.

The function should also be used if the system suddenly starts to work incorrectly, since this can be due to the fact that the contents of the RAM memory has been altered by some electrical disturbances:

Clear the programming and program the system all over again!

Note that the clearing will also clear all programming that has been done from the user terminals.

It is also good practice to start the programming of a new system just delivered from the factory with the clearing of the RAM memory, since there might be some programming left from the system test at the factory, at least if that took place so recently that the battery back-up of the RAM has kept its contents intact.

6.1.5.2 PREVENTING OF THE REMOTE SETTING OF TRANSFER NUMBERS (= THE "FOLLOW ME" FUNCTION)

In security applications including door opening relays or other relay controlled functions, it is often necessary to remove the "follow me" function, that is the possibility to remotely set the transfer number of any terminal from any other terminal, from the whole system.

If this isn't done, anybody can set the transfer number of a terminal that normally answers the calls from the door terminals, so that the calls are transferred to himself, and thus get hold of the door opening function as well (see section 6.1.3.3).

The "follow me" function is removed from the system with the programming key sequence

C5A 0310 ↗ 3000M 0001M

which writes "001" into memory location H0310 L3000.

6.1.5.3 INVERTING THE GROUPS FOR GROUP CALLS 78 AND 79

There is space for 32 connection numbers in each of the five group calls 74, 75, 76, 78 and 79, meaning that each group call consists of a maximum of 32 members.

As the maximum module size is 64 connection numbers, there might sometimes be a need for group calls with more than 32 members. For such purposes the two groups 78 and 79 can be inverted, meaning that the list of numbers programmed tell which connection numbers do not belong to the group, instead of telling that they belong to it. As the list can contain 1-32 numbers it means that the group size then will be $64 - (1-32) = 32-63$.

The two groups 78 and 79 are inverted by programming

C5A 0310 ↗ 3000M 0002M

which writes "0002" into memory location H0310 L3000.

When using processor card PRO 2,5 the first digits 03 after C5A must be replaced BY 12 in section 6.1.5.

6.1.5.4 INVERTING THE CODE SENT OUT FROM THE PAGING ADAPTER POCKET PAGING ADAPTER SL 1000 TLI

SL 1000 central can be connected to any paging system which accepts PABX-type signals either DTMF tone dialling or rotary pulses. TLI pocket paging is available only in free numbered Mark 2.5 central (PRO 2,5 + IPU).

The adapter consists of the interface card TLI and of the software for pocket paging.

The pocket paging adapter decentralizes the paging control. The paging can be made from any terminal which includes keys M and ↗ .

The paging starts with keys M and ↗ . When the dialling tone is heard from the paging system the desired numbers can be dialled. The numbers go straight to the paging system. The pocket paging adapter has a two-way speech channel, the applications depend on the pocket paging equipment. For detailed instructions refer to the manual of the paging equipment manufacturer.

The devices needed for connecting:

1 pc TLI interface unit, program TLI V2.1

1 pc PRO 2,5 processor card, program PRO 2,5 CFRA 141185 (or a newer version)

1 pc IPU connecting processor program T2FA 141185

Taking into use:

- connect the wires (marked A, B, C and D) from the last subscribes number (73) in the module to the TLI unit
- connect one pair (marked ring and tip on TLI card) to the paging system
- program the subscriber number where the TLI unit was connected to, for the pocket paging adapter. Use terminal SL 1002 D for the programming connected to the PRO programming connector.

CiM ↗ A start

C

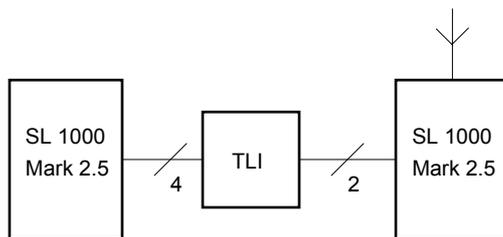
C7A XY73M

X = the number of the central
Y = the number of the module

C

CiM ↗ A end

choose the signalling type DTMF or rotary pulses by the jumper on the T.I. DTMF when connected.



TLI pocket paging adapter is also available to SL 1000 Compact central which has a separate data sheet.

6.1.6 LAST CONNECTION OF THE MODULE

The last connection number of the module can be set with the programming

C6A NN M

where NN is the last number of the module from which a call can originate, that is the last number to which a speech terminal is connected (relays, audio channels and a paging card is thus not included).

This setting does not have to be done, but if the module contains only a few connection cards to which speech terminals are connected, the correct setting of this last number will make system response a little faster. The processor card normally scans for diallings at all terminals 10-73, but if the last number is set, it will stop the scanning there, and start all over again from number 10.

Checking the last number set in a module
The setting can be checked with the function

C6A i

which will show the last number set, or 73 if no setting has been done.

6.1.7 PAGING ADAPTER

If the optional paging adapter SL 1000 TLI, see section 6.1.5.4 above, is included in the central, all modules must be told where this adapter is located, to be able to use it when needed for sending the corresponding number to the paging system.

All modules must thus be programmed with

C7A ERTTM

where E = the central number (1 or 2)
R = the module number (1-7)
TT = 73

Checking the programmed location of the paging adapter
The keying

C7A i

will show what has been programmed with function 7A.

6.1.8 SHORT CODE AND TRANSFER NUMBERS

Each connection number can be given 1 or 2 short code numbers and one transfer number. These can also be programmed from the user terminals themselves, provided that they are model with the display unit. But for terminals without display the short code programming is normally done from the programming terminal. (Since the short codes that are programmed are stored in the RAM memory of the processor card and not in the terminal, one can also borrow a terminal with display, and connect it to the user socket for the time of the programming, and then connect the terminal without the display back into its place.)

The two short codes 8 and 9 are programmed with

C8A ERTT↗ NNKK M and C9A ERTT↗ NNKK M

and the transfer number with

C→A ERTT↗ NNKK M

where E = the central number (= 0 in a system without the free numbering)
R = the module number (= 1-7 or = 0 in a 1-module system with a 2-digit numbering system without the free numbering)
TT = the connection number (=10-73) or a group call number (= 74-79) to which the short code call should connect, or the transfer take place, and
NN = the first, and
KK = the last connection number in the module being programmed that will get the programmed short code or transfer number ERTT.

Programming short code or transfer numbers for relays has a special meaning, see section 6.1.3.3.

Checking the programmed short code and transfer numbers

The key sequences

C8A NN i
C9A NN i
C→A NN i

will show the programmed number for connection NN.

6.2 PROGRAMMING EXAMPLES

Twenty Programming Examples can be found on the back side of the separate User Programming Diagram, copies of which are enclosed in appendices A2 and A3. Below are a few more programming examples of varying complexity levels.

Example 1: In a 1-module system with free numbering and 40 connections (10-49), terminals 10 and 44 are given the priority right, terminals 33-35 should have all incoming calls left as call requests, and connections 48 and 49 are audio channels.

First make sure that possible previous user programming is cleared, and finally set the correct time to 9.15 am.

CC i M ↗ A	starting key sequence when display shows "9999"
C5A 1210 ↗ 0000M 0000M + power OFF and ON	clearing of old programming
CC i M ↗ A	new start sequence
CiA 0800 ↗ 10M 44M	10 and 44 are priority terminals
0010 ↗ 3335M	all incoming calls as call requests for terminals 33-35
0080 4848M	48 and 49 are audio channels
C4A 0915M	time is 9.15 a.m.
CC i M ↗ A	ending key sequence, display will show "9999"

Example 2: In a 1-module system with 30 user terminals (numbers 10-39), form a group call that connects to all terminals except numbers 10-13, and allow only terminals 10-19 and 30 to make the group call(s) and the all call. Set the correct time 10.02 a.m.

C2A 7400 ↗ 1439M
C3A 1100 ↗ 7479M
1200 ↗ 2037M
1300 ↗ 3939M
C4A 1002M

Group 74 is selected for the group call, and numbers 14-39 put into it. Blocking group 1 is selected for the blocking, numbers 74-79 (subgroup 1) cannot be called by numbers 20-37 (subgroup 2) nor by number 30 (subgroup 3). The time is set.

Example 3: Terminals 33 and 34 in a 1-module system are one-button door terminals, from which the call should go to terminal number 20. Terminal 10 shall have the possibility to make the emergence all call, which disconnects all on-going calls, and connects to all terminal. The correct time is 14.30 (2.30 p.m.).

C4A 1430M
C1A 0100 ↗ 3334M
0800 ↗ 10M
C8A 0120 ↗ 3334M

The system clock is set.

Connection numbers 33 and 34 are defined as door terminals, and number 10 is given the priority right, so that it will be able to make the emergency call (797). This also means that a 3-digit numbering system must be chosen, so the module is given e.g. the number 1, which is done with the backboard wiring.

The short code 8 for terminals (1) 33 and (1) 34 is programmed as 120.

Note: in a 2-digit numbering system, the programming would be

C8A 0020 ↗ 3334M

Example 4: In a 2-module system (modules 1 and 2) with all 128 connection numbers (110-173, 210-273), numbers 270-273 are audio channels, which only terminals 110-135 and 210-249 are allowed to listen to.

Two group calls should be available, one that consists of terminals 120-165 and 220-234, and one of the terminals 135-159, 235-259, 265 and 267.

The system clock should also be set (the correct time is 15.37, that is 3.37 p.m.).

Module 1:

C2A 7800 ↗ 6673M
 7400 ↗ 3559M
C5A 0310 ↗ 3000M 0002M
C4A 1537M

Group 78 is selected as the first group, since there are more than 32 numbers of the module in it. Those numbers that should not belong to the group call are put into the group. Groups 78 and 79 are inverted.

Finally the time set (this has to be done in only one of the modules).

Module 2:

C2A 7800 ↗ 2034M
 7400 ↗ 3559M
 65M
 67M

C1A 0080 ↗ 7073M

C3A 1100 ↗ 7073M
 1200 ↗ 7411M
 1300 ↗ 3673M
 2100 ↗ 7073M
 2200 ↗ 5073M

The corresponding groups are programmed. The combined group calls will thus be 788 (= 178 + 278) and 784 (= 174 + 274), in addition to which the four group calls 174, 178, 274 and 278 can be used.

Numbers 2 (70-73) are defined as audio channels.

Blocking group 1 prevents terminals 1 (36-73) from calling the audio channel numbers, and blocking group 2 terminals 2 (50-73).

Example 5: Terminals 132-135 are door terminals with two call buttons (short code 8 and 9). Button 8 of all terminals should connect to terminal 110, button 9 of terminals 132 and 133 to terminal 111, and button 9 of terminals 134 and 135 to terminal 250.

When a call is on to door terminal 135, relay 166m which controls a video camera, should operate, and if the M-button is depressed at the terminal in contact with 135, relay 167, which controls the electrical door lock, should operate.

The only terminals allowed to call door terminal 132 are 110, 111 and 250, and the only terminals allowed to call 135 are 110 and 250.

If terminal 110 is busy when a call is received, it should automatically be transferred to terminal 114.

(All programming is done in module 1, no programming is needed in module 2.)

C1A 0100 ↗	3235M	door terminals
C8A 0110 ↗	3235M	short code 8
C9A 0111 ↗	3233M	short code 9
0250 ↗	3435M	short code 9
C1A 0040 ↗	6673M	connections 166-173 are relays
C1A 4300 ↗	35M	135 reprogrammed because of relays of type 1 and 2
C→A0166 ↗	35M	located at 166 and 167
C1A 0110 ↗	32M	132 reprogrammed: only numbers programmed as short code and transfer numbers can call
C→A0250 ↗	32M	110 and 111 are already programmed
C1A 4310 ↗	35M	135 reprogrammed again, only short code numbers can call (note: transfer in use for the relay adders)
C1A 0020 ↗	10M	if (1) 10 is busy, transfer to
C→A0114 ↗	10M	terminal 114
C5A 0310	3000M 0001M	finally the "follow me" function is prevented because of the door opening relay
C4A	1550M	and the time is set to 3.50 p.m.

7. USER PROGRAMMING OF THE IPU FOR FREE NUMBERING

If an Interface Processor Unit, IPU, is included in the central for free numbering use, please note that -the user programming of the processor card(s) from the programming terminal(s), see chapter 6, will still use the physical numbers 10-73 for the terminals and 74-79 for the group calls, and not the freely programmed numbers.

-the normal use of the terminals, that is calling other terminals, but also programming short code numbers, transfer numbers, and so on, at the user terminals, will use the free numbers.

-the short code dialling numbers at the terminals become 08 and 09 instead of the normal 8 and 9.

The programming of the free numbering is done by connecting a normal SL 1002 D or DH terminal to the IPU programming socket, see figure 7 in chapter 3.

The IPU free numbering program is written so, that it will work in a system consisting of up to 7 centrals. Multi-central system are described in a separate manual, but the programming of the IPU even in a 1-central system, requires that the central is given a number between 1 and 7, usually number 1, and that the connections to the other centrals are defined as nonexisting.

The programming is based on 4 tables:

Table 1, which tells the numbers of the central.

Table 2, which defines the connections to the other centrals in a system with several centrals.

Table 3, which is the configuration table, that is

-tells which centrals and modules the system consists of

-tells whether 2, 3 or 4-digits long free numbers are to be used

-tells where the optional dual numbering possibility is in use or not: each connection number, or the desired ones, can be given a second free number parallel to the main number.

Table 4, which is the number conversion table, that is tells the connections between the physical numbers and the programmed free numbers.

A The starting and ending key sequences of the programming

The programming must be started and ended with key sequence

CC iM ↖ A

When the IPU programming terminal is connected, and CC keyed in, the display of the terminal will show "9999". One 9 will disappear with each of the keyings **i**, **M**, **↖**, **A**. When the display is empty, the programming can start.

The programming must be ended with the same keyings **i**, **M**, **↖**, **A**, each of which will result in a 0 on the display. The programming terminal must not be disconnected until the display contains "9999".

B Setting the number of the central

Each central in the system must be given a number of its own between 1 and 7. In a 1-central system the number is e.g. 1. The chosen number is put into table 1 in the following way:

(Note: XXXX means any numbers 0-9)

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC1A	1 1	XXXX	00NN M ') CC **)
	2 1	XXXX	

*) NN is the number of the central:

Central no	1	2	3	4	5	6	7
NN =	01	02	03	10	11	12	13

**) CC stops the programming of table 1

In a 1-central system, where the central is given the number 1, the programming is thus normally:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC1A	1 1	XXXX	0001 M CC
	2 1	XXXX	

Note: The number given to the central must be used as the central number "E" when programming short code and transfer numbers from the programming terminals of the modules (see section 6.1.8).

C Defining the connections to the other centrals

The contents of table 2 determines the connections to the other centrals in a multicentral system.

In a 1-central system one needs only to tell the IPU that there are no other centrals, which is done with the following programming:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC2A	0 2	XXX	000 M
	1 2	XXX	000M
	2 2	XXX	CC

D Clearing the number conversion table

Whenever needed, or at least before taking an IPU card into free numbering use for the first time, the number conversion table (table 4) should be cleared. This is done by defining an "empty" system into the system configuration table (table 3) in the following way:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC3A	0 3	XXXX	0000 M
	1 3	XXXX	0000 M
	2 3	XXXX	0000 M
	3 3	XXXX	0000 M
	4 3	XXXX	0000 M
	5 3	XXXX	0000 M
	6 3	XXXX	0000 M
	7 3	XXXX	0000 M
	0 3	0000	CC

When, after this, the configuration data for the actual system is programmed into this table, see the following paragraph E, the whole number conversion table will be cleared.

E Programming the configuration table

The configuration table (table 3) contains 8 memory bytes 0-7 (one memory byte is a memory location of 8 bits, where each bit can have the value 0 = off or 1 = on), which define the system configuration in the following way:

Byte number	Module number	Explanation
0	N N N N N N N N	Numbering system
1	E R R R R R R R	Contents of central 1
2	E R R R R R R R	Contents of central 2
3	E R R R R R R R	Contents of central 3
4	E R R R R R R R	Contents of central 4
5	E R R R R R R R	Contents of central 5
6	E R R R R R R R	Contents of central 6
7	E R R R R R R R	Contents of central 7

The contents NNNNNNNN of byte number 0 depends on the numbering system selected, that is

- a) are the connection numbers 2, 3 or 4-digits long
- b) is the dual numbering option in use or not

Depending on these selections the byte should be set to:

NN NN NN NN =	00 10 00 01	if 2-digit single numbers
	00 11 00 10	if 3-digit single numbers
	01 00 00 10	if 4-digit single numbers
	00 10 00 11	if 2-digit dual numbers
	00 11 01 00	if 3-digit dual numbers
	01 00 01 00	if 4-digit dual numbers

The number conversion table consists of 1, 2 or 3 parts, depending on whether the optional parallel numbers for the terminals, and/or the optional numbers for the all calls and group calls have been programmed or not:

Part 1 contains the main numbers (see below).

Part 2 contains the optional parallel numbers for the terminals (see paragraph G).

Part 3 contains the optional free numbers for the group and all calls (see paragraph H).

The programming of the main numbers is done one module at a time, and is started with the key sequence

CC4A + central number + module number + 00 + ↗

after which the display will show the physical number (address) for 1 second, and then the programmed free number (if no number has been programmed after the table was cleared, the display will show 00, 000 or 0000 depending on the length selected for the free numbers). The desired free number is then input and M depressed, after which the next numbers (physical + free) will be displayed.

When the last connection number (73) of the selected module is reached, the program will stop at that address, and the programming sequence will have to be started again for another module, or the checking sequence for the module just programmed, see paragraph I below.

The following example shows the programming of the main numbers for module number 3 of central number 1 in a 3-digit numbering system:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC4A 1300	1310	000	225 M (note 1)
	1311	000	210 M
	1312	000	i (note 2)
	1312	000	111 M
	1313	000	→ (note 3)
	1314	000	896 M
	1315	000	14i (note 4)
	1314	896	896 M (note 5)
	1315	000	896 M
	1316	000	72i (note 4)
	1372	000	444M
	1373	000	570 M
	1373	570	CC (note 6)

Note 1: the number must not start with the number 0

Note 2: depressing the **i**-button repeats the same address for 1 second

Note 3: **→** steps to the next connection number

Note 4: **XXi** jumps to number XX (XX = 10-73)

Note 5: connections are done by keying in the correct number + **M**

Note 6: the address counter stops at --73, **CC** stops the programming

G Programming the number conversion table: Parallel numbers

There is usually¹⁾ in the system a possibility to optionally use a dual numbering of all, or of a desired part, of the terminals. The dual numbering means that there is both a main number and a parallel number available for calling a certain connection number. When such a terminal is in contact with another terminal it is, however, always the main number that is displayed at the other end.

¹⁾ the use of this possibility is restricted by the total system size and the amount of table memory on the IPU card, but is always possible in systems with 6 modules or less. (Consult the factory for bigger systems.)

The dual numbering feature is very useful when two persons share the same terminal, but can also be used to give some persons parallel numbers that are easier to remember, e.g. the department secretaries at numbers 225, 917 and 708 can be given the parallel numbers 101, 102 and 103.

The use of the dual numbering possibility is defined through byte 0 of the configuration table (table 3), see paragraph E above. All connection numbers do not have to be given a parallel number, but only those which need one. The parallel number should be left as (or programmed to) 0000 for those connection numbers that have only a single number.

The programming of the parallel numbers is done one module at a time, and is started with the key sequence

CC4A + central number + module number + 10 + ↗

after which the display will show the physical number (address) for 1 second, and then the programmed parallel number which, however, always is displayed with 4 digits, no matter what length has been chosen for the free numbers; In a 2- or 3-digit numbering system you can thus always see whether you are programming the main or the parallel numbers.

The programming is also done with 4-digits, so in a 2- or 3-digit numbering system 2 or 1 leading zero(es) must be input for each parallel number. (When using the parallel numbers from the user terminals they are, of course, used without these leading zeroes.)

The following example shows the programming of the parallel numbers for module 3 of central 1 in a 3-digit numbering system:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC4A 1310 ↗	1310	0000	0101 M (note 1)
	1311	0000	23i (note 2)
	1323	0000	0102 M
	1324	0000	→ (note 3)
	1325	0000	i (note 4)
	1326	0000	CC (note 5)

Note 1: note the leading 0

Note 2: **XXi** jumps to connection number XX (= 10-73)

Note 3: **→** steps to the next connection number

Note 4: **i** repeats the same connection number

Note 5: **CC** stops the programming

H Programming the number conversion table: Group and all call numbers

The group and all calls of a free numbered system can be dialed using the "physical numbers", see section 5.3, which however are preceded by a "0" that is not displayed, and the number of the central (normally "1" in a 1-central system). Freely chosen numbers can also be programmed for the group and all calls, see below.

The physical numbers of the group and all calls thus become (for central number 1)

0	-	1M74)	
0	-	1M75)	group calls with 2-32 members
0	-	1M76)	
0	-	1M77)	all call to module M
0	-	1M78)	group calls with 2-32 or
0	-	1M79)	32-63 members per module

where M = the module number 1-7, or for the calls that combine the corresponding groups of all modules

0	-	1784)	group calls with 2-32 members per
0	-	1785)	module
0	-	1786)	
0	-	1787)	all call to the whole central
0	-	1788)	group calls with 2-32 or
0	-	1789)	32-63 members per module

The all calls of the module (0-1M77) and of the whole central (0-1787) only connect to the terminals that are not busy when the all call is initiated: There is also an emergency all call for the whole central, the dialling number of which is

0 - 1797

This emergency all call can be initiated from all terminals to which the priority right has been given through user programming of the module to which the terminal in question is connected.

There is also a possibility to freely program the dialling numbers for the group and all calls. The above mentioned physical dialling numbers can, however, still be used in parallel with the programmed numbers. The advantages of the programmed numbers are that they are shorter than the physical numbers, and that they can be stored as short code numbers in the terminals.

The length of the free numbers for the all and group calls, if such are programmed, is the same as the length of the programmed terminal numbers, that is 2 to 4 digits. The programmed numbers must not start with a zero (0), so the available number ranges are 10-99, 100-999 or 1000-9999.

The programming is started with the keying sequence

CC4A 7800 ↗

after which the display of the programming terminal will show the first physical group call number (without the zero, that is 1174) for 1 second, and then the programmed number (00, 000 or 0000) if no number has been programmed). The desired call number is then selected and M depressed, after which the next physical group call number (1175) is displayed, and so on.

In this way all 49 group and all call numbers for a 1-central system, or the chosen ones, are gone through (7 modules x 6 calls + 6 combined calls + 1 emergency call for the whole central = 42 + 6 + 1 = 49 calls). Calling numbers programmed for modules that are not included in the central are, of course, meaningless. The following example shows the different programming possibilities (in a 3-digit numbering system):

I Checking and correcting the number conversion table

After the programming of the number conversion table has been done, it can, and should, be checked, and if needed, corrected.

The same programmed number should, for instance, not appear more than once in the tables. If it does, only its first appearance will be found (the three parts of the free numbering table are checked in the following order: Main numbers, parallel numbers and group call numbers).

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC4A 7800 ↗	(note 3)	000	101M (note 1)
		1175	000 102M
		1176	000 → (note 2)
		1177	000 199M
		1178	000 198M
		1179	000 201M
		1274	000 1279i
		1279	000 202M
		1374	000 i (note 4)
		1374	000 333M
		1375	000 1787i
		1787	000 999M
		1797	000 CC (note 5)

- Note 1: the number must not start with a zero
- Note 2: **→** steps to the next group number
- Note 3: **GGGGi** jumps to group number GGGG
- Note 4: **i** repeats the same group number
- Note 5: **CC** stops the programming

The following example shows the different possibilities for checking, and correcting, the main numbers, but the same alternatives apply when checking the parallel numbers or the group and all call numbers:

Starting key sequence	Display for 1 sec	Display then	Key sequence
CC4A 1300 ↗	1310	225	→ (note 1)
		210	→
		111	113M (note 2)
		000	971M
		869	i (note 3)
		869	72i (note 4)
		444	CC (note 5)

- Note 1: **→** steps to the next connection number
- Note 2: correct by keying in the new number + **M**
- Note 3: **i** repeats the same number
- Note 4: **XXi** steps to number XX
- Note 5: **CC** stops the function

J Taking a free numbered system into use

Before a free numbered system will work, the whole central must be reset, either with the RESET-button, or by turning the power off from the whole system for a few seconds. Only then will the free numbering IPU send of the central and the number of digits used in the calling numbers to the processor cards.

Also, if the IPU is added to a system that earlier has been in use, and thus probably has short code numbers, transfer numbers and call requests stored using the physical numbers, all the programings of the processor cards must be cleared (see section 6.1.5.1).

A2 User Programming Diagram

	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3
FEATURES OF INDIVIDUAL STATIONS	<p>C1A</p> <p>0 NONE OF THE FOLLOWING 2 RELAY 3 (LOCATED IN STATION) 4 RELAY 2 (LOCATED AT TRANSFER ADDRESS +1)</p> <p>0 NONE OF THE FOLLOWING 1 GATE STATION 2 RELAY 1 (LOCATED AT TRFASFER ADDRESS) 3 (1 + 2) 4 OUTGOING CALLS AS CALL REQUESTS 5 (1 + 4) 7 (1 + 2 + 4) 8 PRIORITY STATION</p> <p>0 NONE OF FOLLOWING 1 INCOMING CALL AS CALL REQUEST (IF GATE STATION: ONLY ADDRESSES PROGRAMMED AS PV8-, PV9- AND TRANSFER ADDRESS CAN CALL THIS GATE STATION) 2 AUTOMATIC TRANSFER TO TRANSFER ADDRESS WHEN RELAY 4 RELAY WITH TIME-OUT 6 RELAY WITH TIME-OUT 8 THIS NUMBER IS AN AUDIO CHANNEL</p> <p>0 NONE OF THE FOLLOWING 1 CALL ALERT STATE ON (A) 2 TRANSFER STATE ON (->) 3 (1 + 2)</p>	<p>0 NONE OF THE FOLLOWING 1 GATE STATION 2 RELAY 1 (LOCATED AT TRFASFER ADDRESS) 3 (1 + 2) 4 OUTGOING CALLS AS CALL REQUESTS 5 (1 + 4) 7 (1 + 2 + 4) 8 PRIORITY STATION</p> <p>0 NONE OF FOLLOWING 1 INCOMING CALL AS CALL REQUEST (IF GATE STATION: ONLY ADDRESSES PROGRAMMED AS PV8-, PV9- AND TRANSFER ADDRESS CAN CALL THIS GATE STATION) 2 AUTOMATIC TRANSFER TO TRANSFER ADDRESS WHEN RELAY 4 RELAY WITH TIME-OUT 6 RELAY WITH TIME-OUT 8 THIS NUMBER IS AN AUDIO CHANNEL</p> <p>0 NONE OF THE FOLLOWING 1 CALL ALERT STATE ON (A) 2 TRANSFER STATE ON (->) 3 (1 + 2)</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 K_1 K_2 =$</p> <p>THE STATION NUMBERS THAT ARE GIVEN THE FEATURES IN QUESTION</p>	<p>i E.G. C 1A 17 i WILL SHOW THE FEATURES PROGRAMMED FOR STATION NR 17</p>
GROUPS	<p>C2A</p> <p>74 <input type="checkbox"/> 0 <input type="checkbox"/> IF ADDED TO THE GROUP 75 76 <input type="checkbox"/> 1 <input type="checkbox"/> IF TAKEN OFF THE GROUP 77 78 79</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N N - K K$ 1 2 1 2</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 - K_1 K_2$</p> <p>SUBGROUP 1 = A - B 2 = C - D 3 = E - F</p>	<p>i E.G. C 2A 7400 17 i WILL SHOW WHETHER STATION NR17 BELONGS TO GROUP 74 (DISPLAY WILL SHOW $\lfloor 17 \rfloor$) OR IF NOT, FOR HOW MANY STATIONS THERE IS STILL SPACE IN GROUP 74 (32, ..., 0)</p>
BLOCKINGS	<p>C3A</p> <p>1 2 3 4 <input type="checkbox"/> 0 <input type="checkbox"/> IF BLOCKING SET 5 <input type="checkbox"/> 1 <input type="checkbox"/> IF BLOCKING CLEARED 6 SUBGROUP (N₁ N₂ K₁ K₂ HAS NO MEANING BUT MUST BE SET, E.G. TO 1073) GROUP</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 - K_1 K_2$</p> <p>SUBGROUP 1 = A - B 2 = C - D 3 = E - F</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 - K_1 K_2$</p> <p>SUBGROUP 1 = A - B 2 = C - D 3 = E - F</p>	<p>i E.G. C 3A 4200 17 i WILL SHOW THE CONTENTS N₁ N₂ K₁ K₂ OF SUBGROUP 2 IN GROUP 4</p>
REAL TIME	<p>C4A</p>	<p>$H_1 H_2 M_1 M_2$ M</p>	<p>i C 4A 1 i REAL TIME C 4A 2 i TIMESLOTS 0 ... 6 C 4A 3 i TIMESLOTS 8 ... 14</p>	
SETTING MEMORY BYTE (NOTE 1)	<p>C5A</p> <p>$N_1 N_2 N_3 N_4$ M</p> <p>HIGH ADDRESS (N_i = 0, ..., 3)</p>	<p>$N_1 N_2 N_3 N_4$</p> <p>LOW ADDRESS (N_i = 0, ..., 3)</p>	<p>$D_1 D_2 D_3 D_4$ M</p> <p>DATA (D_i = 0, ..., 3)</p>	<p>i C 5A N₁ N₂ N₃ N₄ 17 i WILL SHOW THE CONTENTS OF THE MEMORY BYTE</p>
LAST NUMBER	<p>C6A</p>	<p>$N_1 N_2$ M</p> <p>LAST NUMBER</p>	<p>$N_1 N_2$ M</p> <p>LAST NUMBER</p>	<p>i C 6A i WILL SHOW LAST NUMBER</p>
PAGING ADAPTER	<p>C7A</p>	<p>$I_1 I_2 I_3 I_4$ M</p> <p>LOCATION OF PAGING ADAPTER</p>	<p>$I_1 I_2 I_3 I_4$ M</p> <p>LOCATION OF PAGING ADAPTER</p>	<p>i C 7A i WILL SHOW LOCATION OF PAGING ADAPTER</p>
PPORGR. OF SHORT CODE 8, SHORT CODE 9 AND TRANSFER ADDRESS	<p>C8A C9A C → A</p> <p>$I_1 I_2 I_3 I_4$ M</p> <p>I₁ = EXCHANGE NUMBER I₂ = MODULE NUMBER I₃ I₄ = STATION NUMBER OF THE SHORT CODE OR TRANSFER ADDRESS</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 - K_1 K_2 =$ THE STATIONS TO WHICH THE SHORT CODE OR TRANSFER ADDRESS IS PROGRAMMED (IF A RELAY IS GIVEN SHORT CODES OR A TRANSFER ADDRESS: ONLY THESE STATIONS CAN CONTROL THE RELAY)</p>	<p>$N_1 N_2 K_1 K_2$ M</p> <p>$N_1 N_2 - K_1 K_2 =$ THE STATIONS TO WHICH THE SHORT CODE OR TRANSFER ADDRESS IS PROGRAMMED (IF A RELAY IS GIVEN SHORT CODES OR A TRANSFER ADDRESS: ONLY THESE STATIONS CAN CONTROL THE RELAY)</p>	<p>i C 8A 17 i JA C 9A 17 i WILL SHOW THE SHORT CODES PROGRAMMED FOR STATION NR 17</p> <p>C → A 17 i WILL SHOW THE TRANSFER ADDRESS OF STATION NR 17</p>

NOTE. AFTER **M** LEVELS 1 AND 2 ARE BOTH AVAILABLE

- NOTE 1:
- C 5A PP00 0000 M 0000 M = POWER OFF AND ON: CLEARING OF ALL PROGRAMMING
 - C 5A PP10 3000 M 0001 M = POWER OFF AND ON: PREVENT REMOTE SETTING OF TRANSFER ADDRESSES (FOLLOW ME)
 - C 5A PP10 3000 M 0002 M = POWER OFF AND ON: INVERT GROUPS 78 AN D79
 - PP = 03 FOR PROCESSOR CARD PRO-2, PP = 12 FOR PROCESSOR CARD PRO-2,5
 - ADDITIONALLY ONLY FOR PRO-2,5
 - C 5A 1210 3000 M 0020 M = POWER OFF AND ON: GROUP CALLS ARE PRECEDED BY A DISTINCT TONE
 - C 5A 1210 3000 M 0T00 M = POWER OFF AND ON: T = TIME-OUT FOR GROUP CALLS (T = 0 = 30, 1 = 60, 2 = 90, 3 = 120 SECONDS)

A3 SL 1000 Mark II, Programming examples

A. ONE MODULE SYSTEMS (WITH 2-DIGIT STATION NUMBER)	
1. Station 17 is a priority station	C1A 0800 ↗ 17M
2. Stations 10-15 and 42 are priority stations	C1A 0800 ↗ 1015M 42M
3. Numbers 70-73 are audio channels	C1A 0080 ↗ 7073M
4. Station 59 is a gate station from which the calls should go to station 17	C1A 0100 ↗ 59M C8A 0017 ↗ 59M
5. Numbers 66-73 are relays. Only station 65 is allowed to operate the relays	C1A 0040 ↗ 6673M C8A 0065 ↗ 6673M
6. Stations 10-19 belong to group call 74	C2A 7400 ↗ 1019M
7. Stations 10, 20 and 30-40 belong to group call 76	C2A 7600 ↗ 10M 20M 3040M
8. Stations 15-35 and 55-70 belong to group call 78 (note! more than 32 stations; groups 78 and 79 must be inverted)	C2A 7800 ↗ 1014M 3654M 7173M C5A 0310 ↗ 3000M 0002M
9. Stations 50-73 are not allowed to call stations 10-19	C3A 1100 ↗ 1019M 1200 ↗ 5073M
10. Only stations 17 and 18 are allowed to make group and all calls 74-79	C3A 4100 ↗ 7479M 4200 ↗ 1016M 4300 ↗ 1973M
11. Only station 10 is allowed to make the all call 77	C3A 6100 ↗ 7777M 6200 ↗ 1173M
12. Set the clock to 9:35	C4A 0935M
13. Set the clock to 13:40	C4A 1340M
14. Station 33 is a gate station (a), from which the calls should go to station 10 (b). When a call is on (a), relay 66 (c) should operate, and if button M is depressed at station 10 during the call (a), relay 67 should operate. Numbers 66-73 are relays (d). Only Stations 10 and 11 are allowed to call the gate station (a, b, e). Nobody is allowed to call the relays directly (f). The follow me function is also prevented (g), so that the calls from the gate to station 10 cannot be captured to another station.	a C1A 4310 ↗ 33M b C8A 0010 ↗ 33M c C → A 0066 ↗ 33M d C1A 0040 ↗ 6673M e C9A 0011 ↗ 33M f C8A 0033 ↗ 6673M g C5A 0310 ↗ 3000M 0001M
B. TWO (OR SEVERAL) MODULE SYSTEMS	
1. Stations 110-115 and 220-230 are priority stations	MOD 1 C1A 0800 ↗ 1015M MOD 2 C1A 0800 ↗ 2030M
2. Station 133 is a gate station from which the calls should go to station 254	MOD 1 C1A 0100 ↗ 33M C8A 0254 ↗ 33M MOD 2 -
3. Stations 123-137 and 170 should belong to group call 174 and stations 210-221 and 242-247 to group call 274. (Note! All mentioned stations will thus belong to group call 784.)	MOD 1 C2A 7400 ↗ 2337M 70M MOD 2 C2A 7400 ↗ 1021M 4247M
4. All stations in a 3-module system except stations 110, 210 and 310 should belong to the same group callt samaan (789 is chosen).	MODULS 1, 2 AND 3 C2A 7900 ↗ 10M C5A 0310 ↗ 3000M 0002M
5. Station 173 is a gate station from which the calls should go to station 270, but if it is busy to station 271.	MOD 1 C1A 0100 ↗ 73M C8A 0270 ↗ 73M MOD 2 C1A 0020 ↗ 70M C → A 0271 ↗ 70M

6. Numbers 171-173 are audio channels in a 3-module system.
Only numbers 120-130, 210-230 and 310-330 are allowed to listen to these channels.
(Note! Row "2200":74 means that this is a blocking between modules, 23 means from modules 2 to 3)

MOD 1 C1A 0080 ↗ 7173M
C3A 1100 ↗ 7173M
1200 ↗ 1019M
1300 ↗ 3170M
2100 ↗ 7173M
2200 ↗ 7423M
2300 ↗ 3173M
MOD 2 -
MOD 3 -

*** KÄYTTÖÖNOTTOPÖYTÄKIRJA * IDRIFTTAGNINGSPROTOKOLL ***
*** START-UP PROTOCOL * PROTOKOLL DER INBETRIEBNAHME ***

Yleistä Allmänt General Allgemeines	Asiakas * Beställare * Customer * Kunde _____
	Osoite * Adress * Address * Adresse _____
	Yhteyshenkilö * Kontaktperson * Liaison person * Zuständige Person _____
	Toimittaja * Leverantör * Supplier * Lieferant _____
	Käyttöönottaja * Ansv. för idrifttag. * Person responsible for start-up * Inbetriebnehmer _____
Järjestelmä System	Moduulien lukumäärä * Modulantal * No. of modules * Modulanzahl _____
	Ominaisuudet * Egenskaper * Specifications * Eigenschaften _____ _____ _____
Käyttöönotto Idrifttagning Start-up Inbetriebnahme	Kaikki laitteet toimitettu * Alla delar levererade * All parts delivered * Alle Teile geliefert Kyllä * Ja * Yes <input type="checkbox"/> Ei * Nej * No * Nein <input type="checkbox"/>
	Kaikki työ tehty * Alla arb. utf. * Installation completed * Alle Arbeiten ausgeführt Kyllä * Ja * Yes <input type="checkbox"/> Ei * Nej * No * Nein <input type="checkbox"/>
	Asiakirjat luovutettu * Samtliga dokument levererade * All document delivered * Dokumente geliefert Kyllä * Ja * Yes <input type="checkbox"/> Ei * Nej * No * Nein <input type="checkbox"/>
	Käyttökoulutus annettu * Kundutbildn. genomförd * Customer training given * Kundens Schulung durchgeführt Kyllä * Ja * Yes <input type="checkbox"/> Ei * Nej * No * Nein <input type="checkbox"/>
	Lisätietoja * Anmärkningar * Additional comments * Weitere Informationen _____ _____ _____

* Käyttöönotto suoritettu ja hyväksytty * Idrifttagningen slutförd och godkänd *

* Start-up completed and approved * Inbetriebnahme durchgeführt und anerkannt abgenommen *

Pvm * Datum * Date

Takuu aika * Garanti period * Warranty period * Garantiezeit

Tilaaaja * Beställare * Customer * Besteller

Toimittaja * Leverantör * Supplier * Lieferant