MAESTRO-1600, MAESTRO-1600DL

Computerized, Multi-Function 8 to 16 Zone Alarm Control/Communicator

Visonic Ltd

Installation Instructions

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1. INTRODUCTION

1.1 System Overview

The MAESTRO-1600 is a programmable modular alarm control system, designed to be easily customized as required by the end user. The simplest version consists of an 8-zone control module that operates in conjunction with one or several stylish keypad/display units. Two types of LED keypads and two types of LCD keypads are available.

By addition of a two-way communicator - the DL-1000 - the MAESTRO-1600 becomes MAESTRO-1600DL. The communicator reports events to central stations or private telephones, and also permits data download / upload from a remote terminal.

Power pack kits adapted to the requirements in the country of use are supplied as requested. A power pack kit consists of a power transformer and an AC input terminal block with a built-in fuse. Optional modules such as a zone expander and a siren driver are also available for system enhancement.

1.2 List of Components

- **The control module:** This module accommodates all control circuitry and operation software for a programmable 8-zone alarm system.

- **DL-1000:** A two-way digital communicator. It reports events to two central stations or to four private telephones (or to a pager). In addition, it accepts programming data and control commands from remote download/upload terminals. This module plugs into a socket at the left-hand edge of the system control module.

- **Keypad / display units** (ordered separately): These units enable the installer and the user to enter their commands and provide visual and audible feedback for every action. Four types are available, as described in Sec. 4.

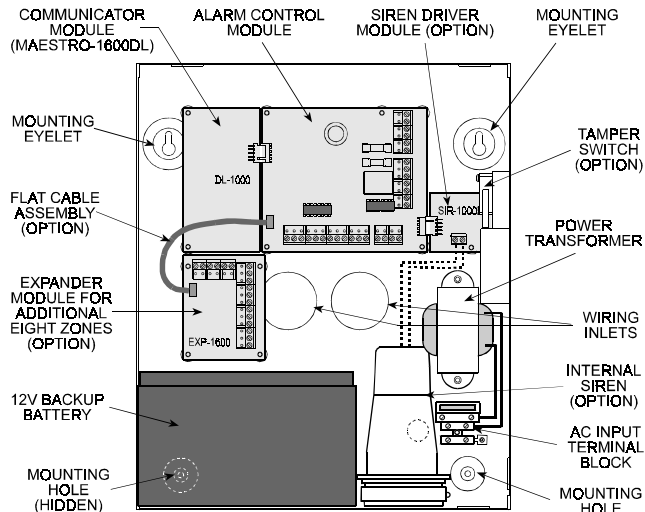
Figure 1.1 *Fully Equipped MAESTRO-1600DL Housing*

- **PK-1 power pack kit** (ordered separately): Stepdown transformer with 16 VAC output and fused AC input terminal block. The kit is adapted to the AC mains voltage in the country of use and to the regulatory requirements in that country.

- **12V backup battery** (ordered separately): Provides operating power in case of an AC failure.

- **EXP-1600** (option): An 8-zone expander which increases the system capacity from 8 to 16 zones. It may be mounted within the system's metal cabinet or near the actual zones it serves (see Sec. 5 for details).

- **SIR-1000** (option): A siren driver module that generates a swept-tone audio signal, used for driving internal or external loudspeakers. This add-on module is described in Sec. 6.

- **TK1 tamper switch kit** (option): Protects the alarm control cabinet against tampering; actuated when the front lid is opened.

- **Momentary action Keyswitch** (option): If one of the zones is defined as a "keyswitch zone", you may install a keyswitch for arming/disarming the system (in the AWAY mode only).

1.3 System Configurations (Fig. 1.2)

An alarm system based on the MAESTRO-1600DL must include, as a minimum, the units which are shaded in Fig. 1.2. Each optional unit (shown in dotted lines) contributes additional capabilities to the alarm system.

Various detectors must be wired to the control module's zone inputs, same as in any other alarm control panel. The detectors are not shown in the diagram, but their existence is suggested by the zone loop circuits.
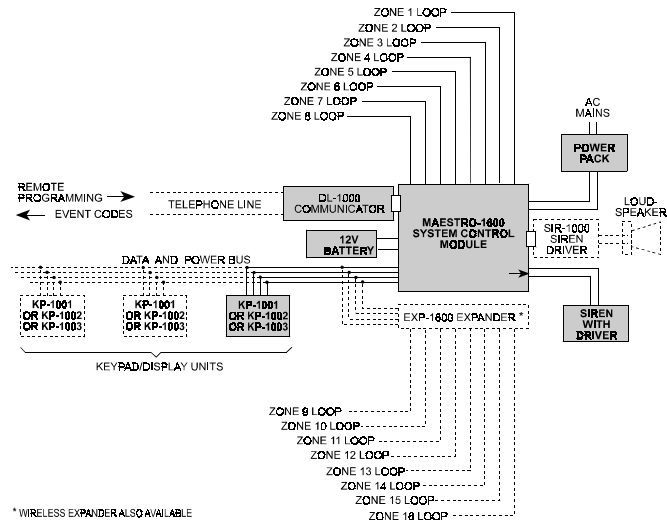
Figure 1.2 *MAESTRO-1600DL, System Block Diagram*

A. All servicing should be undertaken by qualified services personnel.

B. Electrical wiring must comply with the local standards and regulations that are valid at the time of installation.

C. Do not perform service or repair operations unless the mains power supply to the control panel is cut off by the circuit breaker.

2. SPECIFICATIONS

2.1 General Data

Number of Zones: 8 or 16 (with expander), programmable attributes.
Programmable Zone Types: Instant, delayed type 1, delayed type 2, follower type 1, follower type 2, 24 hours (bell), 24 hours (bell/ buzzer), fire, keyswitch.
Additional Zone Attributes: Priority, Perimeter, Chime, Silent
Alarm Loop Type: End-of-Line (E.O.L.), 10 kΩ
Control Facilities: Installer code, master code, 6 users codes and

one "maid code" - 4 digits each. Keyswitch option also available.

Download/Upload: Full system control and data download/upload from a remote computer; partial control from a remote DTMF telephone.

Arming Modes: AWAY, HOME, AWAY-INSTANT and HOME-INSTANT

Disarming Modes: Regular or "ambush"

Emergency Pushbuttons: Quick-action keys A, B and C

Alarm Types: Silent or bell/buzzer, as programmed

Audible Alarm Modes:
> Continuous (initiated by all zones except for fire zones)
> Pulsating (initiated by fire zones only).

Bell/Siren Timeout: Programmable, 1 to 99 minutes. If the zone remains open, the alarm renews 30 seconds after timeout. The number of alarm renewals is also programmable (1 to 99 times).

Exit Delay: Programmable, 0 to 99 seconds

Entry Delay: Programmable, 0 to 99 seconds.

Special Functions: Zone bypass, force arming, false alarm cancellation

Data Retrieval: Alarm memory and trouble indications

Test Modes: Walk, Bell/Siren/Battery, Keypad, Communicator

Alarm Relay Contact Ratings: 5A @ 24 Volts (SPDT).

Supply Voltage: 230 VAC (115 VAC optional).

Power Transformer AC Output: 16 VAC, 40 VA.

Auxiliary DC Output (via the 12VDC terminals): 12 VDC, 700 mA max.

Siren/Bell DC Output (via the V-BELL jumper): 3 A max.

Maximum Number of Keypads: 4

Keypad Current Drain (Max.)
  KP-1001/8 & KP-1001/16: 35 mA
  KP-1002: 45 mA
  KP-1003: 60 mA

PGM Output Current Sinking Capability: 100 mA max.

Fuse Ratings:
  230 VAC input - 315 mA (time lag type T315 mA/250V 5X20mm)
  12 VDC for detectors, keypads and accessories - 1A;

  12 VDC supply for bell - 3A;
  Siren driver - 1.5A.

Standby Battery: Lead-acid type, 12 V, up to 6 Ah.

Charging Current: Electronically limited to 300 mA

2.2 Communicator Characteristics

Programmable Central Station Telephone Numbers
  Channel 1: One first priority number and one backup number
  Channel 2: One second priority number and one backup number

Programmable Private Telephone Numbers: One temporary "follow me" number, 3 "permanent" numbers

Phone Number Length: 16 digits max, including hexadecimal digits for pauses

Dialing Methods: DTMF or Pulse, as programmed

Mark/Space Value Options - 40/60, 34/66, 60/40, 66/34

Central-Station Related Parameters
  Communication Protocols:
  DTMF protocol (at the rate of 10 digits per second),
  Tone pulse protocol with data/handshake tones of 1900/1400 or 1800/2300 Hz
  Additional protocols in future versions.
  Data Rate Options (for tone pulse protocol): 10 pps, 20 pps, 33 pps, 40 pps
  Data Verification Options: Double round or Checksum
  Report Types: Alarm/restore, arm/disarm and system maintenance events
  Report Destinations: Any report type may be linked to any one of these reporting destinations – 1st channel only, 2nd channel only, 1st and 2nd channels or none altogether.
  Protocol Formats: 3/1, 3/2, 4/1, 4/2 and 4/2 + checksum.

Private-Telephone Related Parameters
  Report Types: Regular alarms (two-tone siren) and 24-hour zone alarms (swept-tone siren).
  Report Destinations: All 4 telephones or none altogether.

2.3 Siren Driver Data

Alarm signal: Continuous swept-tone siren (all alarms except

FIRE); pulsating swept-tone siren (FIRE).

Output Power: 10 W max.

Loudspeaker Impedance: Not less than 4 ohms

2.4 Physical Properties

Operating Temperature Range: 0°C to 49°C (32°F to 120°F)
Storage Temperature Range: -20°C to 60°C (-4°F to 140°F)
Dimensions (H x W x D):
Metal Cabinet: 262x315x74 mm (10-5/16 x12-3/8 x2-15/16 in.).

Keypads (all models): 159x112 x 30 mm (6-1/4x4-3/8 x1-3/8 in.).
Optional UPB-3 Cabinet: 165x108x38mm(6-1/2x4-1/4x1-1/2 in.).
Weight:
  Metal Cabinet with Control Module & Communicator: 2.180 kg (4.8 lb).
  LED Keypad KP-1001: 224 gr (7.9 oz)
  Medium LCD Keypad KP-1002: 253 gr (8.9 oz)
Large LCD Keypad KP-1003: 273 gr (9.6 oz)

3. THE ALARM CONTROL CABINET

3.1 Alarm Control Module Description

As the nerve center or the brain of the entire alarm system, this programmable module includes the hardware and firmware necessary for managing the system with or without auxiliary modules - the communicator, zone expander and the siren driver. It must be stressed, though, that at least one keypad/display unit is required to set up a workable 8-zone alarm system.

The control module (Fig. 3.1) comes mounted within the alarm control cabinet. Its printed circuit board is equipped with a socket for the communicator module (at the left hand edge) and a socket for the siren driver module (at the right hand edge).

Operating power is supplied from a 16 VAC / 40 VA stepdown transformer - part of the power pack kit PK-1. The control module accommodates a voltage regulator and a charger for the backup battery. Regulated 12 VDC output for the detectors, all the keypads and other external devices is obtained via an on-board 1A fuse marked "ACCESSORIES". Two pairs of 12VDC output terminals are provided, to allow easier connection of a large number of accessories.

The ALARM relay has changeover (Form 1C) dry contacts rated at 5A/24 Volts, and can be used to activate alarm devices such as sirens or bells (Fig. 3.7). A jumper marked V-BELL connects the 12 VDC supply to the common (C) contact of the alarm relay, via a 3A fuse marked BELL. With the jumper installed across the two V-BELL pins, the bell or siren can be wired between the N.O. contact of the relay and the negative (–) supply terminal.

3.2 Power Pack Kit PK-1

The AC power pack for the MAESTRO-1600 is delivered separately in kit form, to suit the mains voltage and the particular regulations in the country of use. The kit includes a step-down transformer, an AC mains terminal block with a built-in fuse holder and a 0.3 A fuse, mounting hardware and a terminal identification sticker. As an essential part of the alarm control system, the power pack must be installed in the metal cabinet (Fig 3.2) and wired accordingly (Fig. 3.3).

A. Align the transformer mounting ears with the 2 stand-off screws on the rear wall of the case and let the screws pass through the holes. Mount a flat washer, a lock washer and a nut (in this order) on each screw and tighten both nuts.

B. Place AC mains terminal block with its ground lug over the stand-off grounding screw, and the hole nearest to the fuse holder over press nut. Pass a screw (supplied in the kit) through that hole and thread it into press nut. Tighten screw well. Put a lock washer and a nut over the stand-off grounding screw and tighten nut to fasten ground lug to the case.

C. Remove the paper backing from the terminal identification sticker and attach the sticker to the rear wall of the case, as close as possible to the AC terminal block.
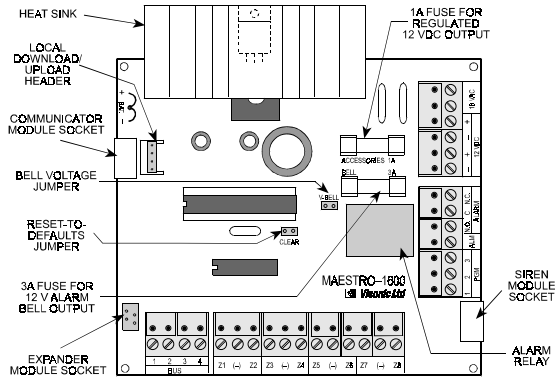
Figure 3.1 *The MAESTRO-1600 Control Module*
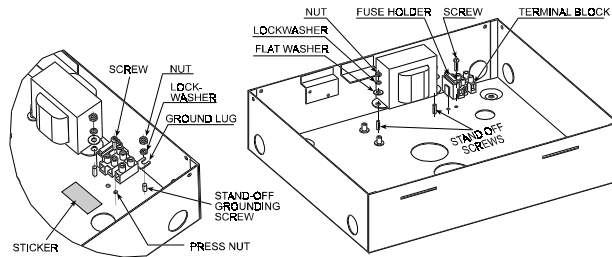
Figure 3.2 *Assembling the PK-1 Power Pack*

D. The primary winding of the transformer is already connected to the terminal block, as shown in Fig. 3.3. Connect the transformer's 16 VAC winding (the 2 free wires) across the control module's 16 VAC terminals

E. Connect AC mains input – Phase **(~),** Neutral **(0)** and Ground ($\perp$) to terminal block (see Fig. 3.3). Make sure your installation complies with the following safety requirements list:

- Conductors carrying the AC mains voltage should be physically separated from other conductors used to wire the alarm system.

- The cross section of the mains input conductors must be not less than 1.0 mm^2 (17 AWG).

- The diameter of the plastic conduit for the mains cable should be at least 16 mm (5/8 in.)

- Insert the plastic conduit as far as 3 cm (1-1/8 in.) into the metal case, to protect the mains conductors from the sharp edges of the entry hole.

- All 3 AC power supply leads must be tied together firmly with a plastic tie wrap close as close as possible to the terminal block to which these leads are connected.

- The phase (~) input wire must be routed via a single-pole, 3A exclusively dedicated circuit breaker.
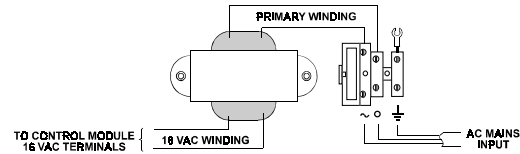
Figure 3.3 AC Mains Input Wiring

3.3 Optional Enhancement Kits

Two optional kits are offered for enhancing the alarm control system:
LK-1: key-operated lock for the front lid of the metal cabinet (see A below)
TK-1: tamper switch kit (see B below)

A. Assembling the Front Lid Lock Kit (LK-1)

The LK-1 lock kit includes the lock itself and mounting hardware as shown in Fig. 3.4. To assemble the lock, proceed as follows:

1. Align the lock with the pre-punched hole in the lid, insert it into the hole and use the nut to fasten it to the front lid. Tighten the nut with a spanner wrench**.**

2. Mount the rotation limiter over the rotating part of the lock, making sure that the small cam on the lock body is positioned

between the two teeth that limit the rotation angle.

3. Mount the lock bar over the rotation limiter.

4. Use spacer and the screw to tighten the entire lock assembly.

5. Insert the key into the lock and check whether the rotation limiter allows the lock to be rotated in the desired direction.

B. Assembling the Tamper Switch Kit (TK-1)

The TK-1 kit includes the tamper switch with two wires soldered to its terminals and two sheet metal screws. To mount the switch on the tamper bracket, proceed as follows:

(1) Align the tamper switch with the bracket as shown in Fig. 3.5.

(2) Use the two sheet metal screws to fasten the switch. to bracket. Tighten the screws well, but do not overtighten because this may break the switch**.**

(3) Verify that the switch contacts close when the front lid is closed.

(4) Connect the tamper switch wires to the zone terminals of a zone dedicated to 24-hour tamper protection.
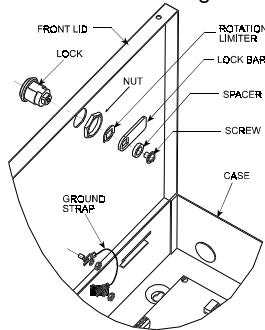

Figure 3.4 LK-1 Assembly

3.4 Mounting the Alarm Control Cabinet

Choose a protected, easily accessible location, preferably where uninterrupted AC power is available. To open the front lid, simply swing it on its hinges to the left. The following steps must be taken before actual mounting:

A. Be sure to assemble the power pack kit within the metal cabinet (Para. 3.2).

B. If you have an LK-1 lock kit, assemble it as shown in Para. 3.3A. If you did not order the optional lock kit, insert the plastic plug supplied with the system into the hole in the front lid (align the plug to fit the shape of the hole before pushing it in).

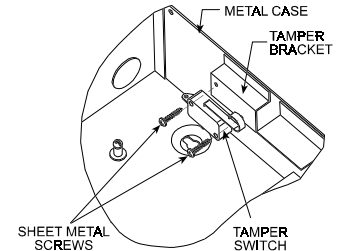**C.** If you ordered tamper switch kit TK-1, mount it as shown in Para. 3.3B.

Figure 3.5 TK-1 Assembly

D. A ground strap is supplied with your system (Fig. 3.4). Mount it in place and tighten it well. The required lock washers and nuts are packed together with the ground strap.

Mounting and wiring holes are provided on the rear wall of the cabinet. If necessary, punch out the wiring knockouts at the sides, to suit your particular installation. Mount the cabinet complete with the alarm control module and the power pack on the wall, using the 4 mounting holes at the rear (Fig 1.1). The front lid may be secured to the cabinet with 4 sheet metal screws, or with the optional lock (LK-1).

3.5 Wiring the Alarm Control Module (Fig. 3.6)

> **Caution!** *Do not connect the AC power or the battery until all other wiring is completed.*

Wiring instructions are given by order of terminals, from left to right.

Terminals	Wiring Information
1 2 3 4 BUS	These are the keypad bus terminals for the various keypads and for the expander module. Each terminal should be wired to its identically numbered counterpart in the keypad/display unit or expander module. Refer to Sec. 8 - Keypad Bus Length Considerations.

Terminals	Wiring Information
Z1	Zone 1 terminal. A normally closed (N.C.) zone loop will be formed if the alarm contacts of all detectors in this zone are connected in series between this terminal and the nearest (–) terminal. A 10 kΩ End-of-Line (EOL) resistor must complete the series connected loop at the point most distant from the zone terminals. **Note:** *If a zone is defined as a keyswitch zone and used for arming/disarming, a 10kΩ resistor must be wired across the keyswitch terminals.*
(–)	A negative common terminal. Each zone loop is connected between the respective zone terminal and a (–) terminal.
Z2	The wiring instructions are the same as for zone 1, with which zone 2 shares the **(–)** terminal.
Z3 - Z8	Three pairs of zones, with a **(–)** terminal between each pair. Wiring instructions are the same as for the first pair of zones (Z1 and Z2).
PGM 1	This is a programmable open-collector auxiliary output (100 mA max.). You may program this output to pull to ground upon communication failure. Alternatively, you may program it to pull to ground for as long as the system is armed (for controlling the alarm memory function in certain detectors), or for lighting an remotely located LED to indicate that the system is armed. An LED with 1kΩ resistor in series may be wired between **PGM1** and any one of the **12 V+** terminals, as shown in Fig. 3.6. A relay can also be wired as shown with PGM2.
PGM 2	This is a programmable open-collector auxiliary output (100 mA max.). You may program this output to pull to ground during exit and entry delays, or to pull to ground whenever the system is ready - all zones are secured and ready to be armed. In the first

Terminals	Wiring Information
	case, a courtesy light control relay or a warning buzzer may be wired between **PGM2** and any one of the **12 V+** terminals (Fig. 3.6). In the second case, a READY LED with a 1kΩ resistor in series may be wired between **PGM2** and any one of the **12 V+** terminals.
PGM 3	This is a programmable open-collector auxiliary output (100 mA max.). You may program this output to reset smoke detectors after the first detection of smoke, or to pull to ground upon any alarm and return to the open circuit state only by disarming or arming the alarm system (strobe output). In the first case, **PGM3** must be wired as the "ground return" for the smoke detectors used in the system, as shown in Figure 3-6. In the second case, a strobe light control relay may be wired between **PGM3** and any one of the **12 V+** terminals.
ALM	This is an open-collector output that pulls to ground during alarm and returns to the open circuit state when the alarm times out. It may be used to activate an auxiliary alarm device.
ALARM	The **N.O., C** and **N. C**. terminals represent the corresponding output relay contacts. You may wire the alarm relay contacts to switch on an external siren by supplying +12 VDC to the siren as shown in Fig. 3.7. **Note:** *If the V-BELL jumper is installed across the two V-BELL pins, +12VDC is applied to the output relay C contact. The N.C. contact will also be at +12VDC potential, but will become "floating" when an alarm occurs.* **If you wish to use the output relay as a "floating" dry contact switch, be sure to remove the V-BELL jumper!**
12 VDC	Two pairs of 12 VDC supply terminals. Up to 700 mA maximum current can be obtained across the [+] and

| Terminals	Wiring Information
	[–] terminals, but this includes the current. drawn by the keypads, the zone expander and the various detectors.
16 VAC	AC power input terminals. The system is powered by 16 VAC output from a 40 VA power transformer, which changes according to the country of use. The secondary winding of the transformer (the two free wires extending from the transformer) must be connected across these terminals.
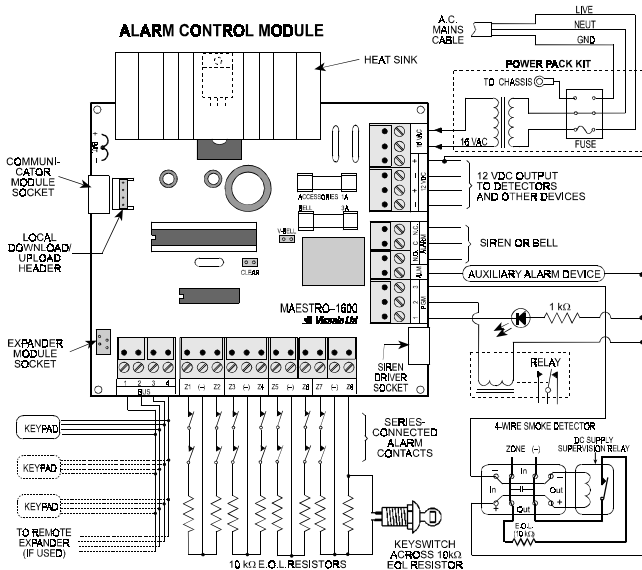
Figure 3.6 Control Module Wiring

3.6 Software and Hardware Reset

When installing a new MAESTRO-1600, you should always replace the factory default installer code with a secret code, known only to yourself (see Installer's Programming Guide, Location 01). In the User's Guide, the

Figure 3.7 Connecting a Siren

master user is similarly instructed to program a secret master code, known only to himself.

It is highly unlikely that the user should forget his code, but if he does - you can help him by performing a "software reset" (see Location 41 in the Installer's Programming Guide). **This reset can not be carried out without your installer code.**

It is also quite unlikely that you lose your installer code, thereby losing your ability to access the system for reprogramming. However, if you <u>do</u> lose the code, don't lose hope: you can still perform a "hardware reset", which will restore the system to the factory default installer and master codes.

The hardware reset procedure is as follows:

- Use a jumper bar to short together the two CLEAR pins on the control module (Fig. 3.6 for location of the pins).

- Disconnect all power - the AC mains as well as the battery.

- Reconnect the battery, wait 5 seconds, remove the short circuit from the CLEAR pins and disconnect the battery once more.

- Reconnect the battery and the AC mains. The system will revert the default Installer code **(1 6 0 0)** and Master User code **(1 2 3 4).**

When done, use the factory default installer code to access the installer mode and program a new secret installer code (see Location 01 in the Installer Programming Guide). Also inform the master user that he must reprogram his secret Master Code.
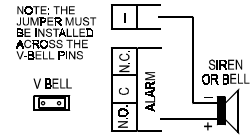
4. DL-1000 TWO-WAY COMMUNICATOR

4.1 Description and Use

The DL-1000 communicator module is supplied as part of the MAESTRO-1600DL.

A board-to-board connector on the DL-1000 left edge (Fig. 4.1) mates with a socket at upper left edge of the alarm control module. The communicator is triggered into action by the alarm control module, and can be programmed to communicate with central stations or private telephones, as required. The communication protocol is selected in the course of programming (refer to the programming manual).

The communicator is designed and programmed to play two roles:

- **Event Reporting:** Once an event occurs, the communicator calls the telephone numbers programmed by the installer or by the user. When communication is established, the communicator reports the event (or events) by sending DTMF or pulse code sequences (if the central station mode has been selected) or two kinds of alarm tone signals (if private telephone mode has been selected). Acknowledgement is expected from the called party for each event reported, or else communicator will report the event repeatedly until factory-programmed number of message repetitions is exceeded.

- **Interaction with a Remote Computer:** The DL-1000 and the control module combine together to handle Download/Upload requests from a remote computer. These operations require a remote modem - the RM-1000 - at the remote computer's end of the line and the RPM-1 software package (see Appendix A). The remote modem and the software also allow full control of the alarm system by the remote computer (arming, disarming, bypassing zones, displaying zone status etc.). To assume control, the remote station operator establishes telephone communication with the protected premises (see Chapter 6 in the programming manual). DTMF code sequences are then sent by the remote station over the telephone line. The DL-1000 interprets these DTMF codes and transfers commands, new parameters and data-upload requests to the control module. The control module will carry out the commands, or reprogram itself or allow upload, as the case may be.

4.2 Operation Routine

A. Reporting to Central Stations

Once triggered into operation by the occurrence of an event, the communicator carries out the following sequence of operations:

(1) It seizes the line and waits 10 seconds for dialing tone.

(2) Upon detection of a 2-second long dialing tone, the communicator starts calling the first-priority telephone number of the first central station.

Note: Without dial tone, the communicator goes "on hook" for about 5 seconds, then seizes the line again to wait for dial tone. If there is still no tone, dialing starts anyway, except in cases where a hexadecimal "D" is programmed as a prefix to the telephone number. With a D-prefix, dialing will not take place unless a dial tone is detected (see the Programming Manual for additional information).

(3) Once the call is answered, the communicator waits 16 seconds for a GO-AHEAD signal from the central station. To prolong this standby period, a hexadecimal E programmed at the end of the telephone number will introduce an additional 10 second delay. If there is no GO AHEAD, the communicator will go on hook and redial the second priority phone number for that central station.

Note: If there is no second phone number, the first number will be called again until the preprogrammed maximum number of dialing attempts is reached.

(4) If a GO-AHEAD signal is received within 16 seconds, the communicator reports the first event in its transmission queue and waits 4 seconds for a KISSOFF signal. Upon KISSOFF, the communicator checks whether another event is waiting to be reported (alarms are always reported before restorals).

(5) If there is a second event to be reported, the communica-tor reports it and disengages the line upon reception of KISSOFF for the second event. The communication session is considered successful.
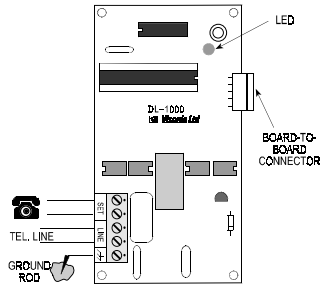
Figure 4.1 *The DL-1000 Communicator*

Note: Without KISSOFF from the central station, messages will be repeated until the factory default number of "message repetitions" is reached. Next, the second (backup) telephone number will be called and a communication session will be attempted. If this fails too, the COMMUNICATION FAILURE code will be sent to the control module, which will produce the relevant TROUBLE indications.

(6) Upon completion of a successful or ineffective communication session with the first central station, and provided that the communicator has been programmed to call the second central station, the entire procedure will be repeated, but this time with the telephone numbers of the second central station.

B. Reporting to Private Telephones

Unlike central stations, private telephones are not equipped to interpret event codes. When programmed to report to a private telephone, the communicator transmits only two types of alarm tone signals over the telephone line:

• A two-tone siren to indicate an alarm in a regular zone.

• A swept-tone siren to indicate an alarm in a 24-hour zone.

In Private Telephone mode, the first telephone number becomes a "follow me" number, which is programmed by the master user each time before arming the alarm system and which will be deleted automatically upon disarming. The other 3 numbers are programmed by the installer as permanent reporting destinations.

Once triggered into operation by the occurrence of an event, the communicator carries out the following sequence of operations:

(1) It seizes the line and waits 10 seconds for dialing tone.

(2) Upon detection of a 2-second long dialing tone, the communicator starts calling the "follow me" number. If no such number is programmed, the first of the other 3 numbers will be dialed.

Note: If there is no dial tone, the communicator goes "on hook" for about 5 seconds, then seizes the line again and waits once more for dial tone. If there is still no tone, dialing starts anyway, except in cases where a hexadecimal "D" is programmed as a prefix to the telephone number. With a D-prefix, dialing will not take place unless a dial tone is detected.

(3) Once called party answers, communicator waits 5 seconds and transmits relevant signal (two-tone or swept siren, depending on the type of alarm event). The siren sounds for 15 seconds and stops for 5 seconds, throughout which communicator stands by for an acknowledgement (DTMF "0" or "2").

DTMF **"0"** will cause the communicator to consider the communication session successful and cease any activity. DTMF **"2"** will cause the communicator to consider the event closed for the presently contacted telephone only, but to continue calling the remaining telephone numbers.

Note: Without an acknowledgement, the siren will sound the maximum number of times allowed by factory programming (5 times). The communicator will then disengage the line and call the other telephone numbers by order of priority. Each telephone will be called the maximum number of times allowed by factory programming, unless proper acknowledgement is received by the communicator.

(4) If a 24-hour zone alarm occurs while a regular alarm is being reported, the communicator will automatically switch to the swept-tone alarm.

Note: If all communication attempts fail, a "communication failure" code will be sent to the control module, which will produce the relevant TROUBLE indications.

C. Download/Upload/Remote Control Capabilities

Besides its task to report alarms via the public telephone network, the DL-1000 communicator is designed to permit the following functions:

- Arming the MAESTRO-1600DL and programming telephone numbers from a remote DTMF telephone (refer to Sec. 6 in the Installer Programming Guide).
- A full extent of system control and data download/upload with a remote computer terminal via telephone lines (Appendix A).
- Data download/upload with a local computer terminal via the local download/upload header of the alarm control module (Appendix A).

4.3 Mounting

Any existing MAESTRO-1600 may be converted into a MAESTRO-1600DL by addition of the DL-1000 module, which can be ordered separately.

Refer to Fig. 1.1 for module location. Mate the board-to-board connector on the DL-1000 with the socket at the upper left edge of the alarm control module. Once the connectors are mated, the two left-side mounting holes of the DL-1000 will be aligned with two stand-offs in the rear wall of the metal cabinet. Use two screws to fasten the DL-1000 to these standoffs.

4.4 Wiring (see Fig. 4.1)

Terminals	Wiring Information
SET	Terminals for connecting the local telephone set to the telephone line via the communicator. The telephone set is disconnected from the line when the communicator is triggered into action.
LINE	Terminals for connecting the telephone line to the communicator.
⏚	Earth terminal - connect to a cold water pipe or to a ground rod, using at least **14 AWG** wire

5. KEYPAD DISPLAY UNITS

5.1 Keypad Types

The MAESTRO-1600 system is designed to operate with one or more microprocessor controlled keypad/display units installed anywhere within the protected premises. Each keypad/display unit is connected to the control panel via the four lead keypad bus - two data wires and two power supply wires. Four types are currently available:

- **KP-1001/8** - Keypad with LED display for an 8-zone system
- **KP-1001/16** - Keypad with LED display for a 16-zone system
- **KP-1002** - Keypad with regular Liquid Crystal Display (LCD)
- **KP-1003** - Keypad with large Liquid Crystal Display (LCD)

5.2 LED keypads KP-1001/8 and KP-1001/16

Both KP-1001 units feature 19 keys (Fig. 5.1):

- A 3 x 4 key numerical keyboard
- A column of 4 function keys: **AWAY, HOME, INSTANT** and **BYPASS.**
- A row of 3 special "quick-action keys": **A, B** and **C.**

In the KP-1001/16, sixteen LED indicators represent the 16 zones, respectively. In the KP-1001/8, indicators 9 through 16 do not

exist, and 8 LED indicators represent the 8 zones, respectively. The group of 6 LEDs at the right hand side of the panel consists of status indicators marked: **READY, ARM, POWER, BYPASS, MEMORY** and **TROUBLE.**

The front panel keys and indicators serve as an interface between the alarm system and the installer or the user. The indicators provide status information, display memorized data and also inform the installer or the user about the success or failure of each operation.

The following list includes interpretations for the basic states of the six front panel function indicators. Two basic states - a **lighted** indicator and an **extinguished** one - are explained below.

Other indications are dealt with in the programming guide and the user's guide.

- **READY indicator:** This indicator lights steadily if all zones are secured and the MAESTRO-1600 is ready to be armed. An extinguished READY indicator warns you of "open" zones (but not when type 1 delay and follower zones are open).

- **ARM indicator:** This indicator lights steadily throughout the armed period. An extinguished ARM indicator informs you that the system is in the disarmed state.

- **POWER indicator:** This indicator lights steadily while AC power is supplied to the system. An extinguished POWER indicator denotes a power failure.

- **BYPASS indicator:** This indicator lights steadily to inform the user that at least one zone has been selected for bypassing. An extinguished BYPASS indicator means that none of the zones is bypassed.

  Note: The BYPASS indicator functions only while the system is disarmed; bypassing is not possible while the system is in the armed state.

Note: The KP-1001/8 looks exactly the same as the KP-1001/16, except that there is no bottom row of LEDs (the LEDs numbered 9 through 16).
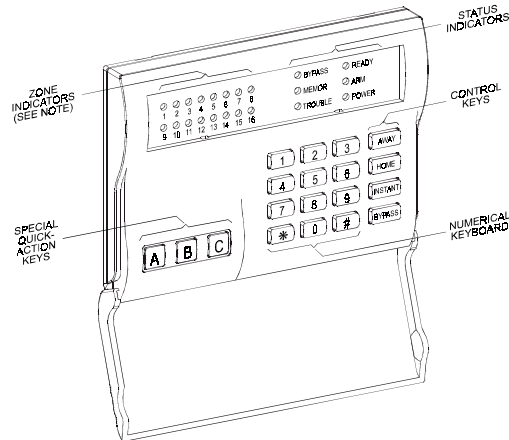
Figure 5.1 *Front View of the KP-1001/16*

- **MEMORY indicator:** This indicator lights steadily while the system is in the disarmed state as a sign that an alarm occurred throughout the last arm period or throughout the ongoing Disarm period. An extinguished MEMORY indicator is a sign that the recent arm/disarm cycle has been uneventful.

  Note: The alarm memory is cleared upon arming, and the MEMORY indicator does not function while the system is in the armed state.

- **TROUBLE indicator:** This indicator lights steadily whenever trouble is detected. The trouble indication is cleared upon arming. An extinguished TROUBLE indicator while the system is in the disarmed state signifies a "no trouble" situation.

A buzzer on the printed circuit board of the keypad "talks" to the installer and the user by sounding a few recognizable beeping sequences. The audible signals combine with the visual display to permit quick and easy programming and operation.

5.3 KP-1003 - Keypad with Large LCD

The KP-1003 features 19 keys (Fig. 5.2):

• A 3 x 4 key numerical keyboard.

• A column of 4 function keys: **AWAY, HOME, INSTANT** and **BYPASS**.

• A row of 3 special "quick-action keys": **A, B** and **C**.

The large LCD window serves as a system status and operation monitor, and displays information in plain language or in easy abbreviations.

The two LEDs at the right hand side of the panel are status indicators marked **TROUBLE** and **ARM**.

The front panel keys, the two LEDs and the LCD window serve as an interface between the alarm system and the installer or the user. Together they provide status information, display memorized data and also inform the installer or the user about the success or failure of each operation.

A buzzer on the printed circuit board of the keypad "talks" to the installer and the user by sounding a few recognizable beeping sequences. The audible signals combine with the visual display to permit quick and easy programming and operation.

## 5.4 KP-1002 - Keypad with Regular LCD

The KP-1002 is almost identical with the KP-1003. The only difference is that the LCD window is somewhat smaller. The description in Para. 5.3 above also applies to the KP-1002.

5.5 Mounting the Keypad/Display Units

Keypad/Display units may be installed wherever required on the premises, keeping in mind that the user must have easy access to the keys and a free view of the indicators. Also keep in mind that there is a limit to the distance between the keypad and the alarm control cabinet (Sec. 8). To mount a keypad on the wall, proceed as follows:

(1) Shut the front lid of the keypad to protect the keys.
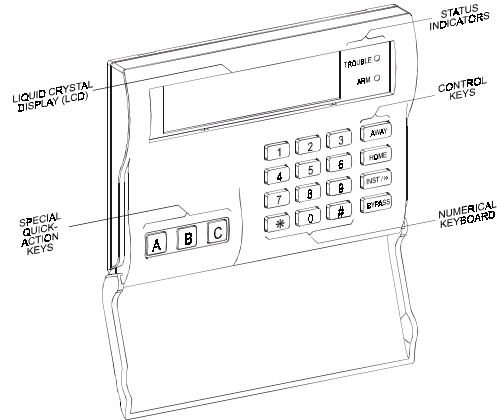
Figure 5.2 Front View of the KP-1003

(2) Insert a small screwdriver blade into one of the four slots near the corners of the case (Fig. 5.3). Swing the handle up and turn the screwdriver slightly to separate the two parts of the case at that corner. Then similarly separate the other corner on the same side of the case. Raise the free side of the base diagonally and pull the base out.

(3) The base has mounting and wiring holes, as shown in Fig. 5.4. Use it as a template to mark the drilling points on the wall and drill the holes.

Note: Be sure to place the base so that the two recesses are at the bottom.

(4) Pass the existing wiring through one of the wiring inlets and attach the base to the wall using four screws.
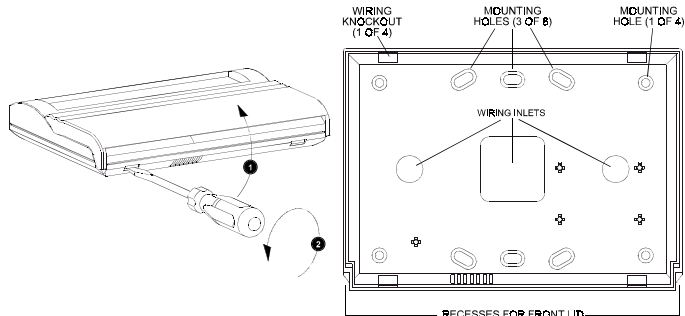
Figure 5.3 *Using a Screwdriver to Open the Case*

Figure 5.4 *Keypad Base Layout*

5.6 Connecting the Keypad to the Bus

Although there is a difference in component layout between the KP-1001 and KP-1002/KP-1003, all types of keypad accommodate the same terminal block at the same location on the printed circuit board. For this reason, only the KP-1001 printed circuit board is shown (Fig. 5.5).

The terminals are numbered from 1 to 4. If you are using a color coded bus cable, note down the color of the wire connected to each one of the control module's BUS terminals. Going by colors, make a "one for one" connection, where terminal 1 in the control module is connected to terminal 1 in the keypad, terminal 2 to terminal 2, etc.
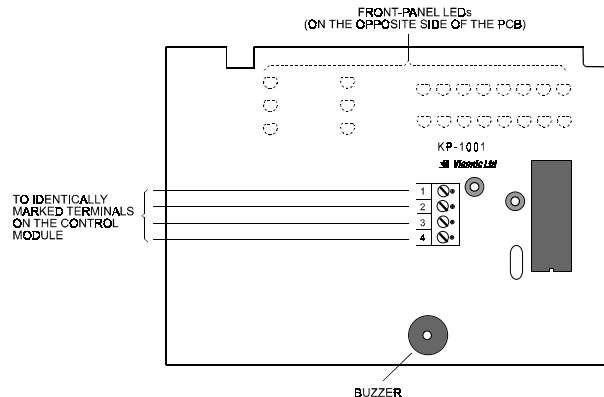
Figure 5.5 *Connecting a Keypad to the Keypad Bus*

IMPORTANT! *If the keypad bus is cut off and not even a single keypad is left connected to the alarm control module, a silent alarm will be initiated, meaning that the communicator will send a* **"keypad bus error"** *event code to the central station.*

Keypad bus error will be reported provided that you program the required event code in Location 34 - refer to the Installer's Programming Manual.

Upon reconnection of the keypad, a **"keypad restore"** *message will be sent to the central station (provided that you program the required event code in Location 34).*

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6. EXP - 1600 ZONE EXPANDER OPTION

6.1 Description and Use

The zone expander is a micro-processor controlled module designed to increase the system zone capacity from 8 to 16. It can be mounted either within the metal cabinet that hosts the alarm control module, or separately elsewhere within the protected area. If located within the metal cabinet, the EXP-1600 is connected to the control module via a short flat cable terminated with 4-pin plugs (this cable is supplied with each expander). Special 4-pin sockets are provided for this purpose on both the expander board (Fig. 6.1) and the control module board.

Installation away from the system control housing reduces the distance between the expander and its associated zone detectors.

A remotely located zone expander is connected to the control module via the same 4-wire bus that serves the control keypads. The bus, that utilizes multiplex communication techniques, is being constantly supervised by the control module, and a trouble alert is generated if a malfunction occurs. The EXP-1600 accommodates terminals for the additional 8 zones, and 12 VDC output terminals for supplying power to detectors used in the additional 8 zones. The 12VDC output terminals are especially useful in installations where the detectors of the additional 8 zones are closer to the expander than to the alarm control module. An optional plastic housing - the UPB-3 - can be used for remote installation of the EXP-1600 (Para. 6.2 B).

6.2 Mounting

Any MAESTRO-1600 or MAESTRO-1600DL may be expanded to control 16-zones by addition of the optional EXP-1600 module. This module can be mounted within the control cabinet or at a remote location, as described in the following paragraphs.

A. Mounting within the Alarm Control Cabinet
If you prefer to install the EXP-1600 within the metal cabinet,

refer to Fig. 1.1 for correct location of this module. Align the 4 mounting holes of the expander module with the 4 standoffs on the rear wall of the metal cabinet. Use four screws to fasten the EXP-1600 to these 4 standoffs. Next, connect the short flat cable assembly supplied with the
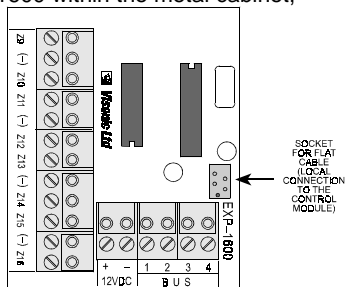

Figure 6.1 Zone Expander EXP-1600

EXP-1600 between the 4-pin sockets on the EXP-1600 and the alarm control module. **Align the plugs properly before insertion!**

B. Distant Mounting (Fig. 6.2 & 6.3)

To mount the EXP-1600 in an optional UPB-3 housing::
(1) Remove the screw that secures the UPB-3 cover to the base.
(2) Insert a small screwdriver blade into the slot near one of the snap-in teeth, as shown. Carefully flex the cover edge out, until the tooth disengages the dent. Repeat this with the other tooth to free the cover edge completely.
(3) Lift the free edge of the cover diagonally up and get the other edge free by pulling it backwards to disengage tabs at back.
(4) Hold the base against the mounting surface and mark the points for drilling.
(5) Drill the mounting holes and insert wall anchors if necessary. Choose the most convenient wiring entry holes and insert the wires into the base. Attach the base to the mounting surface with two screws.
(6) Put the expander module in place (see Fig. 6.3) with the bottom edge seated in the module edge support. Align the holes at the top of the PCB with the plastic standoffs in the base. Secure the module to the base with short hold-down screws
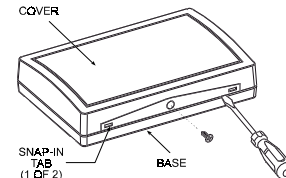

Figure 6.2 UPB-3,Cover Removal

(7) If you wish to protect the UMB-3 housing with a tamper switch, obtain a self-adhesive magnetic switch. Attach the magnet to the cover and the switch to the base Wire the switch to a zone programmed for 24 - hour tamper operation.
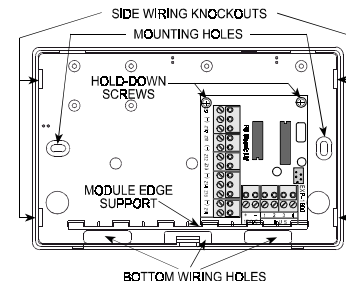

Figure 6.3 UPB-3 Base with EXP-1600

6.3 Wiring

Terminals   **Wiring Information**

12 VDC   A pair of **12 VDC (+)** and **(–)** supply terminals. The maximum current that can be obtained for external devices depends on the amount of current already drawn from the main control module by external devices. The total current should not exceed 700 mA.

BUS   Terminals 1 through 4 serve for connecting the expander to the system via a 4-wire keypad bus. Each terminal should be wired to its identically numbered counterpart in the MAESTRO-1600 control module or in one of the keypads. Refer to Sec. 8 - Bus Length Considerations.

Z9   Zone 9 terminal. A normally closed (N.C.) zone loop will be formed if the alarm contacts of all detectors in this zone are connected in series between this terminal and the nearest (–) terminal. An 10 kΩ End-of-Line (EOL) resistor must complete the series connected loop at the point most distant from the zone terminals.

(–)   A negative common terminal. Each zone loop is connected between the respective zone terminal and a **(–)** terminal.

Z10   The wiring instructions are the same as for zone 9, with which zone 10 shares the **(–)** terminal.

Z11 to Z16   Three pairs of zones, with a **(–)** terminal between each pair. Wiring instructions are the same as for the first pair of zones (Z9 and Z10).

Note: The module is shown here as viewed when installed within the metal cabinet

IMPORTANT! If the remote expander is disconnected from the keypad bus while the alarm system is in the disarmed state, a buzzer alarm will be initiated, and the communicator will send a *"Expander Bus Error"* event code to the central station.
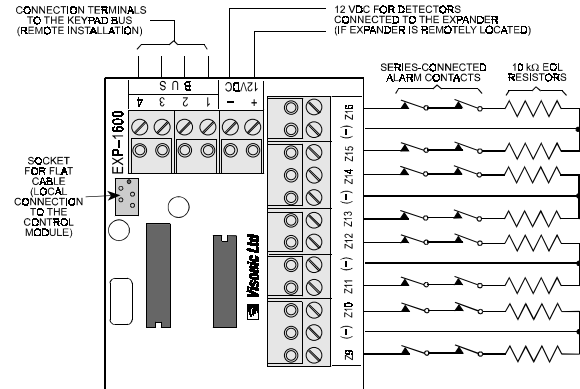

***Figure 6.4** EXP-1600 Wiring*

If the remote expander is disconnected from the keypad bus while the alarm system is in the armed state, a siren alarm will be initiated, and the communicator will send a "**Expander Bus Error**" event code to the central station.

Expander bus error will be reported provided that you program the required event code in Location 34 - refer to the Installer's Programming Manual.

Upon reconnection of the keypad, an **"Expander restore"** message will be sent to the central station (provided that you program the required event code in Location 34). The alarm will continue until it times out or until you stop it by keying **[User Code] [∗]** (see Sec. 3 in the User's Guide).

7. SIR - 1000 SIREN DRIVER OPTION

7.1 Description and Use

The SIR-1000 module (Fig. 7.1) is designed to produce a swept tone siren signal at a power level suitable for driving a 10 watt / 4 or 8-Ohm loudspeaker. The module is equipped with a board-to-board connector for easy integration with the control module - it mates with the connector at the lower right side of the alarm control module. Two screw terminals are provided for connecting a loudspeaker, and an on-board 1.5A fuse protects the SIR-1000 against short circuits across the loudspeaker terminals.
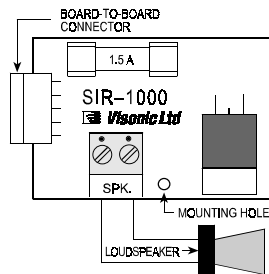

Figure 7.1 *SIR - 1000 Wiring*

7.2 Mounting

If you wish to add the SIR-1000 to an existing MAESTRO-1600 or MAESTRO- 1600DL, refer to Fig. 1.1 for module location. Mate the board-to-board connector on the SIR-1000 with the socket at the lower right edge of the alarm control module.

Once the connectors are mated, the mounting hole near the terminal block of the SIR-1000 will be aligned with a stand-off in the rear wall of the metal cabinet. Use a single screw to fasten the SIR-1000 to this standoff.

7.3 Wiring

Terminal	Wiring Information
SPK	Loudspeaker Output. Connect a $4\Omega/10W$ loudspeaker or two $8\Omega/5W$ loudspeakers in parallel across these terminals.

8. KEYPAD BUS LENGTH CONSIDERATIONS

8.1 Problem Analysis

When installing the MAESTRO-1600, you must take into account that the copper wires used to set up the keypad bus have specific resistance per unit of length, depending on the diameter of the wire. There is always a distance beyond which keypads (or the zone expander) will not work properly, due to the voltage drop along the cable. Keypads are usually "chained" along the bus, and an example of such "chaining" is shown in Fig. 8.1. In the configuration shown above, the voltage drop along the bus depends on the currents drawn by the various units and on the resistance of the bus wires. Your purpose should be to plan ahead so that the voltage at the far end of the line will not drop below the 10 V threshold with proper AC supply to the system.

Planning in advance will enable you to obtain a cable of appropriate gauge for the particular application. You will thus prevent low voltage problems that may compel you to re-wire the bus.
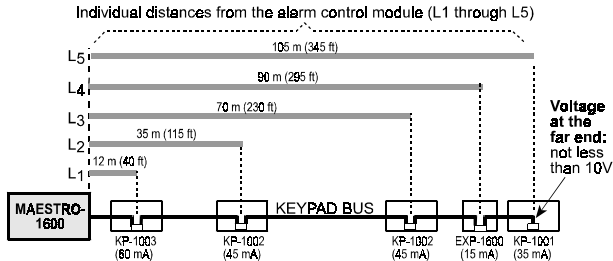
Figure 8.1 *Keypad Chaining Method*

8.2 Technical Data

The wire gauges available for laying out the bus are given below:

AWG Number	Diameter	Resistance per meter	Reference No.* For meters	For feet
24	0.5 mm	0.085 Ω	21.000	68.900
22	0.65 mm	0.053 Ω	35.000	114.800
20	0.8 mm	0.033 Ω	56.000	183.740
18	1.0 mm	0.021 Ω	88.000	288.720
16	1.3 mm	0.013 Ω	142.000	465.900

∗ If you use the calculating method given in Para. 8.3 below, this number will help you determine whether the wire you intend to use will not cause an excessive voltage drop.

The current drawn by the various keypads and zone expander are:

Unit	Current (mA)	Unit	Current (mA)
KP-1001	35 mA	KP-1003	60 Ma
KP-1002	45 mA	EXP-1600	15 mA

8.3 Calculating Method

Suppose you intend to use AWG 24 wires in the case presented in Fig. 8.1, and you wish to verify that this wire gauge will do.

A. Multiply the distance of each unit on the bus by the current drain (in mA) of that unit, as done in the following table (you may use meters or feet, as desired). When done, sum up all products of all multiplication made. The results are shown as "total" for both meters and feet.

Unit	Current (mA)	Distance Meters	Feet	Current x Distance for meters	for feet
KP-1003	60	12	40	720	2,400
KP-1002	45	35	115	1,575	5,175
KP-1002	45	70	230	3,150	10,350
EXP-1600	15	90	295	1,350	4,425
KP-1001	35	105	345	3,675	12,075
			Total:	10,470	34,425

B. At this stage, all you have to do is compare the computed total with the reference number pertaining to AWG24 in the wire data table (Para. 8.2). The reference numbers are **21,000** (for meters) and **68,900** (for feet).

- If the number you computed is **smaller than or equal to** the reference number, then AWG24 wires are suitable for this application.

- If the number you computed is **larger than the reference number**, then you should consider using a smaller AWG number (larger diameter cable).

NOTES:

1. If various detectors draw current from the distant expander, the calculation in A above must include them as well, in accordance with their individual distances from the alarm control module and their individual current consumption.

2. Once the installation work is done, it is recommended to measure the voltage at the end of the line, to verify that the last unit does not receive less than 10 volts DC (while the AC supply is normal).

3. If several keypad buses are branched out in parallel or in different directions from the alarm control module, each bus must be treated separately.

APPENDIX A. REMOTE AND LOCAL COMPUTER CONTROL

Total remote and local control of the MAESTRO-1600DL as well as data download/upload are possible, using optional hardware and computer software. A separate instruction manual will be supplied to purchasers of these optional items.

A.1 Remote Control

The optional items offered for remote control and download/upload operations are listed below and shown in Fig. A.1.

• The RM-1000 remote control modem.

• An RS-232 cable assembly, terminated with RJ-11 plug at the modem side, and a 9-pin D-type plug at the computer side.

• RPM-1 (Remote Programming Manager #1) software package that runs on IBM-PC™ and compatibles under Microsoft Windows™.

  This equipment and software, together with the remote computer, permit the remote station operator to:

• Exercise full remote control of the MAESTRO-1600DL, including status and data retrieval.

• Prepare and save new memory maps for the MAESTRO-1600DL. The data can then be downloaded via the telephone line into the system's memory.

• Upload the current memory map of any MAESTRO-1600DL. The data can then be changed, saved and downloaded back into the same MAESTRO-1600DL.

A.2 Local Control

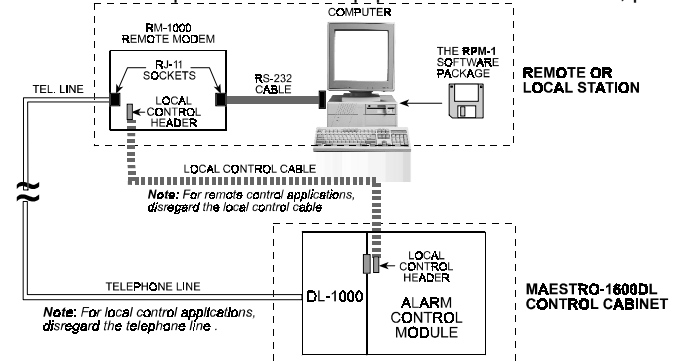Local control requires the same equipment as remote control, plus

Figure A-1. Remote and Local Control Configurations

a local control cable assembly (supplied in the remote control kit)to be connected between the local control headers of the RM-1000 and the MAESTRO-1600 alarm control module (Fig. A.1).

Local control permits the operator to carry out the same operations possible from a remote station, as listed in Para. A.1 above. The only difference is that data interchange is effected via the local control cable and not via the telephone line.

APPENDIX B. SYSTEM DATA RECORD

It is recommended to record all installation information in the following chart, which may prove useful when modifying the system.

Item	Details
Alarm Control System	MAESTRO-1600
Customer's Name	
Customer's Address	
Customer's Phone Number	
Customer's Account Number	
Central Station Name	
Central Station Phone No.	
Installation Date	
Zone 1 Type & Coverage	
Zone 2 Type & Coverage	
Zone 3 Type & Coverage	
Zone 4 Type & Coverage	
Zone 5 Type & Coverage	
Zone 6 Type & Coverage	
Zone 7 Type & Coverage	
Zone 8 Type & Coverage	
Zone 9 Type & Coverage	

Item	Details
Zone 10 Type & Coverage	
Zone 11 Type & Coverage	
Zone 12 Type & Coverage	
Zone 13 Type & Coverage	
Zone 14 Type & Coverage	
Zone 15 Type & Coverage	
Zone 16 Type & Coverage	
Quick Action Key A Function	
Quick Action Key B Function	
Quick Action Key C Function	
Priority Zones	
Perimeter Zones	
Chime Zones	
Number and Type of Keypads	
Keypad Locations	
Keyswitch Location (if installed)	
Internal Siren (yes/no)	
External Alarm Devices	
Installer's Code	

WARRANTY

Visonic Ltd. and/or its subsidiaries and its affiliates ("the Manufacturer") warrants its products hereinafter referred to as "the Product" or "Products" to be in conformance with its own plans and specifications and to be free of defects in materials and workmanship under normal use and service for a period of twelve months from the date of shipment by the Manufacturer. The Manufacturer's obligations shall be limited within the warranty period, at its option, to repair or replace the product or any part thereof. The Manufacturer shall not be responsible for dismantling and/or reinstallation charges. To exercise the warranty the product must be returned to the Manufacturer freight prepaid and insured.

This warranty does not apply in the following cases: improper installation, misuse, failure to follow installation and operating instructions, alteration, abuse, accident or tampering, and repair by anyone other than the Manufacturer.

This warranty is exclusive and expressly in lieu of all other warranties, obligations or liabilities, whether written, oral, express or implied, including any warranty of merchantability or fitness for a particular purpose, or otherwise. In no case shall the Manufacturer be liable to anyone for any consequential or incidental damages for breach of this warranty or any other warranties whatsoever, as aforesaid.

This warranty shall not be modified, varied or extended, and the Manufacturer does not authorize any person to act on its behalf in the modification, variation or extension of this warranty. This warranty shall apply to the Product only. All products, accessories or attachments of others used in conjunction with the Product, including batteries, shall be covered solely by their own warranty, if any. The Manufacturer shall not be liable for any damage or loss whatsoever, whether directly, indirectly, incidentally, consequentially or otherwise, caused by the malfunction of the Product due to products, accessories, or attachments of others, including batteries, used in conjunction with the Products.

The Manufacturer does not represent that its Product may not be compromised and/or circumvented, or that the Product will prevent any death, personal and/or bodily injury and/or damage to property resulting from burglary, robbery, fire or otherwise, or that the Product will in all cases provide adequate warning or protection. User understands that a properly installed and maintained alarm may only reduce the risk of events such as burglary, robbery, and fire without warning, but it is not insurance or a guarantee that such will not occur or that there will be no death, personal damage and/or damage to property as a result.

The Manufacturer shall have no liability for any death, personal and/or bodily injury and/or damage to property or other loss whether direct, indirect, incidental, consequential or otherwise, based on a claim that the Product failed to function. However, if the Manufacturer is held liable, whether directly or indirectly, for any loss or damage arising under this limited warranty or otherwise, regardless of cause or origin, the Manufacturer's maximum liability shall not in any case exceed the purchase price of the Product, which shall be fixed as liquidated damages and not as a penalty, and shall be the complete and exclusive remedy against the Manufacturer.

Warning: The user should follow the installation and operation instructions and among other things test the Product and the whole system at least once a week. For various reasons, including, but not limited to, changes in environmental conditions, electric or electronic disruptions and tampering, the Product may not perform as expected. The user is advised to take all necessary precautions for his /her safety and the protection of his/her property.

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