

Karel MS128

Telephone System

*Installation
&
Maintenance
Guide*



Edition 3.2

KAREL

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INTRODUCTION

This Installation and Maintenance Guide provides an overall technical reference on the KAREL MS128 system and its accessories and includes descriptions, structures and capabilities as well as the installation and maintenance information.

This guide is formed up of three main chapters:

- 1) Technical Reference: The system outline is given and all the accessories are described. Brief information about the software structure of the system is presented and finally the technical specifications of the system are listed.*
- 2) Installation Guide: The basic system installation and wiring instructions are presented. Following the system installation part, the installation and wiring of the accessories are explained.*
- 3) Maintenance Guide: The basic steps to solve the problems faced after the installation of the system are given.*

TECHNICAL REFERENCE

I. SYSTEM

MS128 system has a capacity of 4 to 20 lines and 12 to 124 extensions.

At minimum capacity, the MS128 system consists of the following parts :

- CBN128 Cabinet made of metal, including a metal rack and some plastic parts,
- SPS128 Power Supply Module including a metal power rack, a power card, a ring transformer and a cable for BPL128 Backplane connection,
- BPL128 Backplane,
- CPU128 Central Processing Module,
- MS128 EX1 (4/12) Expansion Module that can support the minimum capacity of 4/12.

The MS128 system has 8 slots for MS128 EX1 (4/12) and MS128 EX2 (0/16) Expansion Modules, and the maximum capacities that can be reached when all slots are occupied are 4/124 and 20/108.

See the following figures to have a general idea about the outlook of the system and the structure of the system cabinet.

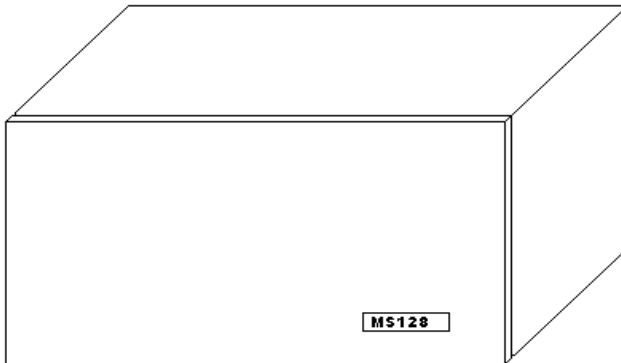


Figure A-1

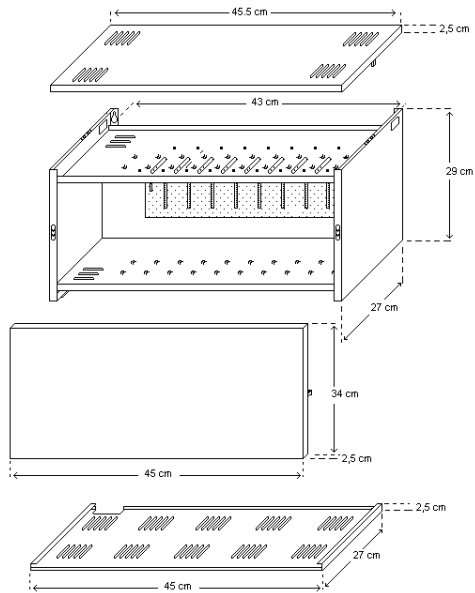


Figure A-2

The CBN128 metal cabinet provides a strong shell and a natural electromagnetic shield for the system.

I.1. PARTS LIST

In order to make the reader familiar with the cabinet which has a complex structure, the parts list for the cabinet is given below with respect to the references in the following figure.

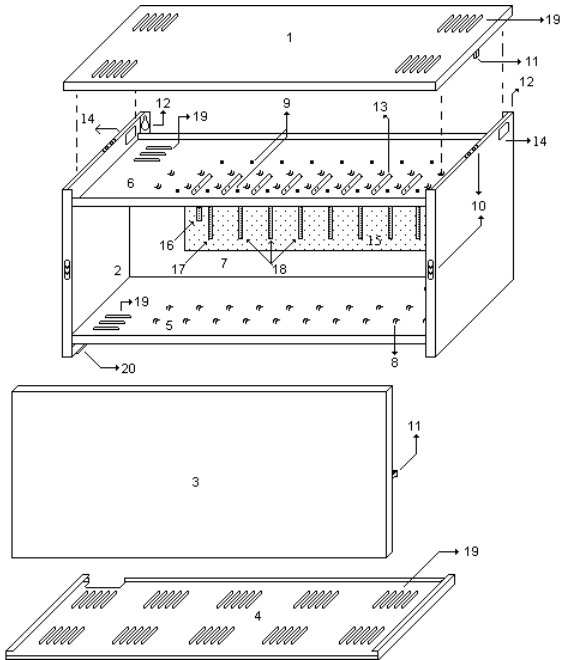


Figure A-3

- | | |
|--|---|
| 1. Top Cover | 2. Side Cover |
| 3. Front Cover | 4. Bottom Cover |
| 5. Rack Bottom Plate | 6. Rack Top Plate |
| 7. Rack Rear Plate | 8. Card Slot |
| 9. KN1 / KN2 Connection Card Holders | 10. Front and Top Cover Holders - Female Parts |
| 11. Front and Top Cover Holders - Male Parts | 12. Pear Holes (to hang the system on the wall) |
| 13. CPU-FC / EX-FC Flat Cable Holes | 14. Line / Extension Cable Holes |
| 15. BPL128 Backplane | 16. SPS128 Connector |
| 17. CPU128 Connector | 18. MS128 EX1 / MS128 EX2 Connector |
| 19. Ventilation Holes | 20. Bottom Cover Slot |

I.2. BACKPLANE OF THE SYSTEM – BPL128

The backbone of MS128 system is the BPL128 Backplane. All the modules, which are SPS128, CPU128, MS128 EX1 and MS128 EX2, are linked through the backplane.

BPL128 has the following connectors, from left to right (see Figure A-4):

- One 10-pin male connector for SPS128 Power Supply,
- One 64-pin female connector for CPU128 Central Processing Board,
- Eight 64-pin female connectors for the common use of MS128 EX1 and MS128 EX2 Expansion Modules.

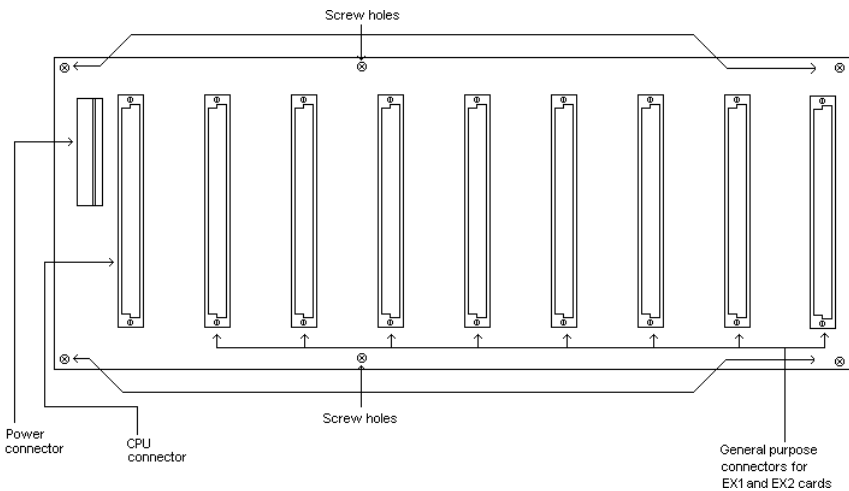


Figure A-4

BPL128 is mounted inside the system cabinet as fixed to the rack rear plate. The connectors on BPL128 match the card slots on the metal cabinet to ease the attachment of the modules.

The dimensions of BPL128 are 31 cm x 11.5 cm and the weight is 0.3 kg.

I.3. POWER TO THE SYSTEM

MS128 system receives 220 VAC from the mains. Inside the mains fuse slot on SPS128 Power Supply Module, there exist two T-type fuses for mains - one on phase and the other on neutral - of 2 A / 250 VAC for the first step protection (see Figure A-5).

The system can operate for the mains input of 180 - 260 VAC 50/60 Hz, which is processed by the SPS128 Power Supply Module.

I.3.A. POWER SUPPLY MODULE – SPS128

The front view of SPS128 Power Supply Module is illustrated in the following figure.

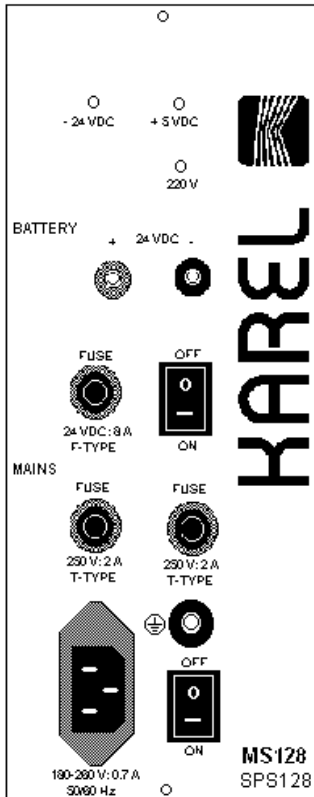


Figure A-5

SPS128 Power Supply Module is attached to the 10-pin power connector on the BPL128 Backplane (see Figure A-4) via a cable coming with the module itself and fixed to the metal rack with two screws.

SPS128 Power Supply Module consists of a metal power rack, to which the SPS128CR Power Card and the ring transformer are fastened. The mains transformer is located on the SPS128CR Power Card. The module also has a 10-pin cable for connection to the BPL128 Backplane.

SPS128 is a Switched Mode Power Supply (SMPS) operating at mains voltage. Receiving 220 VAC over the mains, SPS128CR generates 5 VDC, -5 VDC, +12 VDC and -24 VDC for the system operation, for the accessories and for the ring transformer. The ring transformer generates the 64 Vrms ring signal. Through the 10-pin power connector, the outputs of SPS128CR and ring transformer are passed to the BPL128 Backplane, which carries them to the system modules. The pin-out of the SPS128 – BPL128 connector on the backplane is as follows:

SPS128 – BPL128 Connector

Pin	Signal
1	- 24 VDC
2	GND
3	GND
4	+ 12 VDC
5	+ 5 VDC

Pin	Signal
6	GND
7	- 5 VDC
8	GND
9	+ 5 VDC
10	64 Vrms (Ring)

MS128 system can be backed up with a battery of 24 VDC in order to provide the continuity of the operation in case of mains failure. Hence, SPS128CR has necessary circuitries for battery backup. It is strongly recommended to use a dry battery for proper operation of the system. Also a 24 V - 15 Ah battery is recommended for a full capacity system with an average traffic of 35%.

There exists one F-type fuse of 8 A / 24 VDC for battery. The battery input is also controlled by the battery ON/OFF switch, which enables the user to put the battery out of service when necessary.

SPS128CR is also capable of charging the battery while the system power is on and the system is running under low traffic. Besides, there exists a low voltage battery cut-off circuitry, which turns itself off when the battery voltage goes below 17 VDC and does not start until the battery voltage is above 23 VDC. So, preventing full discharge of the battery SPS128 makes the lifetime of the battery longer.

The Power Status LEDs on the front panel of the SPS128 Power Supply Module help to identify the power source in use on time. There are three LEDs. One is for 220 VAC and the others are for -24 VDC and +5 VDC. Normally when the system is fed from the mains all three LEDs are on. The 220 VAC LED turns off when the mains power is off. In this case - 24 VDC and + 5 VDC LEDs stay on, if battery backup is available for the system.

The dimensions of the SPS128 are 9 cm x 26 cm x 23 cm and the weight is 2.2 kg (including SPS128CR).

The dimensions of the SPS128CR are 5.5 cm x 18 cm x 20 cm and the weight is 0.9 kg.

I.3.B. POWER FAILURE TRANSFER STATIONS

In case of a power failure, the stand-by battery backup allows the system resume operation without any interrupt. However if there is no battery connected to the system, then any four lines can be automatically connected to any four extensions of the system. The power failure transfer stations are handled by four relays placed on the MS128 CPUKON card.

I.4. CENTRAL PROCESSING MODULE – CPU128 & CPU CONNECTION CARD - MS128 CPUKON

CPU128 Central Processing Module is located on the leftmost card slot inside the cabinet. The board is attached to the CPU connector on the BPL128 Backplane (see Figure A-4) and fixed to the rack top plate via the the latch on the plastic card cover.

MS128 CPUKON CPU Connection Card resides on the rack top plate below the top cover of CBN128 Cabinet (see Figure A-3). It is fixed to the rack by a brass card holder with its screw and two plastic card holders. The MS128 CPUKON card is connected to the CPU128 board by a 20-pin flat cable, called MS128 CPU-FC. See the following figure for the outlook of MS128 CPUKON card.

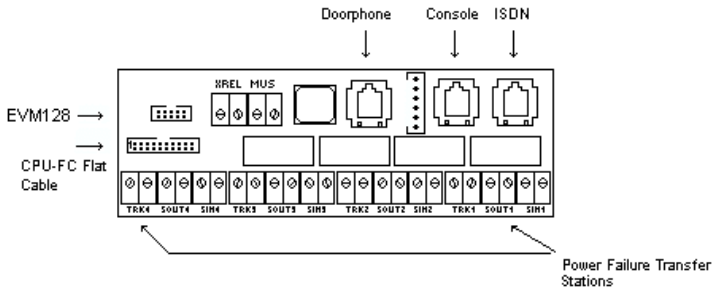


Figure A-6

CPU128 is the brain of the system consisting of the microprocessor, utility, switching and DTMF circuitries. See Figure A-8 for the location of these circuitries and Figure A-7 for the operational flow diagram of CPU128.

MS128 CPUKON is the interface between the accessories and the system, it includes the connectors used to attach the accessories to the system.

CPU128 generates the address and data signals for the MS128 EX1 and MS128 EX2 Expansion Modules and gives them to the BPL128 Backplane, via the 64-pin connector on BPL128. Then, the signals travel through the BPL128 Backplane to the MS128 EX1 and MS128 EX2 Expansion Modules. The pin-out of the CPU128 – BPL128 connector on BPL128 Backplane is as follows:

CPU128 – BPL128 Connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+ 1 VDC	17	X13	33	+ 12 VDC	49	X7
2	- 5 VDC	18	X12	34	- 5 VDC	50	X8
3	CS1	19	GNDCPU	35	A0	51	GNDCPU
4	CS2	20	X11	36	A1	52	X16
5	CONT1	21	X9	37	A2	53	X10
6	CS6	22	X17	38	CONT3	54	X14
7	CONT2	23	X15	39	DATA	55	X5
8	B	24	X0	40	RD	56	X22
9	DA1	25	X1	41	WR	57	X21
10	DA2	26	X2	42	CS3	58	X20
11	A	27	X18	43	DA0	59	X19
12	C	28	X3	44	D	60	X23
13	CS4	29	+ 5 VDC	45	CS5	61	+ 5 VDC
14	VAG	30	CS7	46	VAG	62	CS8
15	X4	31	GND	47	X6	63	GND
16	+ 5 VDC	32	- 24 VDC	48	+ 5 VDC	64	- 24 VDC

The data signals for the accessories are generated on CPU128, and then transmitted to MS128 CPUKON via MS128 CPU-FC. The following table illustrates the pin-out of the MS128 CPU-FC Flat Cable.

MS128 CPU-FC Cable

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1(red)	XREL2	6	GNDCPU	11	OUT1	16	EMBT
2	XREL1	7	+ 5 VDC	12	OUT2	17	RMF12
3	MUS1	8	DIAINP	13	- 24 VDC	18	GNDCPU
4	VAG	9	INP2	14	EMBR	19	BUSY
5	DIA	10	INP1	15	SERDATA	20	+ 12 VDC

There is a LED on the front panel of CPU128. During normal operation it blinks continuously. During a Reset or a Parameter Download it remains on. So, the state of the system can be monitored by way of this LED.

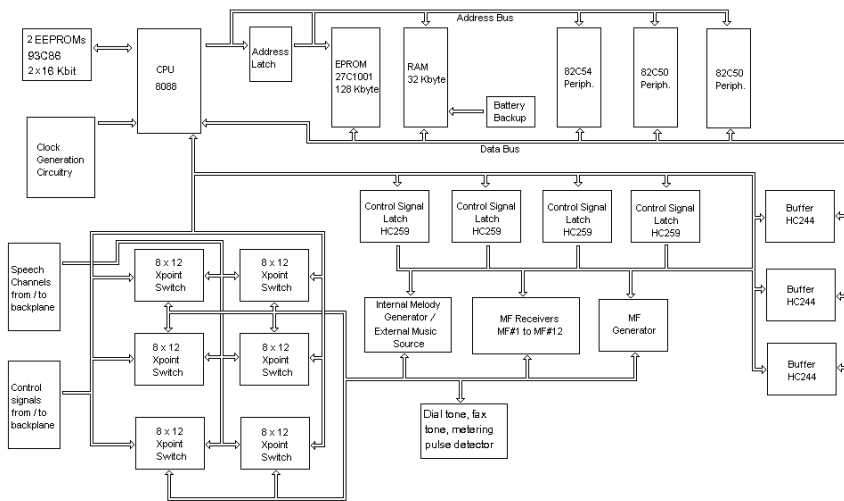


Figure A-7

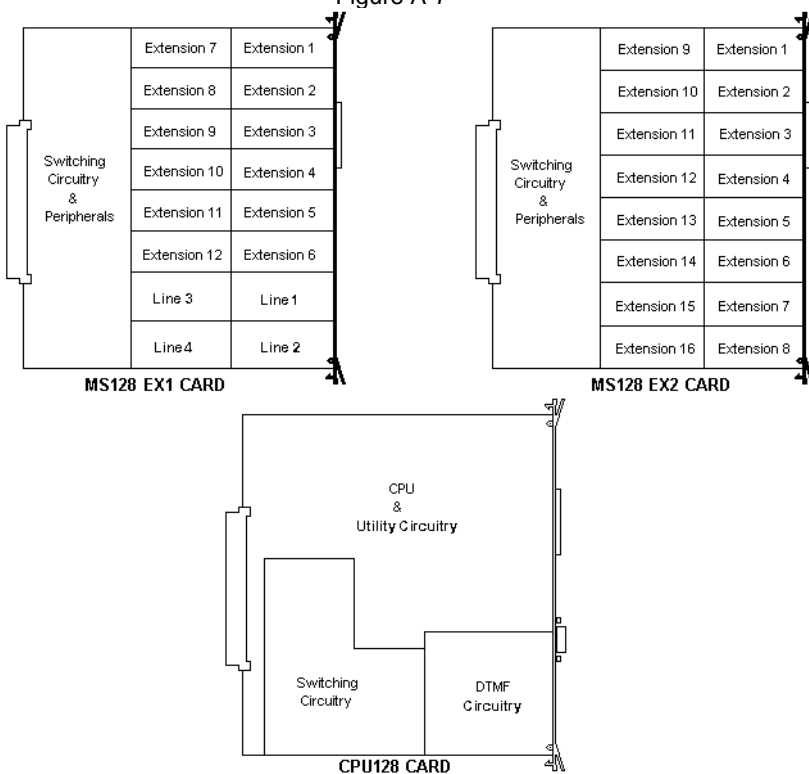


Figure A-8

The dimensions of CPU128 are 26 cm x 21 cm and the weight is 0.3 kg.

The dimensions of MS128 CPUKON are 13 cm x 4.5 cm and the weight is 0.2 kg.

I.5. EXPANSION MODULES - MS128 EX1 / MS128 EX2

MS128 EX1 and MS128 EX2 modules are used to increase the system capacity. MS128 EX1 Expansion Module has a capacity of 4/12 whereas MS128 EX2 Expansion Module has a capacity of 0/16.

The system should have at least one MS128 EX1 module to support the minimum capacity of 4/12. At maximum capacity, the system can have 124 extensions or 20 lines. Hence, by means of the 8 general purpose slots for MS128 EX1 and MS128 EX2 modules, the maximum system capacity may be configured as 4/124 or 20/108, when all slots are occupied.

MS128 has a default numbering plan for extensions from 111 to 234 (max.) and lines from 01 to 20 (max.). When all the cards are installed and the system is powered on, the system checks and recognizes all the cards automatically and arranges the numbering plan accordingly.

MS128 EX1 consists of MS128 EX1B and KN1 cards together with the EX-FC flat cable. Similarly, MS128 EX2 includes MS128 EX2B and KN2 cards together with the EX-FC flat cable. MS128 EX1B and MS128 EX2B are the capacity expansion boards, having extension circuitries as well as bus receiver circuitries. MS128 EX1B cards employ line circuitries as well. See Figure A-8 for the location of these circuitries as well as Figures A-9 and A-10 for the operational flow diagrams of MS128 EX1 and EX2 Expansion Boards, respectively.

KN1 and KN2 Connection Cards are the interface boards between the extension telephones / external lines and the MS128 EX1B and EX2B cards, respectively. KN1 and KN2 have the extension / line connectors as well as some protection and filter elements.

KN1 lays on the rack top plate below the top cover of CBN128 cabinet (see Figure A-3). It is fixed to the rack by a brass card holder with its screw and two plastic card holders. The KN1 card is connected to MS128 EX1B by a 34-pin flat cable, called EX-FC. The same also applies to the connection of KN2 and MS128 EX2B. The pin-outs of the KN1 – MS128 EX1B and KN2 – MS128 EX2B connectors are illustrated in the following tables.

KN1 – MS128 EX1B Connector

Pin	Signal
1 (red)	LED2
2	SUB1A
3	SUB1B
4	SUB2A
5	SUB2B
6	SUB3A
7	SUB3B
8	SUB4A
9	SUB4B

Pin	Signal
10	SUB5A
11	SUB5B
12	SUB6A
13	SUB6B
14	SUB7A
15	SUB7B
16	SUB8A
17	SUB8B
18	SUB9B

Pin	Signal
19	SUB9A
20	SUB10B
21	SUB10A
22	SUB11B
23	SUB11A
24	SUB12B
25	SUB12A
26	TRK5B
27	TRK5A

Pin	Signal
28	TRK6B
29	TRK6A
30	TRK7B
31	TRK7A
32	TRK8B
33	TRK8A
34	LED1

KN2 – MS128 EX2B Connector

Pin	Signal
1 (red)	LED2
2	SUB1A
3	SUB1B
4	SUB2A
5	SUB2B
6	SUB3A
7	SUB3B
8	SUB4A
9	SUB4B

Pin	Signal
10	SUB5A
11	SUB5B
12	SUB6A
13	SUB6B
14	SUB7A
15	SUB7B
16	SUB8A
17	SUB8B
18	SUB9B

Pin	Signal
19	SUB9A
20	SUB10B
21	SUB10A
22	SUB11B
23	SUB11A
24	SUB12B
25	SUB12A
26	SUB13B
27	SUB13A

Pin	Signal
28	SUB14B
29	SUB14A
30	SUB15B
31	SUB15A
32	SUB16B
33	SUB16A
34	LED1

MS128 EX1B and MS128 EX2B cards are connected to the BPL128 Backplane through the 64-pin connectors on BPL128 (see Figure A-4). The pin-out of the MS128 EX1B/EX2B – BPL128 connector is illustrated in the following table :

MS128 EX1B/EX2B – BPL128 Connector

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+ 1 VDC	17	X13	33	+ 12 VDC	49	X7
2	- 5 VDC	18	X12	34	- 5 VDC	50	X8
3	CONT3	19	GNDCPU	35	A0	51	GNDCPU
4	-	20	X11	36	A1	52	X16
5	CONT1	21	X9	37	A2	53	X10
6	-	22	X17	38	CS	54	X14
7	CONT2	23	X15	39	DATA	55	X5
8	B	24	X0	40	RD	56	X22
9	DA1	25	X1	41	WR	57	X21
10	DA2	26	X2	42	-	58	X20
11	A	27	X18	43	DA0	59	X19
12	C	28	X3	44	D	60	X23
13	-	29	+ 5 VDC	45	-	61	+ 5 VDC
14	VAG	30	RING	46	VAG	62	RING
15	X4	31	GND	47	X6	63	GND
16	+ 5 VDC	32	- 24 VDC	48	+ 5 VDC	64	- 24 VDC

There is a LED on the front panel of MS128 EX1 / MS128 EX2 cards. This LED turns on when any port on the card is in use. During Reset or Parameter Download these LEDs remain on.

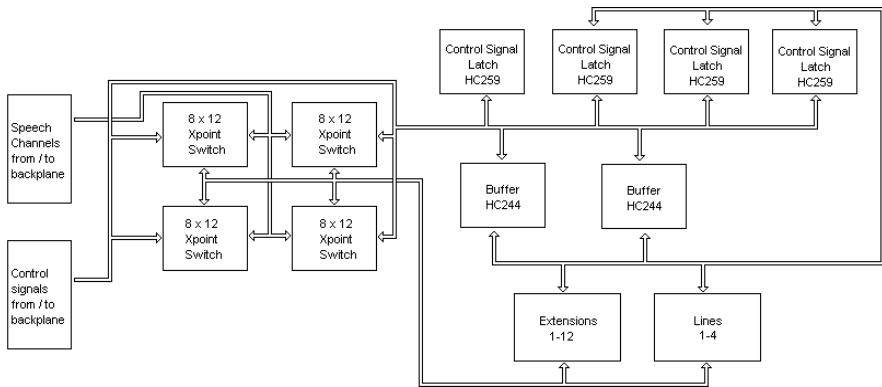


Figure A-9

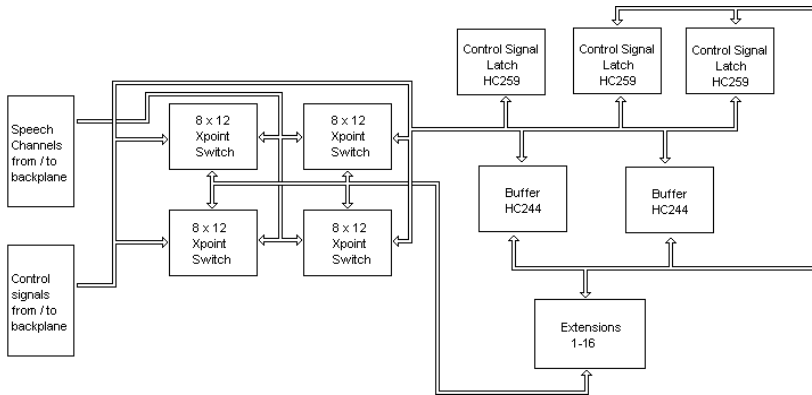


Figure A-10

The dimensions of the MS128 EX1B are 26 cm x 21 cm and the weight is 0.3 kg.

The dimensions of the MS128 EX2B are 26 cm x 21 cm and the weight is 0.3 kg.

The dimensions of the KN1 / KN2 are 16 cm x 3 cm and the weight is 0.1 kg.

1.6. EXTERNAL MUSIC CONNECTOR

Any external music source (tape recorder, radio or CD player) can be connected to the system to be used for background music facility and to be transmitted to the parties parked or put on hold. This connection is established via the 2-pin MUS connector on MS128 CPUKON card.

1.7. EXTERNAL RELAY

An external relay which is rated for 250 VAC - 24 VDC at a maximum current of 2 A exists on the MS128 CPUKON CPU card to be used to activate either a door opener, an external ringer, an external music source or an external announcement system. The connection to the external relay is established through the 2-pin XREL connector on MS128 CPUKON card. The selection among these devices is made by programming.

II. ACCESSORIES

To offer you a full telecommunication system, MS128 is equipped with many accessories. These accessories are shown in the following figure and explained one by one in the following sections.

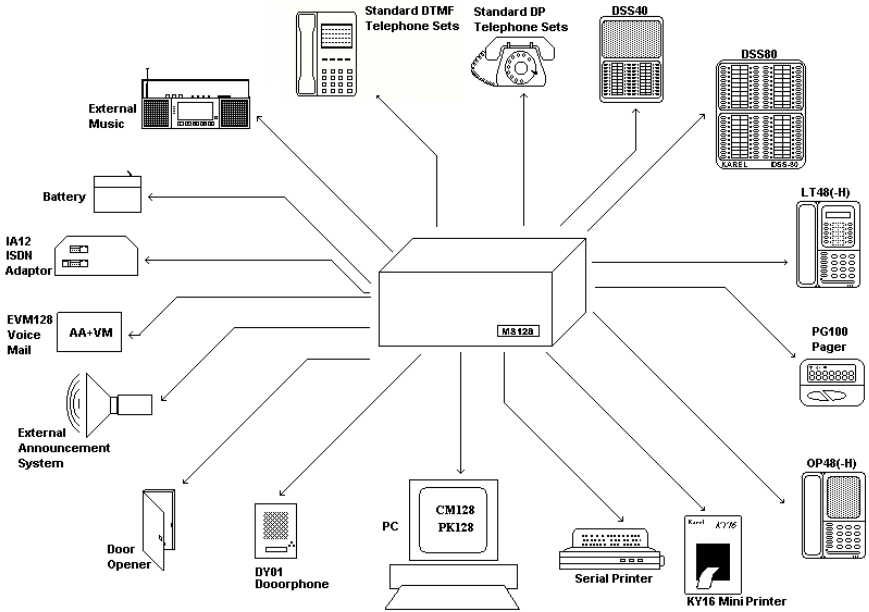


Figure A-11

II.1. CONSOLES, FEATURE PHONES, DIRECT STATION SELECT MODULES - OP48(-H), LT48(-H), DSS80, DSS40

OP48(-H) Consoles, LT48(-H) Feature Phones, DSS80 / DSS40 Direct Station Select Modules are the members of the same telephone family, hence they have similar cases.

The data cabling of these sets is made via the 6-pin RJ socket on the MS128 CPUKON card. The signaling between the system and consoles, feature phones or DSS modules is illustrated in the following table :

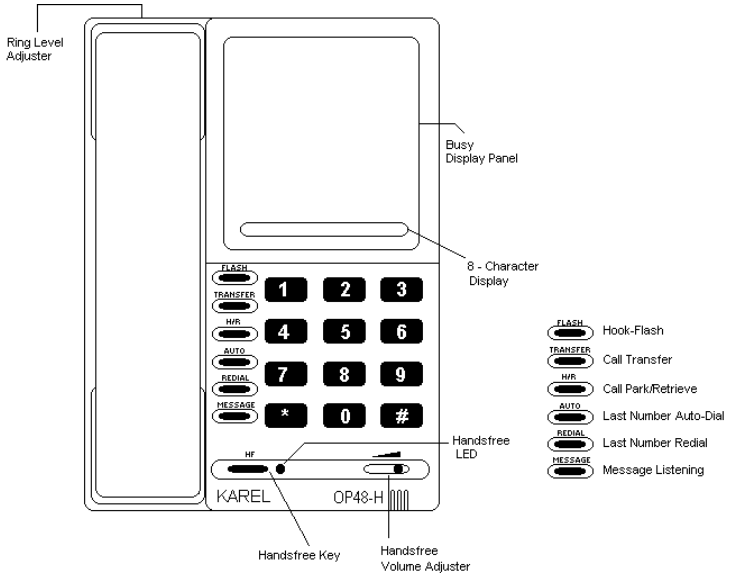
MS128 CPUKON Card Console Connector Pin No	Signal	Telephone / DSS Card RJ Socket Pin No
1	+12 VDC	6
2	Busy	-
3	-	-
4	-	-
5	GND	2
6	Data	1

The input of +12 VDC is regulated to +5 VDC by telephone / DSS cards.

II.1.A. OP48(-H) CONSOLE

There are two types of OP48 Consoles, OP48 Console and OP48-H Handsfree Console, the second one being half-duplex. The OP48(-H) Console has a BDP (Busy Display Panel) that shows the states of the first 40 extensions and the first 12 lines as well as some system features. There is also an 8-Character Display that keeps the user informed about the calling / called extensions and dialed numbers as well as some system features.

The outlook and BDP of OP48-H Console are illustrated in the following figures.



Handsfree Key, Handsfree Volume Adjuster and Handsfree LED are available only on the handsfree versions.

Figure A-12

11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
01	02	03	04	C	J	»	C1	C2	S
05	06	07	08	Ⓟ	⌂	★	Lo	Pa	Er
09	10	11	12	⚡	⚠	⚡	Pr	Ro	Di

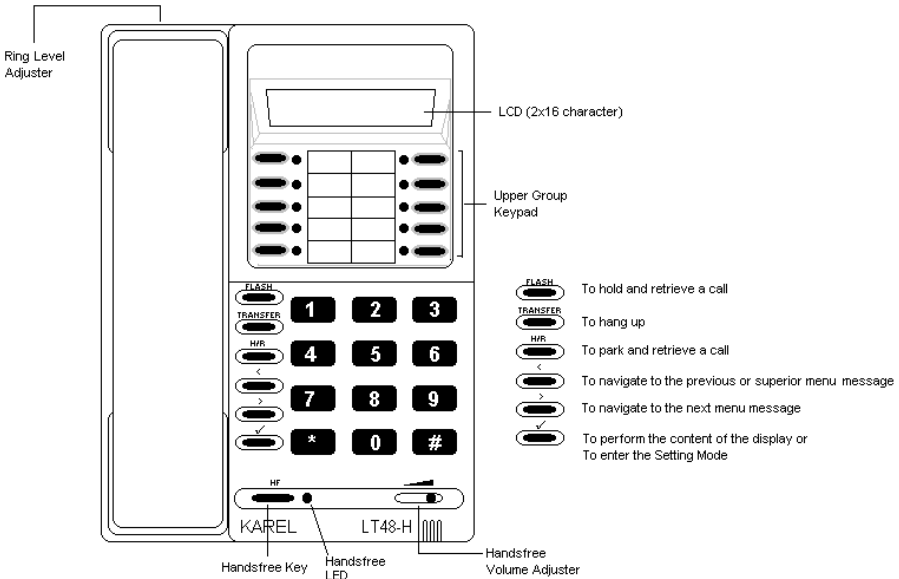
Figure A-13

The dimensions of OP48(-H) are 22 cm x 6.5 cm x 16 cm and the weight is 0.9 kg.

II.1.B. LT48(-H) FEATURE PHONE

There are two types of LT48 Feature Phones, LT48 Feature Phone and LT48-H Handsfree Feature Phone, the second one being half-duplex. The LT48(-H) Feature Phone is equipped with a 2 x 16 menu driven LCD, which offers self explanatory messages for the user to monitor the state of operation and access many system features. Also, it is possible to make one touch dialing for accessing any extension / line or activating most of the system features, by the help of the 10 programmable keys in the upper keypad.

The outlook of LT48-H Feature Phone is illustrated in the following figure .



Handsfree Key, Handsfree Volume Adjuster and Handsfree LED are available only on the handsfree versions.

Figure A-14

The dimensions of LT48(-H) are 22 cm x 6.5 cm x 16 cm and the weight is 0.9 kg.

II.1.C. DSS80 DIRECT STATION SELECT MODULE

The DSS80 Direct Station Select Module, which is used as an add-on module for OP48(-H) Consoles and LT48(-H) Feature Phones, is a programmable keypad, including 80 multipurpose keys and 80 corresponding LEDs.

Each key may be programmed to activate two facilities, which may be calling an extension, accessing a line or activating a system feature. The corresponding LED of each key shows the status of the facility assigned to the primary function of the key.

The outlook of DSS80 is illustrated in the following figure .

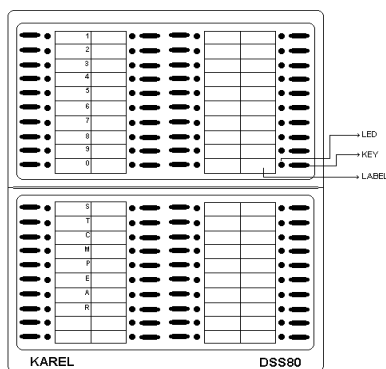


Figure A-15

The dimensions of the DSS80 are 16 cm x 22 cm x 6.5 cm and the weight is 0.7 kg.

II.1.D. DSS40 DIRECT STATION SELECT MODULE

The DSS40 Direct Station Select Module, which is used as an add-on module for OP48(-H) Consoles and LT48(-H) Feature Phones, consists of a BDP (Busy Display Panel), a 2-Character Display and a programmable keypad including 40 multipurpose keys and 40 corresponding LEDs.

Each key may be programmed to activate two facilities, which may be calling an extension, accessing a line or activating a system feature. The corresponding LED of each key shows the status of the facility assigned to the primary function of the key.

The BDP (Busy Display Panel) together with the 2-Character Display shows the states of 124 extensions and 20 lines as well as some system features.

DSS40 can be used not only with the MS128 system, but also with the other KAREL systems of bigger capacities. That is why DSS40 handles 4-digit physical numbers for extensions, such that the 2-Character Display is used to show the most significant two digits whereas the LEDs on the BDP are used to indicate the least significant two digits. In this way, the two digits in the 2-Character Display may be interpreted as “page numbers”, and there are 3 pages with numbers 11 to 13 that covers all the extensions in the KAREL systems to which DSS40 can be connected. It is also possible to navigate forward and backward among the pages, via the “+” and “-“ keys on DSS40 keypad. However, when DSS40 is connected to MS128 system, it is enough to observe the first page (page 11) for the extensions 111 to 199 and the second page for the extensions 200 to 234. The states of 20 lines as well as system features are displayed on all pages.

The outlook and BDP of DSS40 are illustrated in the following figures.

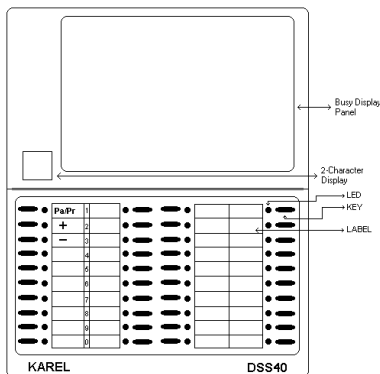


Figure A-16

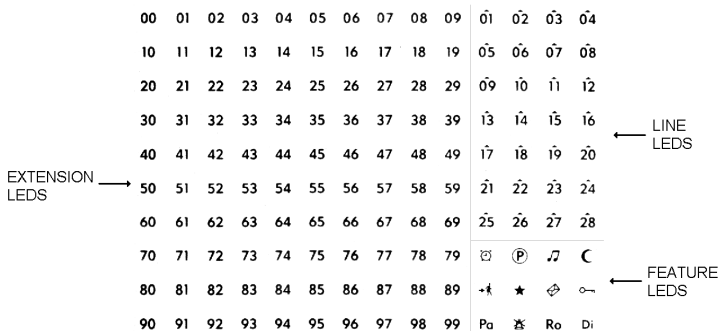


Figure A-17

The dimensions of the DSS40 are 16 cm x 22 cm x 6.5 cm and the weight is 0.7 kg.

II.2. MINI PRINTER - KY16

MS128 system offers *Call Record Listing (CRL)* facilities, by keeping the records of the external calls and storing them in its non-volatile memory against any power failure. You may obtain these records by way of some external devices.

One of these external devices is KY16 Mini Printer, which gives 16-column printout using an Epson type print head.

The following figure illustrates the outlook of KY16 Mini Printer.

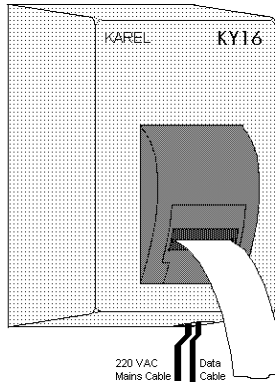


Figure A-18

The data cabling of KY16 is made via the 6-pin RJ socket (the same socket used by consoles) on the MS128 CPUKON card. The signaling between the system and KY16 is illustrated in the following table :

MS128 CPUKON Card Console Connector Pin No	Signal	KY16 Card Connector Pin No
1	+12 VDC	-
2	Busy	2
3	-	-
4	-	-
5	GND	1
6	Data	3

Below is a sample printout of KY16 :

Counter ←	#0006	LDIS	→	Call Type
Date (Day/Month) ←	25/01	19:33:19	→	Starting Time (Hour/Minute/Second)
Duration (Minute/Second) ←	01:29	112 113 D1	→	Line
			→	Ending extension
			→	Starting extension
Pulse number ←	0002	000200	→	Cost
Number dialed ←	0212543123			

Figure A-19

The dimensions of KY16 are 15 cm x 20.5 cm x 9 cm and the weight is 1.3 kg.

- **NOTE**

Only one of the three CRL accessories - namely KY16 Mini Printer, CM128 CRL Interface and/or PK128 PC-Console Interface or the serial printer - can be connected to the system at a time. The selection among these devices is made by programming.

II.3. SERIAL INTERFACE - CM128, PK128, CM128+PK128, SERIAL PRINTER INTERFACE

II.3.A. CM128 CALL RECORD LISTING INTERFACE AND/OR PK128 PC-CONSOLE INTERFACE

Using the serial communication port on CPU128 card, a PC can be connected to the system. KAREL provides two modules for PC connection: CM128 and PK128.

CM128 CALL RECORD LISTING INTERFACE

Call records, which are transferred to the PC via the serial communication port on CPU128 card, are processed by the CM128 CRL software. A 3.5" diskette with the necessary software, a 5 meter long cable for PC-Exchange connection and a security plug are provided. The cable has a 25-pin D-type plug at the PC end and a 9-pin D-type plug at the exchange end, to be attached to the 9-pin D-type plug on the front panel of CPU128 card.

The software operates under Windows.

PK128 PC-CONSOLE INTERFACE:

PK128 PC-Console is the software, which enables you to supervise your system via your personal computer, by monitoring the states of extensions / lines or checking and editing all the system parameters. A 3.5" diskette with the necessary software, a 5 meter long cable for PC-Exchange connection and a security plug are provided. The cable has a 25-pin D-type plug at the PC end and a 9-pin D-type plug at the exchange end, to be attached to the 9-pin D-type plug on the front panel of CPU128 card.

The software operates under DOS.

CM128+PK128:

This is a combined unit of CM128 and PK128 modules. These programs are the same as the ones described above and they run independently, but cooperatively. Two 3.5" diskettes one with CM128 and the other with PK128 software, a 5 meter long cable for PC-Exchange connection and a security plug are provided. The cable has a 25-pin D-type plug at the PC end and a 9-pin D-type plug at the exchange end, to be attached to the 9-pin D-type plug on the front panel of CPU128 card.

- **PC REQUIREMENTS :**

The PC to be used with MS128 system should have the following specifications:

- a) 640 KB RAM (at least)
- b) Windows (not older than version 3.1)
- c) A harddisk
- d) A serial port

- **SIGNALING AND COMMUNICATION PARAMETERS :**

The signaling between the system and the PC is illustrated in the following table. Since the PC-Exchange cable has a 25-pin plug at the PC end, it is necessary to employ a 25-pin to 9-pin converter plug, in order to use the 9-pin connector of the PC.

CPU128 Card Connector No	Signal	PC	
		25-pin connector Pin No	9-pin connector Pin No
2	+ 10 VDC	3	2
3	- 10VDC	2	3
4	TXD	20	4
5	RXD	7	5
7	GND	4	7

The signal names above are given with respect to MS128 system and these pin assignments are valid only for IBM compatible devices. If your device is not IBM compatible, then you must provide the requested pin connections to match the signaling parameters of the system.

The communication protocol for PC - Exchange connection is illustrated in the following table:

For PC	
Data Bits	8
Stop Bit	1
Parity	None
Baud Rate	4800 Bps

The CM128 and PK128 modules are able to set the communication protocol to the appropriate values, automatically.

- **DATA FORMAT OF CM128 :**

A call record consists of two lines, each followed by Carriage return (0Dh) and Line Feed (0Ah) characters.

Structure of the first line:

Starting Character Position	Field Width	Information
1	1	#; indicates start of record
2	4	4 digit counter value
6	1	Space
7	4 or 2	Call type
11	1	Space
12	1	Common Pool information

- Call type:

LDIS	Long Distance
INTL	International
IC	Incoming

Call type field and the preceding space are not sent to the PC for local calls.

- Common pool information field contains the character "C" for the calls made from the common pool. If the call is not made from the common pool then this field and the preceding space are not sent to the PC.

Structure of the second line:

Starting Character Position	Field Width	Information
1	8	Date in the format dd/mm/yy
9	1	Space
10	8	Starting time of the call in the format hh:mm:ss
18	1	Space
19	8	Ending time of the call in the format hh:mm:ss
27	1	Space
28	5	Call duration in the format mm:ss
33	1	Space
34	4	Starting extension number, OPE for the operator and Dtt for the incoming calls coming from a DISA line where tt is the line number.
38	1	Space
39	4	Ending extension number, OPE for the operator.
43	1	Space
44	3	Call info
47	1	Space
48	2	Line number
50	1	Space
51	4	Metering Pulse count
55	1	Space
56	7	Call cost
63	1	Space
64	variable	Number dialed

- **NOTES:**

Only one of the three CRL accessories - namely KY16 Mini Printer, CM128 CRL Interface and/or PK128 PC-Console Interface or the serial printer - can be connected to the system at a time. The selection among these devices is made by programming.

II.3.B. SERIAL PRINTER INTERFACE

Using the serial communication port on CPU128 card, any serial printer can be connected to the system to have the reports of the call records and activated system features.

The signaling between the system and the printer is illustrated in the following table:

CPU128 Card Connector No	Signal	Printer	
		25-pin connector Pin No	9-pin connector Pin No
2	TXD	3	2
8	RXD	20	4
5	GND	7	5

The signal names above are given with respect to MS128 system and these pin assignments are valid only for IBM compatible devices. If your device is not IBM compatible, then you must provide the requested pin connections to match the signaling parameters of the system.

The communication protocol for Printer - Exchange connection is illustrated in the following table :

For Printer	
Data Bits	8
Stop Bit	1
Parity	Even
Baud Rate	2400

You may need to configure the printer for these parameters by selecting appropriate settings on the printer.

- **NOTES:**

Only one of the three CRL accessories - namely KY16 Mini Printer, CM128 CRL Interface and/or PK128 PC-Console Interface or the serial printer - can be connected to the system at a time. The selection among these devices is made by programming.

II.4. DOORPHONE – DY01

MS128 system has a built-in circuitry, which can drive DY01 Doorphone. Any user of the system can access the doorphone and make a conversation with the party near the doorphone. The voice path is full-duplex. The doorphone has a ring button on it. This ring button can be utilized to ring an external ringer or an extension telephone. DY01 doorphone has a speech processor card inside the metal box of the doorphone.

The outlook and structure of DY01 is illustrated in the following figure.

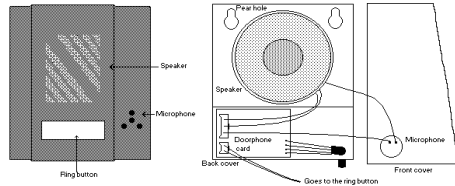


Figure A-20

The pin-out of the 4-pin RJ socket used to connect DY01 to MS128 CPUKON card is illustrated in the following table :

MS128 CPUKON Card	
Doorphone Connector	
Pin no	Signal
1	SPEECH
2	GND
3	+ 5 VDC
4	RINGGEN

The dimensions of the DY01 are 12 cm x 14 cm x 3 cm and the weight is 0.5 kg.

II.5. EXTERNAL ANNOUNCEMENT SYSTEM

Any external announcement system can be connected to MS128 through the 4-pin RJ socket (the same socket used by DY01 doorphone) on MS128 CPUKON card.

II.6. AUTO-ATTENDANT & VOICE MAIL - EVM128

EVM128 Auto Attendant guides the external callers throughout their calls with pre-recorded messages, and hence enables the operator to work more efficiently, especially under high traffic. Optionally, Voice Mail facilities may be employed, and then the extensions can have private voice mail boxes to be used to leave / receive messages to / from other users.

EVM128 has 2 minutes Auto Attendant memory on board. Besides, EVM128 has two 36-pin connectors on the component side, which are used to install the optional EVM-FE (Auto Attendant Expansion) and three 24-pin connectors, which are used to install the optional EVM-DE (Voice Mail Expansion) cards.

The EVM-FE card with a Flash ROM memory chip preserves the special messages for Auto Attendant purposes. At most two EVM-FE cards can be installed on the EVM128 card in addition to the onboard one. Each EVM-FE card has a message capacity of 2 minutes. Thus, EVM128 can have a maximum Auto Attendant message capacity of 6 minutes. 24 different messages to be used during different states of call handling of Auto Attendant can be entered. These messages are retained even when the system power is off.

The EVM-DE card with two Dynamic RAM chips stores messages for the Voice Mail purposes. At most three EVM-DE cards can be installed on the EVM128 card. Each EVM-DE card can provide a total message capacity of 15 minutes. Thus, EVM128 can have a maximum Voice Mail message capacity of 45 minutes. The capacity per EVM-DE card may be also increased to 20 minutes by programming, in which case the voice quality is impaired to a certain extent, but the difference cannot be recognized by human ear. The Voice Mail messages are lost when the system power is off.

EVM128 supports two voice channels, used by both Auto Attendant and Voice Mail facilities. That is, EVM128 can serve two users at a time, to record and listen to the messages. The two LEDs on the card are used to show the states of these voice channels. At start up, these LEDs blink till the system recognizes EVM128. Then, each LED stays on while the corresponding channel is idle and stays off when the corresponding channel is in use.

The external callers can make use of the EVM128 facilities, only if they have DTMF telephone sets in order to be able to key in numbers whenever required by EVM128.

The outlook of EVM128, EVM-FE and EVM-DE cards is illustrated in the following figure.

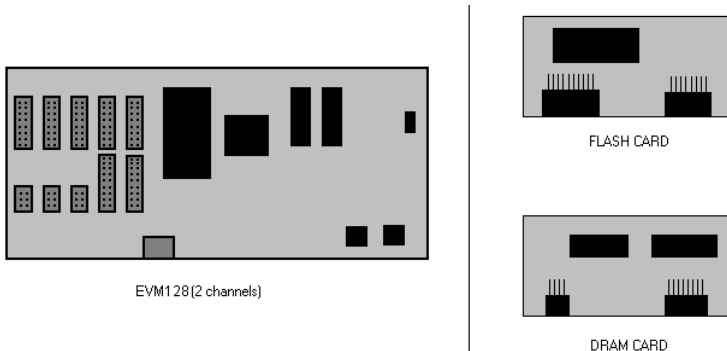


Figure A-21

EVM128 is located on the rack top plate below the top cover of CBN128 cabinet (see Figure A-3) and connected to the 10-pin connector on MS128 CPUKON card via the 10-pin flat cable that comes with EVM128 itself (see Figure A-6).

The dimensions of EVM128 are 9 cm x 18 cm and the weight is 0.1 kg.

The dimensions of EVM-FE and EVM-DE are 6.5 cm x 3.5 cm.

II.7. ISDN ADAPTOR – IA12, EXP-IA12

The IA12 ISDN Adaptor is an ETSI compatible terminal adaptor that serves as an interface between the ISDN BRA-S0 lines coming through the network terminator (NT1) of PTT and the analog lines of the MS128 system. The adaptor also supports many EURO-ISDN facilities for Basic Rate Access.

The function of IA12 ISDN Adaptor is to support the ISDN BRA protocol of the network in order to make bi-directional conversions between the ISDN BRA lines of PTT and the analog lines of the MS128 system.

At basic capacity, IA12 ISDN Adaptor is capable of handling one S0 line coming from NT1 of the PTT. This capacity can be further increased by means of an EXP-IA12 Expansion Board which can also support one S0 line. Since each S0 line offers two separate channels, the IA12 alone can convert two analog lines of the MS128 system to one ISDN BRA-S0 line whereas the IA12 with EXP-IA12 can convert four analog lines to two ISDN BRA-S0 lines.

The IA12 ISDN Adaptor communicates with the MS128 system through the data line of KAREL telephones. Due to the current limitation on this data line which also feeds the adaptor, it is not possible to connect more than three adaptors to the same system, and the third adaptor cannot have the EXP-IA12 Expansion Board. As a result, the available ISDN line capacities of MS128 system are illustrated as follows:

1 st IA12 ISDN Adaptor	With motherboard only	1 S0 (2 analog lines)
	With expansion board	2 S0 (4 analog lines)
2 nd IA12 ISDN Adaptor	With motherboard only	3 S0 (6 analog lines)
	With expansion board	4 S0 (8 analog lines)
3 rd IA12 ISDN Adaptor	With motherboard	5 S0 (10 analog lines)

The IA12 motherboard has one 8-pin RJ45 socket for connection to the S0 line coming from NT1, two 623K4 type connectors for connection to the A / B terminals of the analog line on the MS128 system and one 6-pin RJ jack for connection to the data line of KAREL telephones. The data cable having a connection box at one end and a 6-pin RJ plug at the other end also comes with the adaptor.

The EXP-IA12 Expansion Board has one 8-pin RJ45 socket for connection to the S0 line coming from NT1 and two 623K4 type connectors for connection to the A / B terminals of the analog line on the MS128 system. The EXP-IA12 Expansion Board also comes with a flat cable for IA12 connection, which is to be attached to the corresponding 20 pin connectors on the IA12 motherboard and EXP-IA12 card.

The IA12 motherboard also has three LEDs to display the status of S0 lines as well as the data line. The rightmost LED turns on when the adaptor is synchronized with the S0 line connected to the IA12 motherboard. The middle LED turns on when the adaptor is synchronized with the S0 line connected to the EXP-IA12 card. And the leftmost LED turns on when the adaptor is synchronized with the data line.

The outlook of IA12 motherboard and EXP-IA12 card are illustrated in the following figures .

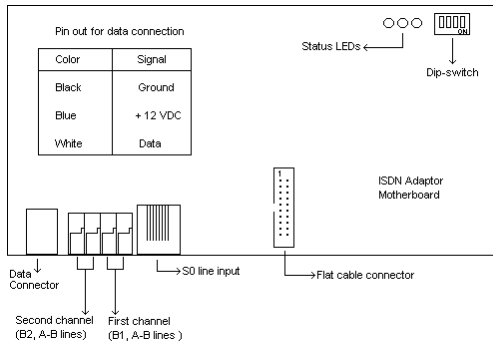


Figure A-22

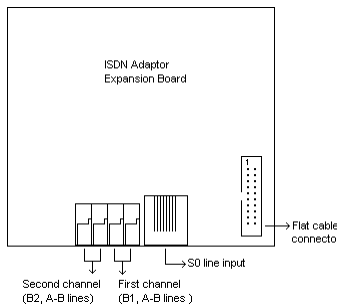


Figure A-23

The S0 lines connected to the IA12 adaptor may be Point to Point (that supports the connection of 1 device only) or Point to Multi-Point (that supports the connection of upto 8 distinct devices). Furthermore, as far as the numbering scheme is concerned, DDI (Direct Dialing In) may be active on Point to Point lines, or MSN (Multiple Subscriber Numbering) may be active on Point to Multi-Point lines. These settings are simply managed by the system software.

The IA12 ISDN Adaptor also supports the following Euro-ISDN features, provided that the user has the subscription to the network, if necessary :

- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Connected Line Identification Presentation (COLP)
- Connected Line Identification Restriction (COLR)
- Advice of Charge at Call Setup (AOC_S)
- Advice of Charge During Call (AOC_D)
- Advice of Charge at the End of Call (AOC_E)

The IA12 ISDN Adaptor is capable of matching either “Speech” or “3.1 KHz Audio” bearer capabilities for outgoing calls as well.

By way of the OP48(-H) or LT48(-H) telephones, several ISDN network messages including the number of the calling party and call charge information can be monitored. These network messages are also transferred to the CRL accessories.

Neither MS128 system nor IA12 ISDN Adaptor has internal S0 ports, so it is not possible to connect an ISDN terminal to the extensions of MS128 system. However, it is possible to connect another ISDN terminal in parallel with the IA12 ISDN Adaptor in the Point to Multi-Point lines with MSN facility.

The dimensions of IA12 are 10 cm x 21 cm x 7 cm and the weight is 0.9 kg.

The dimensions of EXP-IA12 are 9 cm x 8 cm.

II.8. LOCAL PAGER – PG100

PG100 Local Pager lets you page extensions that are equipped with receivers (beepers) so that they can pick up their calls or attend later. The outlook of PG100 is illustrated in the following figure.

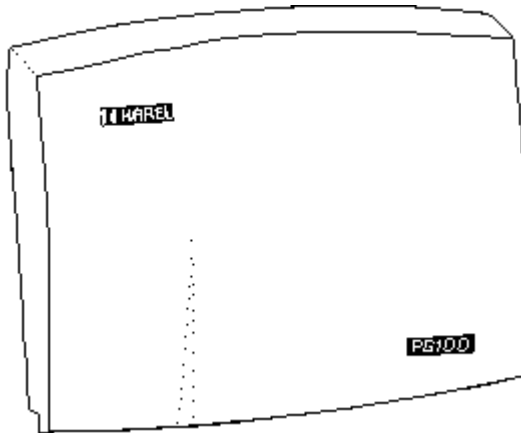


Figure A-24

KAREL also has its own beepers (receivers), which are adjusted to operate at the same frequency of PG100 and which are also programmable for the desired extension number as well as the PG100 Local Pager.

IMPORTANT

The operating frequency of PG100 Local Pager is 167.050 MHz. with a 25 KHz. Bandwidth.

The coverage area of PG100 is 200 m indoor and 2 km open air.

The data cabling of PG100 Local Pager is made via the 6-pin RJ socket (the same socket used by consoles) on the MS128 CPUKON Connection Card. The signaling between the system and PG100 is illustrated in the following table :

MS128 CPUKON Card		PG100 Card
Console Connector Pin No	Signal	RJ Socket Pin No
1	+12 VDC	6
2	Busy	-
3	-	-
4	-	-
5	GND	2
6	Data	1

The input of +8 VDC is regulated to +5 VDC by PG100.

PG100 can also be connected directly to mains voltage through a 12 VDC power adaptor. Normally, PG100 receives power over the data cable. However, if the data line of the system is overloaded due to the existence of many OP48(-H) and LT48(-H) telephones or DSS40 and DSS80 modules connected to the system, it is preferable to feed PG100 over the power adaptor that is to be procured locally.

The dimensions of PG100 are 24 cm x 19 cm x 4.5 cm and the weight is 0.5 kg.

II.9. STANDARD TELEPHONE SETS

Any ordinary telephone set, may be DP or DTMF, can be connected to MS128 system including KAREL's own Ladin and Fulya telephone sets, which are both DP/DTMF switchable.

The following figure illustrates the outlook of Ladin.

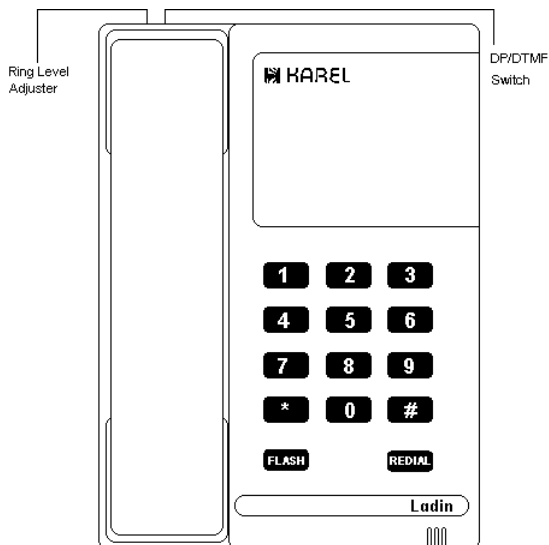


Figure A-25

The following figure illustrates the outlook of Fulya.

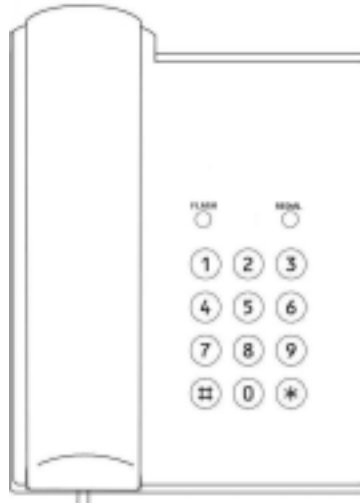


Figure A-26

The dimensions of the Ladin are 22 cm x 6.5 cm x 15.5 cm and the weight is 0.6 kg.

The dimensions of the Fulya are 16 cm x 8 cm x 22 cm and the weight is 0.5 kg.

II.10. FILTER & PROTECTION UNIT – FPBASE, FPEXP

The external lines that are connected to the system and the extension lines coming from other buildings are open to environmental effects like lightning or AM radio interference.

In order to protect the system against lightning and radio interference, KAREL has external modules that can be connected to both extensions and lines. These modules are presented in two different models:

- a) FPBASE Filter & Protection Base Unit
- b) FPEXP Filter & Protection Expansion Unit

Both units are capable of handling four lines. The difference between FPBASE and FPEXP is the base cover, which exists only on FPBASE. FPEXP units are installed on top of an FPBASE unit. So, if a Filter and Protection Unit is required for a system then an FPBASE unit must be used and depending on the capacity of the ports that must be filtered and protected, any number of FPEXP units can be added.

The outlook and structures of FPBASE and FPEXP units are illustrated in the following figure .

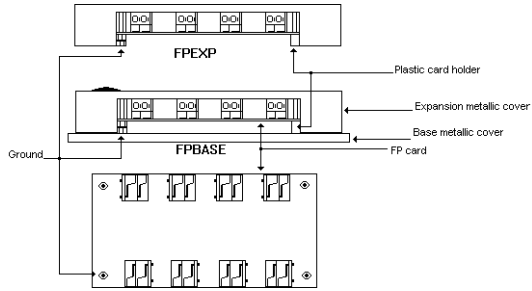


Figure A-27

The dimensions of the FPBASE are 18 cm x 12 cm x 3 cm and the weight is 0.4 kg. The dimensions of the FPEXP are 17 cm x 12 cm x 2.5 cm and the weight is 0.3 kg.

III. SOFTWARE

MS128 system is a *Stored Program Controlled* (SPC) system. It has a microprocessor, which controls the operation of the system, and an EPROM, which stores the software of the system. All the default system and port parameters are stored in the EPROM.

The software of MS128 system is designed to provide a full feature system. There are three categories for the features of the system:

- 1) User features,
- 2) Operator features,
- 3) Programs.

User features are the software facilities, which may be activated by any user of the system.

Operator features are the software facilities, which may be activated only by the operator of the system. The operator is the first extension of the system, ie. the extension who has the physical access code "111".

Programs are the codes, some of which may be entered only by the system supervisor and some of which may be entered only by the operator, after the system is put in programming mode by the system supervisor. By default, the operator is the system supervisor. By programming most of the parameters which control the operation of the system can be changed.

The software facilities are given in the relevant guides together with their details.

IV. TECHNICAL SPECIFICATIONS

General specifications		
1.	Capacity	Total : 128 ports + 1 doorphone channel Lines : Min 4 / Max 20 Extensions : Min 12 / Max 124
2.	Control	SPC 80C88 Processor EPROM (1 Mbit) EEPROM (2x16 Kbit) 512 Kbit Static RAM With NiCd Battery Backup
3.	Switching	Space Division CMOS Crosspoint Switch
4.	Power	180 - 260 VAC; 50/60 Hz. MS128 (0/0) stand-by power consumption: 11 W MS128 EX1 stand-by power consumption: 3 W MS128 EX2 stand-by power consumption: 3 W Maximum power consumption: 85 W <ul style="list-style-type: none"> • Battery backup with 24 VDC • Power failure transfer stations
5.	Dialing	Dial Pulse (DP) 10 pps Dual Tone Multi-Frequency (DTMF) 140 msec
6.	Dialing conversions	DP – DTMF, DTMF – DP
7.	Speech paths	24 (2 paths are reserved for incoming external calls)
8.	MF Receiver Capacity	24 (12 x 2)
9.	Connectors	Lines and extensions : 623K4 (GEO4) type External relay and external music : 623K4 (GEO4) type External interfaces : Pin connectors (Tunik), RJ plugs
10.	External connections	Standard Telephones: 2 wires KAREL Feature Phone (LT48(-H)): 5 wires KAREL Console (OP48(-H)): 5 wires KAREL DSS Module (DSS80, DSS40): 3 wires KAREL KY16 Mini Printer: 3 wires KAREL PG100 Pager : 3 wires KAREL Doorphone (DY01): 4 wires PC: 5 wires Serial Printer: 3 wires
11.	CRL (Call Record Listing)	KAREL KY16 Mini Printer PC Interface Serial Printer Interface
12.	CRL Capacity	Approximately 500 calls

CHARACTERISTICS		
1.	Extension Interface	Station Loop: Max 1200 Ohms Including the Telephone Set
2.	Maximum Line Loop Resistance	2.2 Kohms
3.	Line Interface	Loop Start With DP and DTMF Signalling 12/16 KHz Metering Pulse Detection Polarity Reversal Detection
4.	Extension Feed Voltage	- 24 VDC
5.	Make-Break Ratio	33 msec make / 67 msec break

6.	Interdigit Pause for Automatic Dialer	720 ± 20 msec for DP 175 ± 5 msec for DTMF
7.	Cross-Talk Attenuation	Better than 70 Db
8.	Maximum Number of Telephone Sets per Line	2 telephone sets
9.	Ring Voltage Generated	64 Vrms, 25-30 Hz
10.	Minimum Ring Detected	30 Vrms, 25-30 Hz
11.	Environmental Requirements	0 C ^o to +45 C ^o , 20% - 80% Humidity
12.	Hook-flash Duration Range	100 - 600 msec
13.	Dimensions	29 cm x 34 cm (h) x 45 cm
14.	Weight (Min. Capacity)	12.3 Kg
15.	Maintenance	Built-in Self-Diagnosis On Site / Remote Programming PC Console

TONE CADENCES & FREQUENCIES		
1.	Dial tone (500 Hz.)	Continuous
2.	Ring-back tone (500 Hz.)	1500 msec on, 3500 msec off
3.	Busy tone (500 Hz.)	500 msec on, 500 msec off
4.	DISA dial tone (500 Hz.)	300 msec on, 300 msec off, 300 msec on, 300 msec off, 300 msec on, 2000 msec off
5.	Message waiting dial tone (500 Hz.)	300 msec on, 300 msec off, 300 msec on, 300 msec off, 300 msec on, 2000 msec off
6.	Error tone (500 Hz.)	300 msec on, 300 msec off, 300 msec on, 300 msec off, 300 msec on, 300 msec off, 700 msec on, 300 msec off
7.	Reminder dial tone	1000 msec 500 Hz, 1000 msec 250 Hz
8.	Special dial tone (250 Hz.)	Continuous
9.	Overflow tone (2000 Hz.)	700 msec on, 200 msec off
10.	Warning tone (250 Hz)	20 msec on, 1500 msec off

RING CADENCES		
1.	External Call, Call Back Call, Reminder Call, Wake Up Call	1500 msec on, 3500 msec off
2.	Internal Call	400 msec on, 350 msec off, 400 msec on, 3500 msec off
3.	Doorphone Call	800 msec on, 350 msec off, 800 msec on, 3500 msec off

DTMF tones:

		High frequency group (- 7 dBm)		
		1209 Hz	1336 Hz	1477 Hz
Low Frequency Group (- 9 dBm)	697 Hz	1	2	3
	770 Hz	4	5	6
	852 Hz	7	8	9
	941 Hz	*	0	#

Nominal frequencies of MS128 may deviate ± 2.5 % from the values above.

INSTALLATION GUIDE

I. PRELIMINARY NOTICE

I.1. DELIVERY CHECK

On the arrival at the stock or the installation site, the first thing that should be done is to check all the items against the packing list. It is essential to report any missing elements immediately.

I.2. INSPECTION

Before starting installation, it is necessary to make a visual inspection to ensure that:

- 1) The cabinet of the system as well as the covers of the accessories are not dented or scratched during the shipment.
- 2) The cards are not cracked.
- 3) There are no loose ends, damaged or loose components on the cards.
- 4) All connections to the power supply are tight.

Existing damages should be reported immediately.

I.3. ENVIRONMENTAL REQUIREMENTS

Before installation, the system should be stocked in a place where the temperature is in-between -40 C° and $+80\text{ C}^{\circ}$.

At start up, you should make sure that the room where the system is to be installed is clean, well ventilated and well lit. In fact the following places must be avoided for installation:

- 1) Places exposed to direct sunlight,
- 2) Extremely hot and cold places,
Temperature must be in the range of 0 C° and $+45\text{ C}^{\circ}$ and the relative humidity must be in the range of 20% and 80%,
- 3) Places where vibrations or shocks are frequent or strong,
- 4) Places near radio broadcast antennas,
- 5) Dusty places, places where the system may be in contact with water or oil,
- 6) Sulfuric gases produced in areas where there are thermal springs, etc. that may damage the system,
- 7) Near high frequency sewing machines or electric welders.

II. SYSTEM INSTALLATION

The MS128 system is designed to be mounted on the wall. Hence, the system comes with a template and a pair of anchor plugs with screws.

The template has the same dimensions with the MS128 system, so that it can be used to choose the location of the system and to determine the points of the holes on the wall. The template also has the necessary information to hang the system on a proper location on the wall, that is the bottom drill holes must be 130 cm above the floor.

To install the system (see Figure B-1):

- 1) Place the template on the wall.
- 2) Drill 2 holes at the points on the template.
- 3) Drive the anchor plugs into the holes.
- 4) Insert the screws into the anchor plugs and fix the screws.
- 5) Hang the cabinet on the wall by placing the two pear holes at the back of the cabinet over the screws.

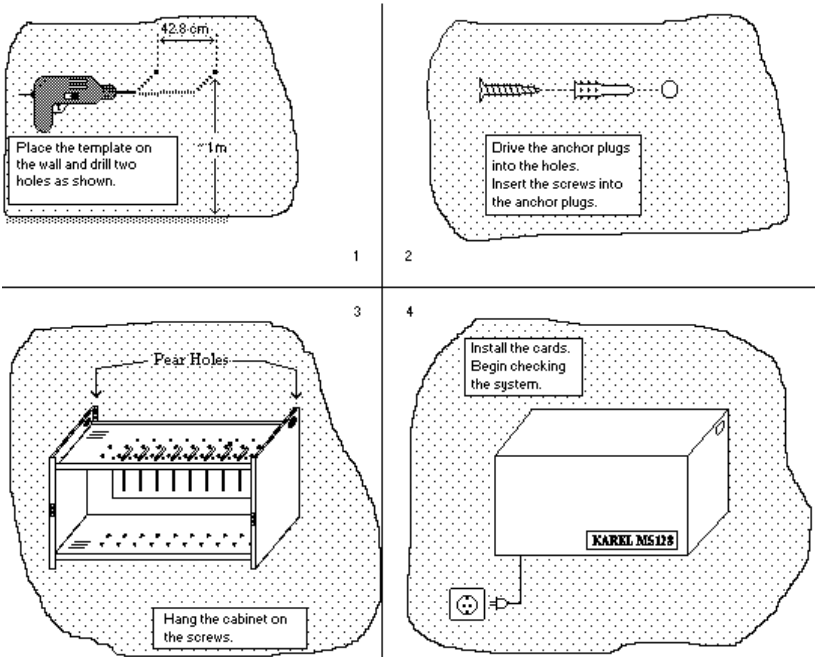


Figure B-1

The BPL128 backplane comes already installed in the system cabinet, as fixed to rear plate of the metal rack by 6 screws, 4 at the corners and 2 in the middle.

- **REMARK**

The internal modules must be installed from left to right, starting from SPS128 Power Supply Module.

IMPORTANT

1. The equipment can be installed only by the service personnel.
2. The area behind the front cover is not for operator access, hence the front cover can be opened only by the service personnel.
3. The mains socket should be installed near the equipment or should be easily accessible.

II.1. GROUNDING

The chassis ground of the MS128 system also serves as the signal ground, which takes place on all the cards as a reference for the existing signals.


The chassis ground has an utmost importance for the protection of the system against lightning or high voltage coming through lines, extensions or mains.

The chassis ground is partly established through the mains cable of the system, which is equipped with the ground wire. Due to this reason, it is recommended to operate the system over a mains plug that is properly grounded.

Checking whether the mains ground is proper or not requires some special devices. But it is possible to have a rough idea about the mains ground simply by measuring the voltage across:

- The phase and the neutral; it must be in-between 180 VAC and 260 VAC.
- The ground and the neutral; it must be around 1-2 VAC.

However, even if the mains outlet is properly grounded, it may not be sufficient by itself for MS128. So, it is also strongly recommended to make a separate and private ground connection for MS128. The best way to construct an ideal ground for this purpose is to insert a metal bar (of at least 1.5 m length and 1.5 cm radius, copper is preferable) into the earth, as illustrated in Figure B-2.

To establish the connection of the system to such a ground surface, the ground screw (labeled with , as illustrated in Figure A-5) must be connected to the ground surface.

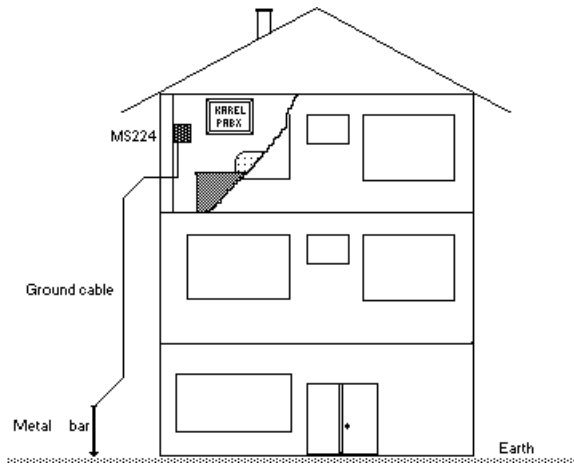


Figure B-2

II.2. POWER SUPPLY MODULE

The SPS128 Power Supply Module, including SPS128CR Power Card with a 10-pin cable for BPL128 connection and the ring transformer, is installed in a metal case.

SPS128 comes installed in the system cabinet. However, if it is necessary to take out SPS128 from the system cabinet, the mains and battery ON/OFF switches must be turned off, the SPS128 fixing screws on the system rack must be loosened, the power rack must be pulled out and then the cable for BPL128 connection must be removed from SPS128CR.

To insert SPS128 back in the system cabinet, the cable for BPL128 connection must be attached to SPS128CR, the metal rods on the power rack must be placed properly to the metal slots on the leftmost part of the cabinet and then SPS128 must be pushed inside the cabinet. Then SPS128 fixing screws must be then fastened.

The following figure is to give a brief idea about the installation of SPS128.

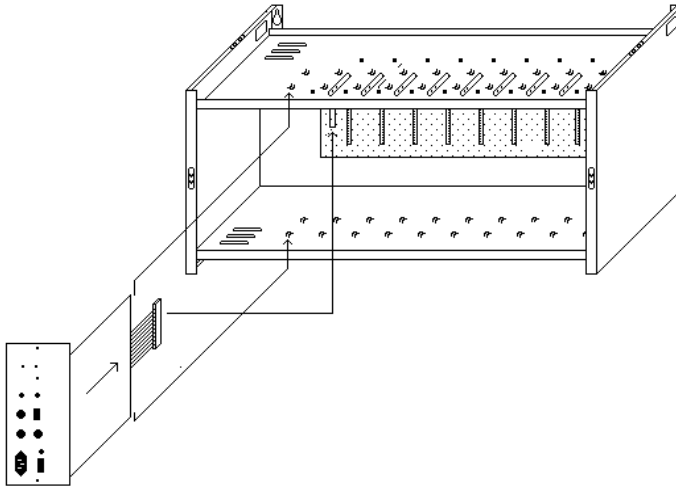


Figure B-3

IMPORTANT

The ventilation holes on the top and bottom covers of the system cabinet must not be closed for any reason, since it may cause SPS128 to overheat and get damaged.

II.3. CENTRAL PROCESSING MODULE

The CPU128 Central Processing Board is located on the leftmost card slot inside the system cabinet, next to SPS128 Power Supply Module. MS128 CPUKON CPU Connection Card resides on top of the cabinet, as connected to CPU128 via the MS128 CPU-FC Flat Cable.

CPU128 comes installed in the cabinet. However, if it is necessary to take out CPU128 from the cabinet, MS128 CPU-FC must be removed from CPU128. After that, the latch at the top of the plastic card cover must be pressed towards the cover itself and then, the card must be pulled out of the cabinet.

To insert CPU128 back in the cabinet, the back corners of the card must be placed in between the top and bottom card slots and then, the card must be pushed inside the cabinet so that the connector at the back of the card fits to the one on the backplane (see Figure B-4). When the card is inserted completely, it must be fastened by the latch at the top of the plastic card cover and then, MS128 CPU-FC must be plugged to CPU128 (see Figure B-5).

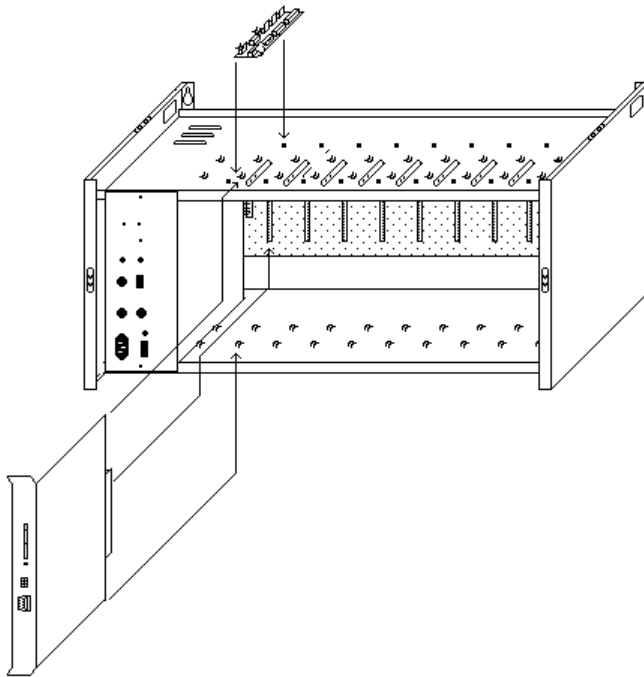


Figure B-4

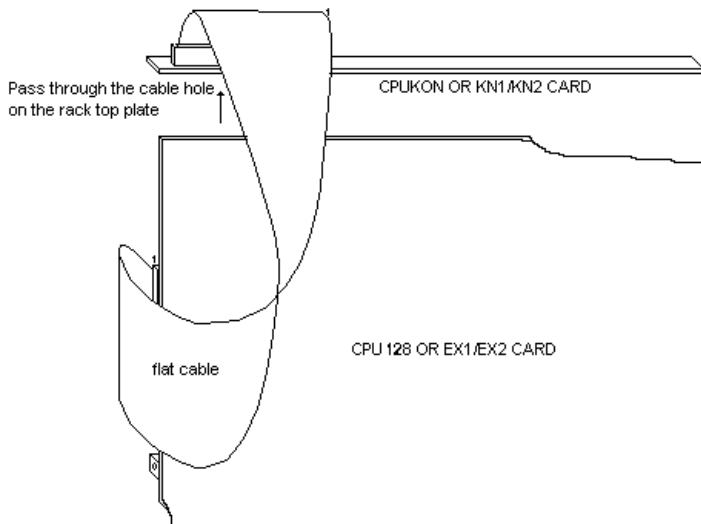


Figure B-5

MS128 CPUKON comes installed on the cabinet. However, if it is necessary to take out MS128 CPUKON from the cabinet, the top cover of CBN128 cabinet must be opened, MS128 CPU-FC must be disconnected and then, the screw fixing the card to the brass card holder on rack top plate must be loosened and the card must be removed from the brass and plastic card holders. Later on, the card can be installed on the cabinet, applying exactly the same method in the reverse order.

II.4. EXPANSION MODULES

MS128 EX1 consists of MS128 EX1B and KN1 cards together with EX-FC flat cable. Similarly, MS128 EX2 includes MS128 EX2B and KN2 cards together with EX-FC flat cable. The parts of each module are packed in the same cardboard box, although they are not connected to each other.

The first step of installation is, to locate the KN1 or KN2 card in the cabinet. For each KN1 or KN2 card, there are one brass and two plastic card holders on the rack top plate. To locate the card, the top cover of CBN128 cabinet must be opened and then, the card must be placed on the corresponding card holders on the rack top plate. The KN1 or KN2 card must be then fastened to the brass card holder with its screw.

The second step is, to attach the EX-FC cable to KN1 or KN2 card. For this, one of the free ends of the cable must be attached to KN1 or KN2 card and then, the other free end must be passed through the corresponding cable hole on the rack top plate (see Figure B-5).

The third step is, to locate the MS128 EX1B or MS128 EX2B card in the cabinet. For this, the back corners of the card must be placed in between the top and bottom metal card slots and then, the card must be pushed inside the cabinet (see Figure B-6). When the card is inserted completely, the card must be fastened by the latch at the top of the plastic card cover and then, EX-FC coming from the corresponding KN1 or KN2 card must be plugged to MS128 EX1B or MS128 EX2B card (see Figure B-5).

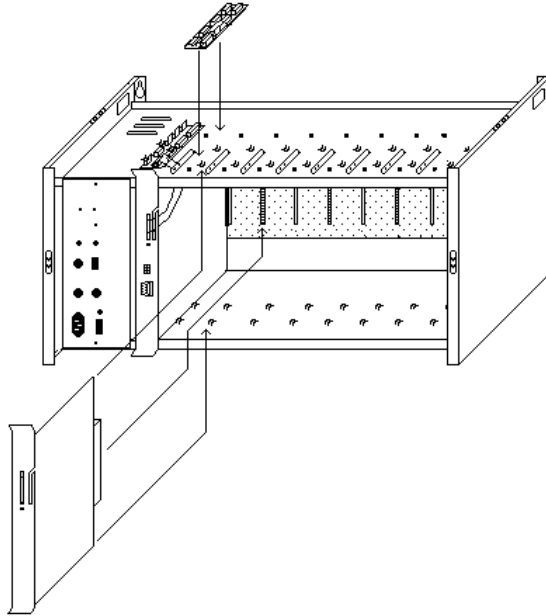


Figure B-6

IMPORTANT

MS128 EX1 and MS128 EX2 cannot be removed from or inserted in the system when the power is on.

III. ACCESSORY INSTALLATION

III.1. CONSOLES, FEATURE PHONES, DIRECT STATION SELECT MODULES

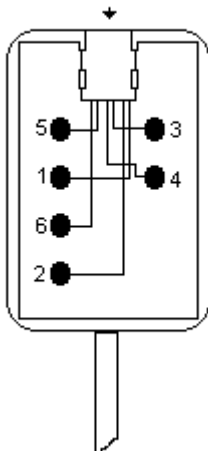
- **CABLING**

Each LT48(-H) Feature Phone, OP48(-H) Console and DSS40 / DSS80 Direct Station Select Module comes with a telephone data cable, which is a 2.5-meter long cable formed up of two parts. One is a cable with a 6-pin RJ plug at both ends and the other one is a connection box. The connection box has a 6-pin RJ socket at one side so that one of the free ends of the cable can be fixed to the connection box easily. The other free end of the cable has also the corresponding RJ socket at the backside of the telephone or DSS module.

The system itself also comes with the system data cable, which is similar to telephone data cable. One end of the cable is fixed to the connection box. The other free end of the cable has a 6-pin RJ plug, which is to be inserted to the console connector on the MS128 CPUKON card, in order to carry data signals for the telephones and DSS modules.

The following signals are present on the connection box of system data cable:

Cable to the connection box of
the telephone data cable



- 1- Data signal
- 2- GND
- 3- No connect
- 4- No connect
- 5- Busy
- 6- + 12 VDC

Note : Busy signal is for KY16 Mini Printer.

Cable from the system

Figure B-7

The following figure illustrates the cabling of OP48(-H) Consoles, LT48(-H) Feature Phones and DSS40 / DSS80 Direct Station Select Modules .

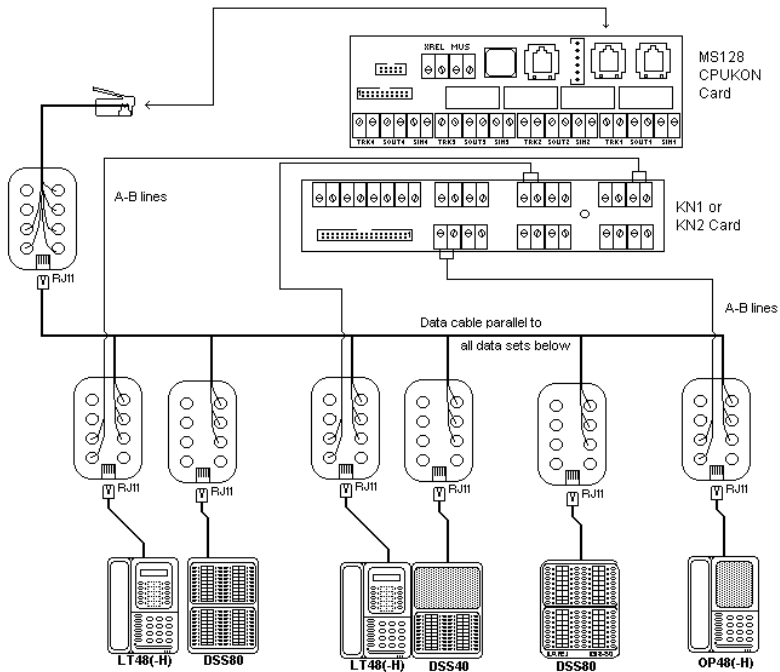


Figure B-9

In case there is a LT48(-H) Feature Phone or OP48(-H) Console located near the system, the method of Data / +12 VDC / GND cabling for this telephone may be simplified by connecting one of the RJ plugs on the telephone data cable to the RJ socket on the connection box of the system data cable.

● **FIXING DSS40 / DSS80 MODULES TO OP48(-H) / LT48(-H):**

Each DSS40 or DSS80 module comes with a plastic telephone connection part, used to fix the module to the LT48(-H) or OP48(-H) telephone of the relevant extension.

To fix the DSS40 or DSS80 module to the LT48(-H) or OP48(-H) telephone (see Figure B-10) :

- 1) Remove the screw at the bottom of the telephone.
- 2) Remove the two screws at the bottom corners of the DSS module.
- 3) Place the plastic telephone connection part in-between the telephone and the DSS module.
- 4) Insert the screws to the telephone and DSS module.

If there are several DSS modules connected to the same extension, each extra DSS module can be connected to the previous one as explained above.

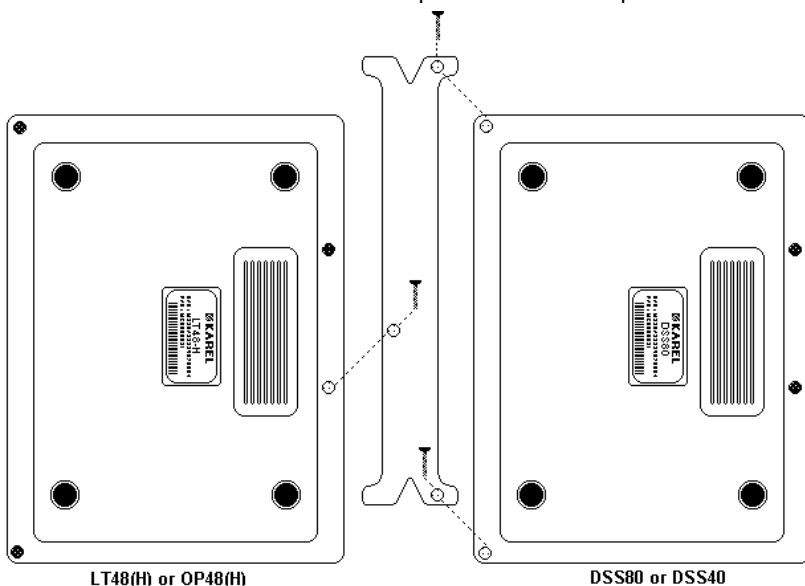


Figure B-10

• **NUMBER OF TELEPHONES & DISTANCE TO THE SYSTEM:**

Please also note that :

- 1) OP48(-H) Consoles, LT48(-H) Feature Phones and DSS80 / DSS40 Direct Station Select Modules can be connected to the first 16 extensions of the system.
- 2) The total number of OP48(-H) Consoles, LT48(-H) Feature Phones and DSS80 / DSS40 Direct Station Select Modules connected to the system must not exceed 10.

If the Data / 12 VDC / GND and A / B (ring / tip) wires of a console or a feature phone are carried separately as described in the “Cabling” part above, the console or feature phone can be installed more than 5 meters away from the system.

In such a case, the maximum distance between a single feature phone, console or DSS module and the system can be 250 meters, if the wiring is made with ordinary wires.

However, if more than one set will be installed to the system and if the Data / 12 VDC / GND wires of the sets are wired in parallel as described in the “Cabling” part above, the maximum distance of 250 meters decreases proportionally. For example, if 10 LT48 Feature Phones are connected to the system in this way, the distance between the system and the LT48 Feature Phones cannot exceed 25 meters.

In such a case, the performance can be further improved by connecting +12 VDC power supply, if the data voltage of the ultimate console is below +8.5 VDC, between 12 VDC and GND terminals.

- **EXTENSION NUMBER SETTING :**

After the wiring of the OP48(-H) Consoles, LT48(-H) Feature Phones and DSS40 / DSS80 Direct Station Select Modules, the extension setting of these sets should be made as follows :

- a) OP48(-H): The setting is made by the "Message" key. Keep the key pressed till the extension number starts blinking on the display and "A" appears next to it. Then, press the same key several times till the correct extension number appears on the display.
- b) LT48(-H): The setting is made by the "H/R" key. Keep the key pressed till an extension number is shown on the display. Then, press the same key several times till the correct extension number appears on the display.
- c) DSS80: The setting is made by the "A" key. Press the key till the 3rd beep and then, enter the extension number.
- d) DSS40: The setting is made by the "Pa/Pr" key. Press the key till the 2nd beep. Then, press the same key several times till the correct extension number appears on the display.

III.2. MINI PRINTER

The KY16 Mini Printer has the built-in mains and data cables. Also it has a paper roll and a printer ribbon installed. A pair of anchor plugs with screws for the printer to be mounted on the wall as well as two spare paper rolls and a spare printer ribbon are also provided.

- **INSTALLATION:**

- 1) Drill two holes 12.5 cm apart at a height of 150 cm.
- 2) Drive the anchor plugs into the holes.
- 3) Insert the screws into the anchor plugs.
- 4) Hang the printer on the screws.

The following figure illustrates the installation.

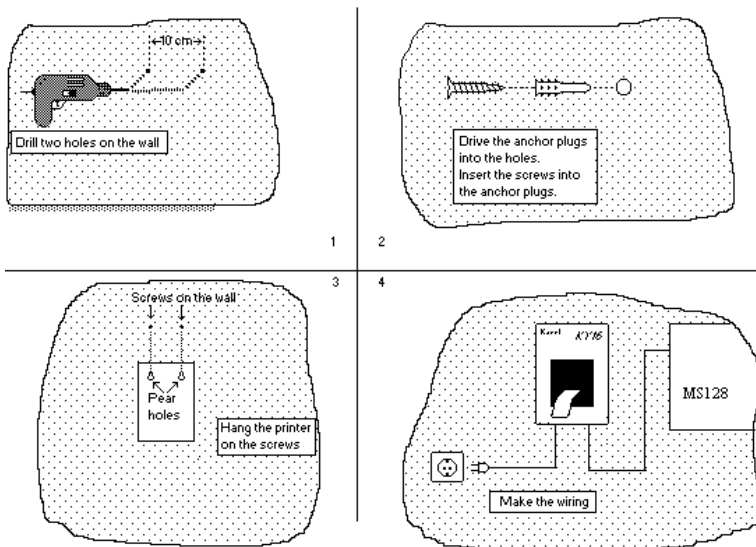


Figure B-11

• **CABLING**

The power cabling can be established via the built-in mains cable.

The printer data cable that emerges from the bottom of the KY16 Mini Printer has a connection box (with a cable) at its free end. The printer end of the data cable is attached to the connection box through a 6-pin RJ plug. The cable that comes out of the connection box is not used for connecting KY16 to the MS128 system.

The following signals are present on the connection box of printer data cable :

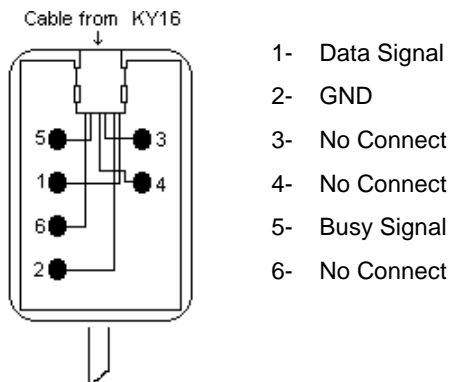


Figure B-12

For connecting KY16 to the system, the Data / Busy / GND signals on the connection box of the system data cable (used by KAREL consoles / feature phones as well) must be wired in parallel to the corresponding pins of the connection box of the printer data cable (see Figure B-13).

In the absence of Karel consoles / feature phones connected to the system, the method of cabling for KY16 may be simplified as follows :

- 1) The RJ plug at the end of the cable that comes from the printer must be disconnected from the connection box.
- 2) This RJ plug must be then passed through passed through the hole on the side covers of the system cabinet and then, connected to the console socket on MS128 CPUKON card.

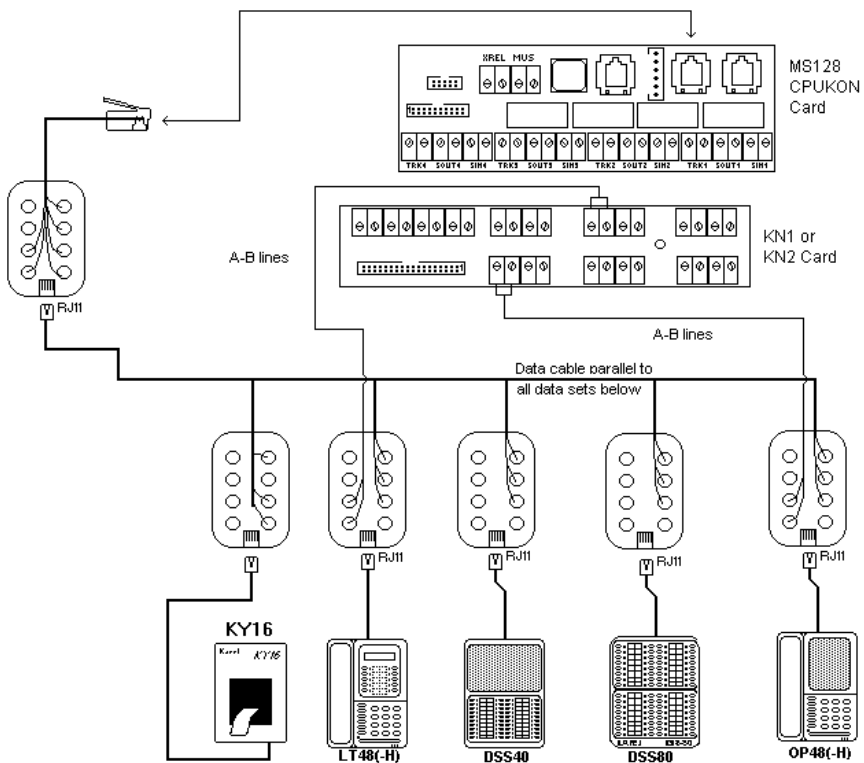


Figure B-13

After the installation and cabling of KY16 is completed, it is also necessary to enter the related programming code for selecting KY16 as the CRL (Call Record Listing) media. Refer MS128 Programming Guide.

- **DIP-SWITCH SETTING**

For KY16 to operate with MS128 system, the dip-switches that exist on the printer card inside the KY16 cabinet must be set as follows:

Dip-switch	Position
1	OFF
2	OFF
3	ON
4	ON

- **PAPER ROLL & PRINTER RIBBON**

Replacing the paper roll or the printer ribbon is very easy by way of the mobile front cover of the cabinet.

To replace the paper roll:

- 1) Pull out the black front cover from the upper side.
- 2) Take out the old paper roll with the cylindrical bar fixing it in the slot.
- 3) Place the new roll on the bar.
- 4) Place the bar into its slot.
- 5) Fix the free end of the paper to the print head.
- 6) Close the front cover.

Placing a new paper roll in KY16 is illustrated in the following figure.

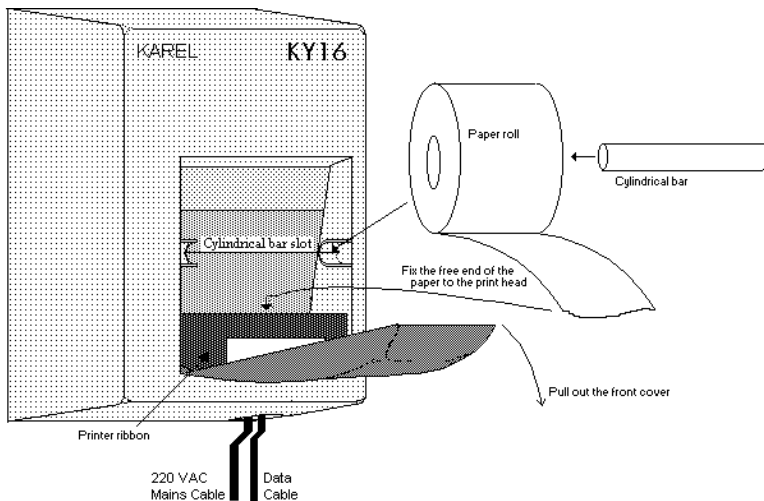


Figure B-14

To replace the printer ribbon:

- 1) Pull out the black front cover from the upper side.
- 2) Take out the old ribbon.
- 3) Place the new ribbon inside the print head.
- 4) Close the front cover.

III.3. SERIAL INTERFACE

Either a PC or a serial printer can be connected to the MS128 system. The selection among these devices is made by programming.

III.3.A. PC INTERFACE

- **CABLING :**

- 1) The free end of the PC-Exchange cable with 9-pin D-type plug should be passed through the cable hole on the bottom cover of the system cabinet (the hole below the SPS128 module).
- 2) This 9-pin D-type plug must be then connected to the socket on the front panel of CPU128 card.
- 3) The 25-pin D-type plug at the other end of the PC-Exchange cable must be attached to the security plug first and then the security plug should be connected to the 25-pin serial port of the PC. (It is necessary to employ a 25-pin to 9-pin converter plug, in order to use the 9-pin connector of the PC.)

The following figure illustrates the cabling .

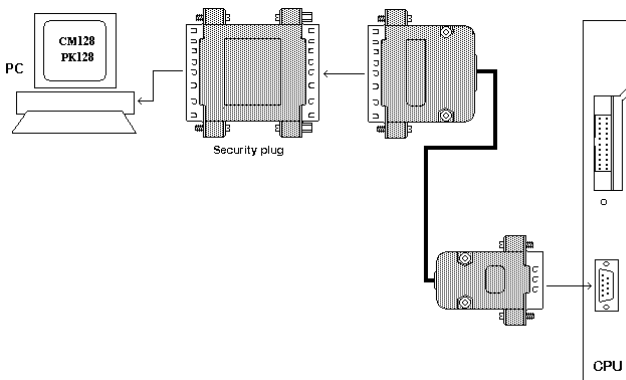


Figure B-15

After the cabling of the PC interface is completed, the necessary CM128 and / or PK128 software must be installed on the PC, as described in the CM128 and PK128 Owner's Guides, respectively.

It is also necessary to enter the related programming code for selecting the PC as the CRL (Call Record Listing) media, as explained in the MS128 Programming Guide.

III.3.B. SERIAL PRINTER INTERFACE

- **CABLING :**

- 1) The free end of the Printer-Exchange cable with 9-pin D-type plug (which is to be procured locally) should be passed through the cable hole on the bottom cover of the system cabinet (the hole below the SPS128 module).
- 2) This 9-pin D-type plug must be then connected to the socket on the front panel of CPU128 card.
- 3) The 25-pin or 9-pin D-type plug at the other end of the cable should be attached to the serial port of the printer.

The following figure illustrates the cabling .

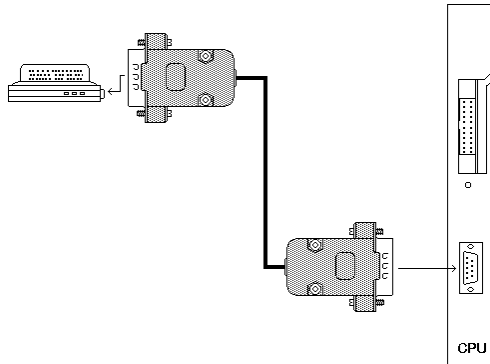


Figure B-16

It is also necessary to enter the related programming code for selecting the serial printer as the CRL (Call Record Listing) media, as explained in the MS128 Programming Guide.

III.4. DOORPHONE

• **INSTALLATION :**

DY01 Doorphone is designed to be mounted on the wall with a couple of anchor plugs and screws. For this:

- 1) Drill two holes, which are 7.5 cm apart.
- 2) Drive the anchor plugs into the holes.
- 3) Insert the screws into the anchor plugs.
- 4) Hang the doorphone on the screws.

The following figure illustrates the installation.

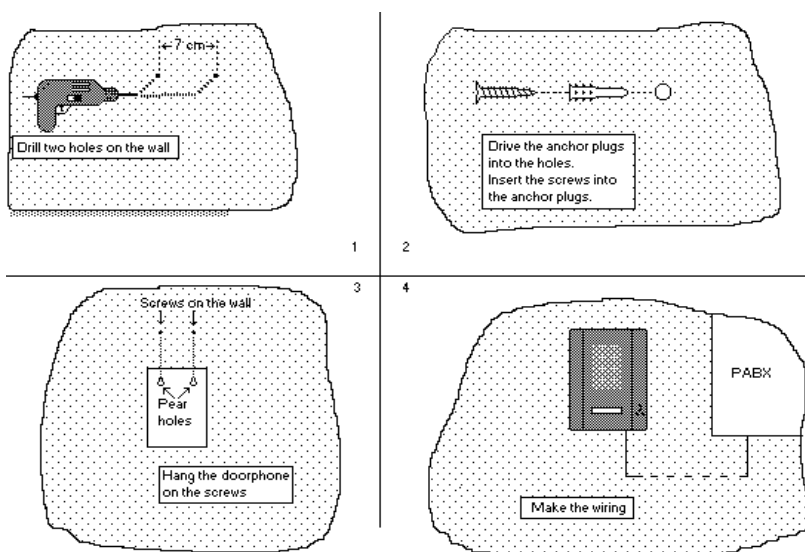


Figure B-17

• **CABLING :**

The cable that emerges from the bottom of the DY01 doorphone has a 6-pin RJ plug at its free end. For connecting the doorphone to the system, the free end of this cable should be passed through the cable hole on the left cover of the system cabinet and then, this plug must be attached to the doorphone socket on the MS128 CPUKON card, as illustrated in the following figure.

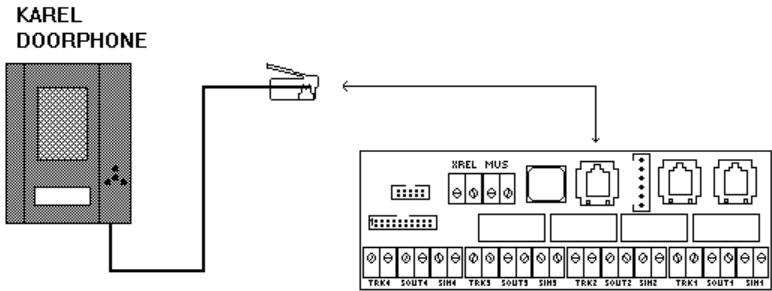


Figure B-18

DY01 doorphone has a ring button on it. When a doorphone user presses this button the telephone of the operator or the ringing extension rings. But if desired this facility may be cancelled and an external ringer can be connected to the ring button. For this:

1. Loose the screws at the top and the bottom of the doorphone and open the front cover.
2. Loose the screws at the back of the ring button and disconnect the two-wire cable between the doorphone card and the ring button.
3. Pass the power cables of the ringer through the data cable hole at the back cover of the doorphone box.
4. Connect the power of the external ringer through the ring button.
5. Close the cover of the doorphone.

The following figure illustrates this connection.

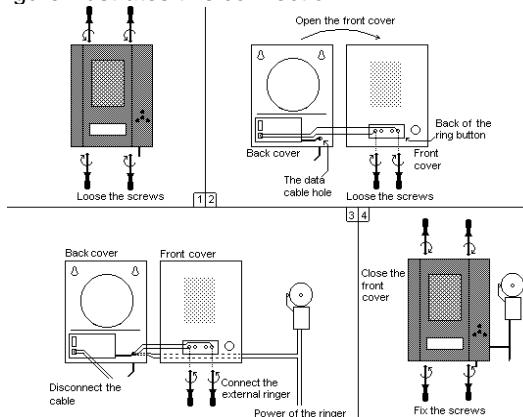


Figure B-19

III.5. EXTERNAL ANNOUNCEMENT SYSTEM

- **CABLING :**

Any external announcement system can be connected to MS128 system through the doorphone socket on MS128 CPUKON card. For making this connection, the free end of the cable (with 4-pin RJ plug) should be passed through the cable hole on the left cover of the system cabinet and then attached to the doorphone socket on the MS128 CPUKON card. The following figure illustrates this installation.

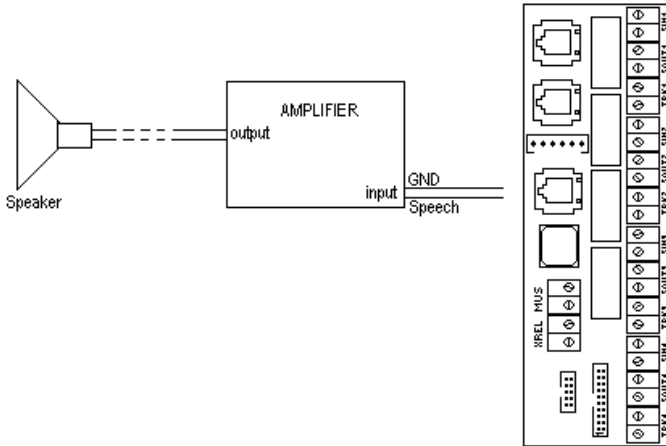


Figure B-20

MS128 system is enhanced with a facility, which provides the efficient use of your amplifier by way of its external relay (see section III.12). The external relay of MS128 system can be used to switch the power of the amplifier of the announcement system. For this, the power of the amplifier must be connected through the external relay on the MS128 CPUKON card using the 2-pin XREL connector and the system must be programmed accordingly.

The following figure is to give an idea about these connections.

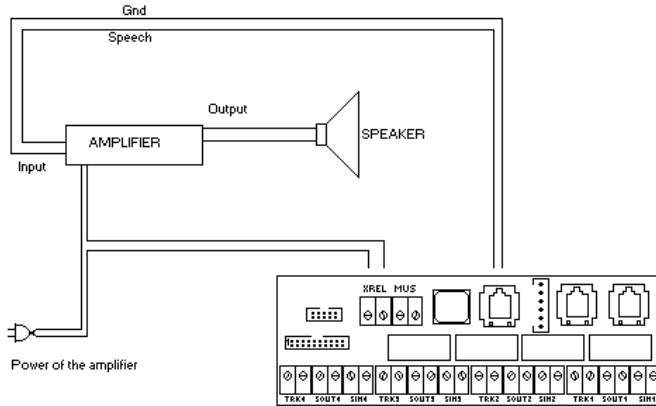


Figure B-21

III.6. ISDN ADAPTOR

- **INSTALLATION**

IA12 ISDN Adaptor is designed to be mounted on the wall with a couple of anchor plugs and screws. For this:

- 1) Drill two holes, which are 17.5 cm apart.
- 2) Drive the anchor plugs into the holes.
- 3) Insert the screws into the anchor plugs.
- 4) Hang the adaptor on the screws.

- **MOUNTING**

The IA12 motherboard comes installed in the cabinet. It stays on the brass card holders that are attached to itself by screws.

The EXP-IA12 Expansion Board is mounted on the motherboard with brass card holders and screws. The communication between the IA12 motherboard and EXP-IA12 card is established by a 20-pin flat cable. The following figure illustrates this connection .

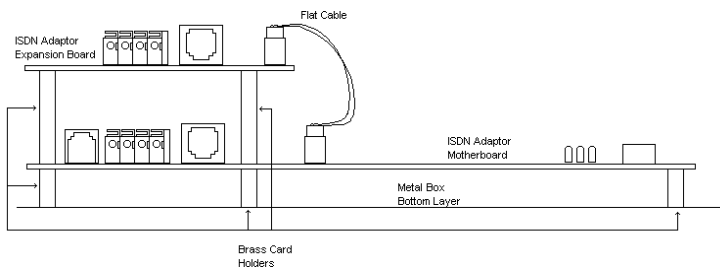


Figure B-22

- **CABLING**

For the data line :

The IA12 ISDN Adaptor comes with the ISDN data cable. Like the telephone data cable of the consoles and feature phones, the ISDN data cable is formed up of two parts. One is a cable with a 6-pin RJ plug at both ends and the other one is a connection box. The connection box is not used for connecting IA12 to the MS128 system.

The signals on the connection box of ISDN data cable are the same as the signals on the connection box of telephone data cable.

For making the data connection of the IA12 ISDN Adaptor :

- 1) One end of the ISDN data cable must be passed through the hole on the left cover of the system cabinet and connected to the ISDN socket on MS128 CPUKON card.
- 2) The RJ plug at the other end of the ISDN data cable must be attached to the corresponding RJ socket at the bottom part of the IA12 motherboard.

For the S0 line :

By the help of a cable having 8-pin RJ45 plugs at both ends, the S0 line coming through NT1 must be attached to the corresponding RJ45 socket at the bottom part of the IA12 motherboard or EXP-IA12 card.

For the analog lines :

An S0 line is converted to two analog external lines.

For connecting a pair of analog external lines corresponding to the S0 line on the IA12 motherboard, the wires of the cable coming from the related line connectors on KN1 card and passing through the holes on the side covers of the system cabinet must be attached to the two 2-pin connectors at the bottom part of the IA12 motherboard.

The same also applies to the analog line connection of EXP-IA12 Expansion Board. However, before such a cabling is made, the sticker covering the empty hole at the bottom of the IA12 cabinet must be removed, so as to access the analog line connectors on the EXP-IA12 card.

IMPORTANT

The first channel of the IA12 motherboard or EXP-IA12 card must be connected to an odd numbered line (i.e. 01, 03, 05,.....,19) and the second channel must be connected to the succeeding even numbered line.

As illustrated in the figure below, while making the analog line connection as explained above, the first channel on the IA12 motherboard or EXP-IA12 card must be connected to line 01 or line 03 or so on. Then, if the first channel is connected to line 01, the second channel must be connected to line 02 or if the first channel is connected to line 03, the second channel must be connected to line 04 or so on.

The following figure illustrates the wiring between MS128 system and IA12 motherboard.

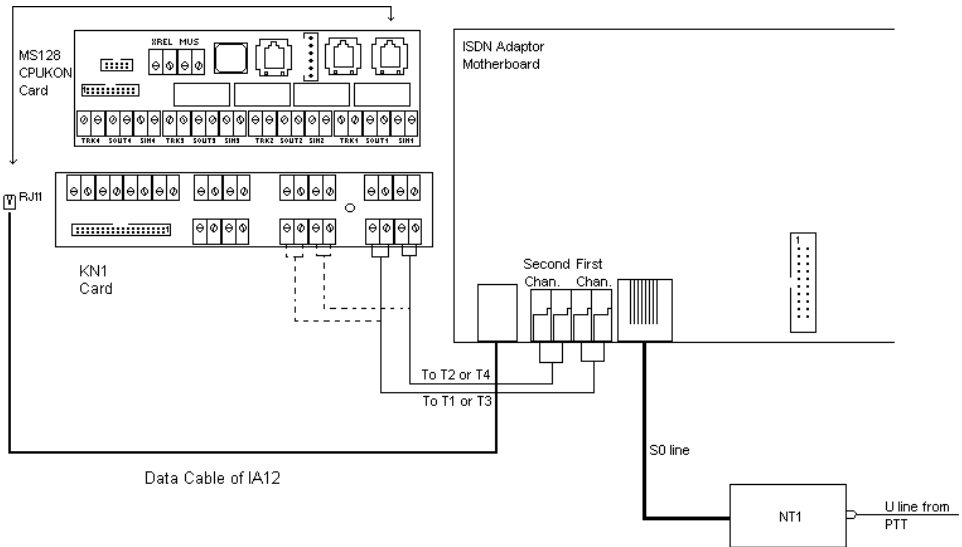


Figure B-23

● **DIP-SWITCH SETTING :**

There exists four dip-switches on the IA12 motherboard, that can be accessed upon opening the top cover. These dip-switches are used to distinguish the IA12 ISDN Adaptors connected to the system. For the first adaptor all the dip-switches must be OFF. For the second one the dip-switch "3" must ON and the others must be OFF and for the third one (which can have only the IA12 motherboard) the dip-switch "2" must be ON and the others must be OFF. To make it clear the following table is given:

	Dip-switch 1	Dip-switch 2	Dip-switch 3	Dip-switch 4
First Adaptor	OFF	OFF	OFF	OFF
Second Adaptor	OFF	OFF	ON	OFF
Third Adaptor	OFF	ON	OFF	OFF

III.7. AUTO-ATTENDANT & VOICE MAIL

- **INSTALLATION :**

EVM128 card is placed to the empty space on top of the cabinet laying on SPS128 and fixed to the space with three plastic holders. The figure below illustrates this installation:

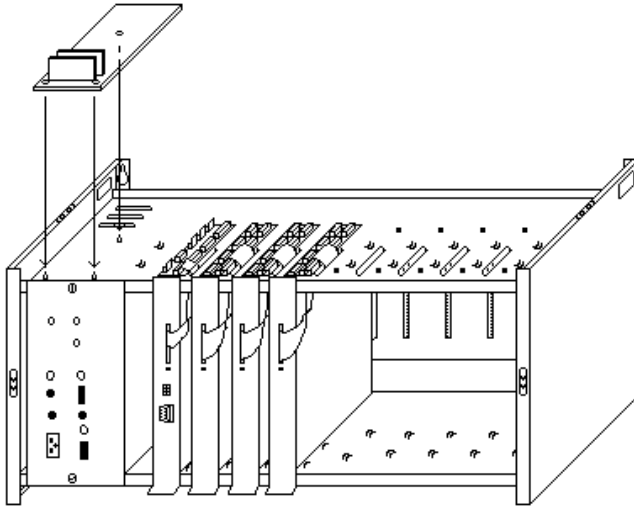


Figure B-24

- **CABLING :**

The EVM128 card has a 10-pin connector on the component side of the card. This has a correspondent on the MS128 CPUKON card. The 10-pin flat cable, which comes with EVM128, is used to make the connections between these connectors (see Figure B-25).

Additional EVM-FE (Auto Attendant Expansion) and EVM-DE (Voice Mail Expansion) cards – if there exist any - must be installed on the EVM128 card through 36-pin F1/F2 and 24-pin D1/D2/D3 connectors, respectively. The first EVM-FE card must be installed to the Flash socket marked as F1, whereas the second EVM-FE card must be installed to the socket marked as F2. The first EVM-DE card must be installed on the DRAM socket marked as D1 and the

second EVM-DE card must be installed to the socket marked as D2, whereas the third EVM-DE card must be installed to the socket marked as D3 (see Figure B-25).

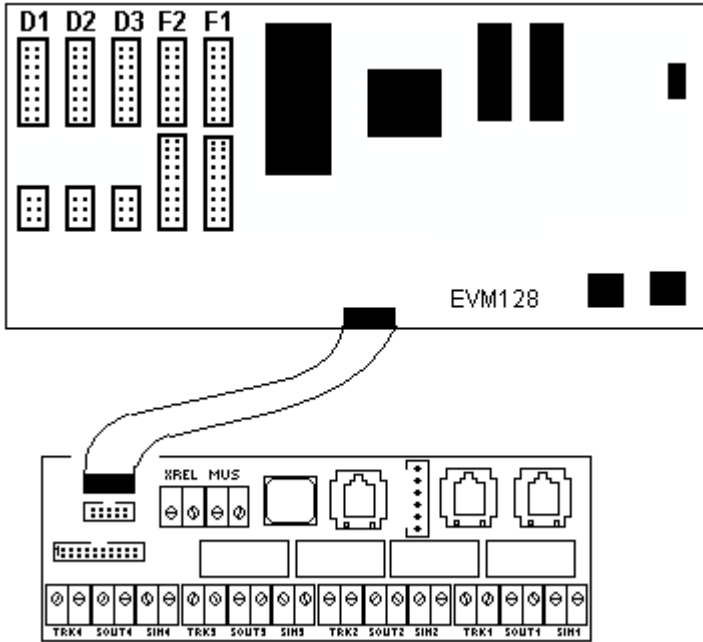


Figure B-25

III.8. LOCAL PAGER

- **INSTALLATION :**

The PG100 Local Pager is designed to be mounted on the wall. Hence, PG100 comes with a template and 2 anchor plugs with screws.

To install PG100 :

- 1) Place the template on the wall.
- 2) Drill 2 holes at the points on the template.
- 3) Drive the anchor plugs into the holes.
- 4) Insert the screws into the anchor plugs.
- 5) Hang the pager on the screws.

The following figure illustrates this installation.

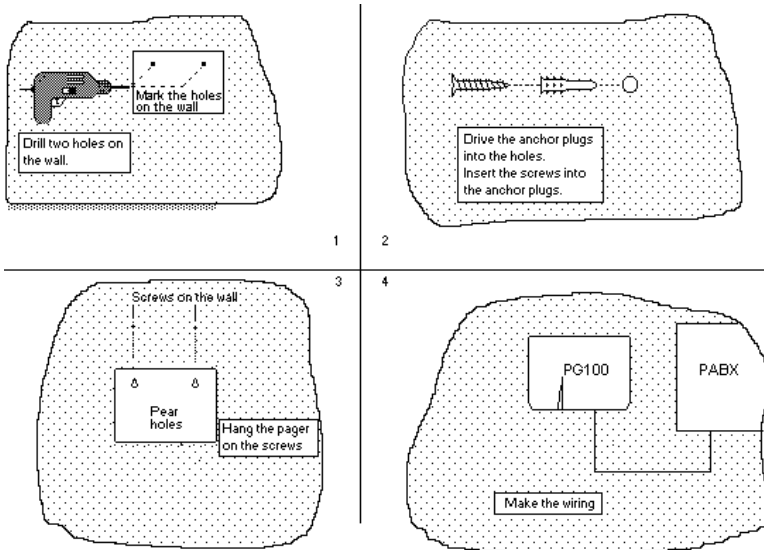


Figure B-26

• **CABLING :**

The PG100 Local Pager comes with the pager data cable. Like the telephone data cable of the consoles and feature phones, the pager data cable is formed up of two parts. One is a cable with a 6-pin RJ plug at both ends and the other one is a connection box. The connection box has a 6-pin RJ socket at one side so that one of the free ends of the cable can be fixed to the connection box easily. The other free end of the cable has also the corresponding RJ socket at the bottom part of the PG100 cabinet.

The following signals are present on the connection box of pager data cable.

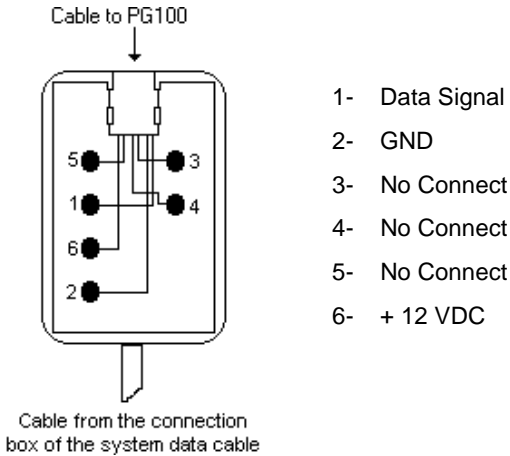


Figure B-27

PG100 shares the system data cable with OP48(-H) Consoles, LT48(-H) Feature Phones and DSS80 / DSS40 Direct Station Select Modules.

For connecting the PG100 pager to the system :

- 1) The Data / + 12 VDC / GND signals on the connection box of the system data cable must be wired in parallel to the corresponding pins of the connection box of the pager data cable.
- 2) The RJ plug at the free end of the pager data cable must be attached to the corresponding RJ socket at the bottom part of the PG100 cabinet.

The following figure illustrates the cabling of PG100 Local Pager.

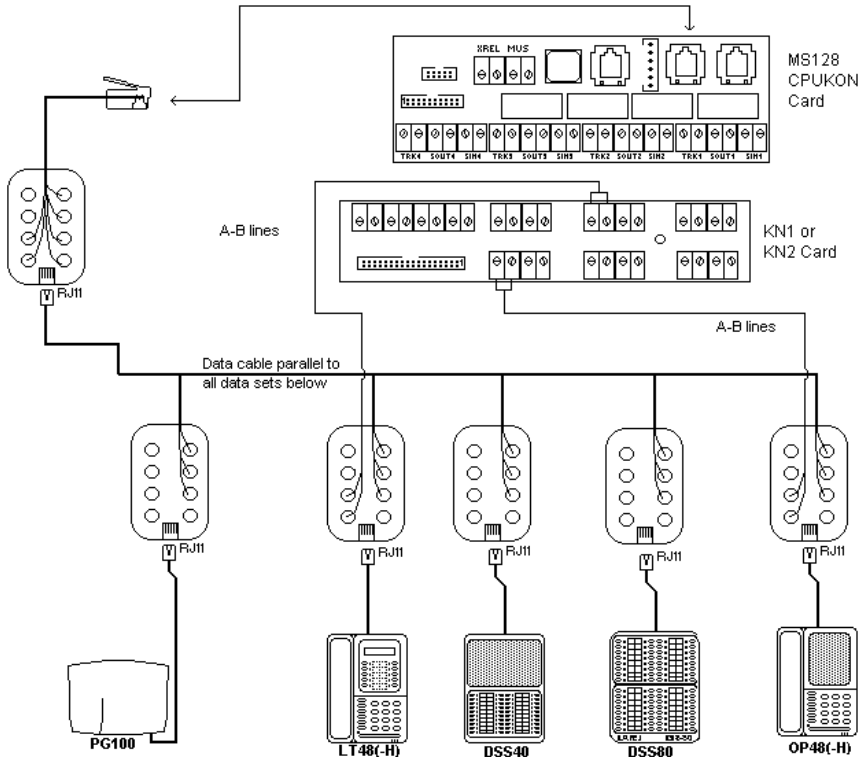


Figure B-28

The maximum distance between the PG100 Local Pager and the system can be 300 meters, if the wiring is made with ordinary wires.

However, the maximum distance of 300 meters decreases proportionally if there are KAREL telephones connected to the system. For example, if 2 LT48 Feature Phones are connected to the system in this way, the distance between the system and the PG100 Local Pager cannot exceed 100 meters.

• **POWER CONNECTION :**

PG100 can be also directly connected to mains voltage through a 12 VDC power adaptor. Normally, PG100 receives power over the system data cable. However, if the data line of the system is overloaded due to the existence of many OP48(-H) and LT48(-H) telephones or DSS40 and DSS80 modules connected to the system, it is preferable to feed PG100 over the power adaptor that is to be procured locally.

The power adaptor can be connected to the PG100 pager via the power socket at the bottom part of the PG100 cabinet.

• CABLING :

For standard telephone sets and external lines :

The cabling of extension telephones and external lines are established through the 2-pin connectors on KN1 and KN2 cards. Each connector corresponds to an extension or line.

For connecting a standard telephone set to the system, the wires coming from the corresponding connector on KN1 or KN2 card and passing through the hole on the side covers of the system cabinet must be attached to the A / B terminals of the telephone.

For connecting an external line to the system the wires of the cable coming from the corresponding line connector on KN1 card and passing through the hole on the side covers of the system cabinet must be attached to the external line.

The following figure illustrate the cabling of standard telephones .

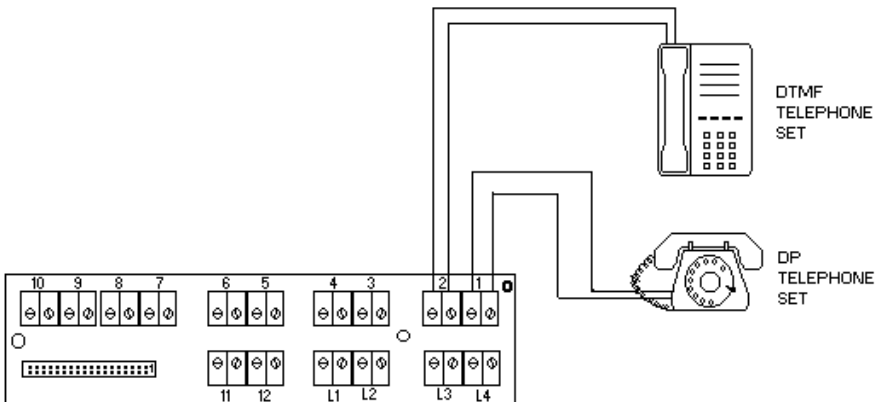


Figure B-29

Normally a standard telephone set can be connected as far as 2 km away from the system by using ordinary copper wires. Depending on the quality of the wires the distance changes proportionally.

For power failure transfer stations :

It is possible to connect any four lines directly to any four extensions in case of power failure in the absence of battery backup. For this purpose, there are four sets of triple connectors on the MS128 CPUKON card.

The left most connector in a set is used to make the connection of the line. The middle one is used to make the connection of the extension circuitry and

the right most one is used to connect the extension telephone. Then, when the system power is on, the relevant relay connects the extension circuitry to extension telephone. When the power is off, the same relay connects the extension telephone to the relevant line directly. The following figure illustrates the connections for power failure transfer stations .

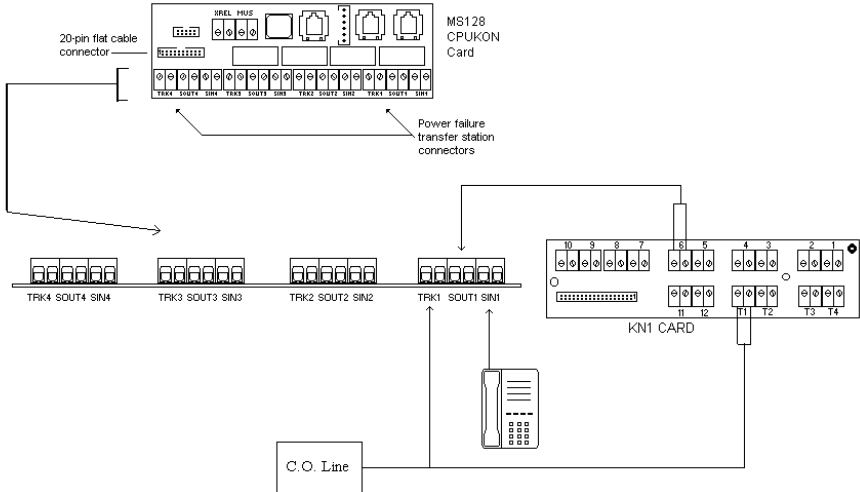


Figure B-30

III.10. FILTER & PROTECTION UNIT

- INSTALLATION :**

The FPBASE unit has a metal base, which has two pear holes. Through these pear holes the FPBASE unit can be mounted on the wall.

On the top covers of FPBASE and FPEXP units there are four holes, one at each corner. These holes are used to fix each module to the one underneath. Three holes on FPEXP are connected to FPBASE unit with plastic holders whereas the fourth one has a brass card holder with two washers to carry the chassis ground to the upper modules.

The following figure illustrates the installation of an FPEXP on top of an FPBASE.

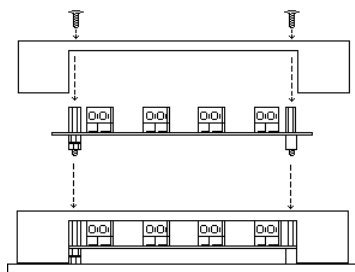


Figure B-31

• **CABLING :**

During the installation of FPBASE and FPEXP units, it is very important to connect the ground of all the units to the chassis ground of the system. For that there is a special connector on the metal base of FPBASE, which is to be attached to the ground screw (labeled with ⚡) that is located on the SPS128 module. This ground is carried to the FPEXP units by way of two washers and a brass card holder (see Figure B-32).

It should be noted that the directions of the line / extension connections are also important. The system side of the card is marked with "PABX" and the external line (or far extensions) side is marked with "PTT" on the card, as illustrated in the following figure.

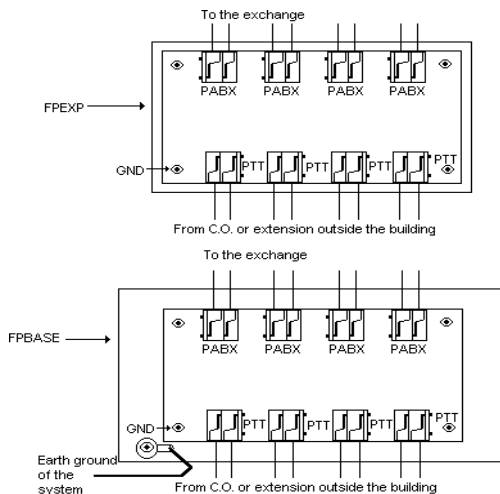


Figure B-32

To get the utmost benefit from FPBASE and FPEXP units against lightning, the modules should be installed 20 meters away from the system. This need not be the physical distance but the length of the cables between the system and the modules.

III.11. EXTERNAL MUSIC SOURCE

- **CABLING :**

A music source (tape recorder, radio or CD player) can be connected to the system to be used for "Background Music" and "Music On Hold" facilities. For this connection, the wires coming from the speaker outlet of the music source and passing through the hole on the left cover of the system cabinet must be inserted into the 2-pin MUS connector on the MS128 CPUKON card, as illustrated in the following figure.

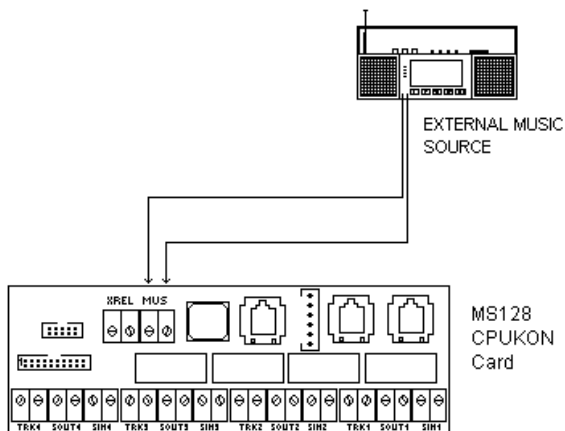


Figure B-33

MS128 is enhanced with a facility to provide the efficient use of the music source by way of its external relay (see section III.12.). When the power switch of the music source is connected to the relay on the MS128 CPUKON card and the necessary programming is carried on, the music source is automatically activated when an external party is parked or put on hold or a user activates Background Music facility. Hence, the music source remains on only while a call is parked or put on hold or when a user is listening to music on the handsfree telephone.

III.12. EXTERNAL RELAY

The external relay on the MS128 CPUKON card can be used to switch one of the following equipments provided that the relay is programmed accordingly:

- 1) Door Opener
- 2) External Ringer (to ring for the incoming external calls)
- 3) External Announcement System (see section III.5.)
- 4) External Music Source (see section III.11.)

- **CABLING :**

The connection to the external relay should be made through the 2-pin XREL connector on the MS128 CPUKON card. The following figure illustrates the connection of the relay to an external device.

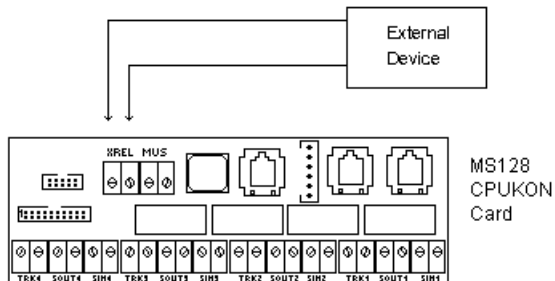


Figure B-34

WARNING

When the mains power goes off and on, if no battery backup is available for the system, the external relay may be activated for a very short while which may cause an undesired activation of the device that is connected to the relay.

This may be especially important for the security of the building if a door opener is connected to the relay. Therefore during the installation please make sure that no undesired operations occur.

MAINTENANCE GUIDE

I. MAINTAINING THE SYSTEM

After powering on the system, all the extensions, external lines and accessories must be tested.

To help the installer and to ease his job, some basic problems with their easy solutions are listed below:

1) One or more ports on the MS128 EX1 or MS128 EX2 module do not operate properly:

- a) Check if the card is inserted in the slot properly,
- b) Replace the card.

2) No Auto Attendant message can be recorded:

- a) Check the flat cable connection of the EVM128 card to the MS128 CPUKON card,
- b) Check if the EVM-FE card, if any, is inserted to the correct connector properly,
- c) Replace the EVM-FE card, if any.
- d) Replace the EVM128 card,
- e) Replace the MS128 CPUKON card.

3) No Voice Mail message can be recorded:

- a) Check the flat cable connection of the EVM128 card to the MS128 CPUKON card,
- b) Check if the EVM-DE card(s) is inserted to the correct connector properly,
- c) Replace the EVM-DE card,
- d) Replace the EVM128 card,
- e) Replace the MS128 CPUKON card.

4) The recorded Auto Attendant messages are very noisy:

- a) Replace the EVM-FE cards, if any.

5) The recorded Voice Mail messages are very noisy:

- a) Replace the EVM-DE cards.

6) CPU128 card cannot communicate with the PC:

- a) Remove KY16 Mini Printer if installed on the system,
- b) Make sure that you are using the correct security plug,
- c) Check the cable connections at both sides,
- d) Check if the communication port of the PC is working properly,

- e) Replace the cable,
- f) Reinstall the software,
- g) Replace the CPU128 card.

7) CPU128 card cannot communicate with the printer:

- a) Remove KY16 Mini Printer if installed on the system,
- b) Check the cable connections at both sides,
- c) Check whether the communication parameters of the printer match to these of the system,
- d) Replace the cable,
- e) Replace the CPU128 card.

8) The DY26 doorphone does not function:

- a) Check the cabling of the doorphone,
- b) Replace the doorphone,
- c) Replace the MS128 CPUKON card,
- d) Replace the CPU128 card.

9) LB or TE is displayed on the consoles and feature phones:

- a) Check the cabling of all the consoles, feature phones, direct station select modules and KY16 Mini Printer,
- b) Replace the MS128 CPUKON card,
- c) Replace the CPU128 card.

10) One of the telephones have no dial tone:

- a) Check the cabling of the telephone,
- b) Replace the telephone,
- c) Check the related extension circuitry of the relevant MS128 EX1 or MS128 EX2 card, and replace that card if no dial tone is received.

Design and specifications subject to change without notice.