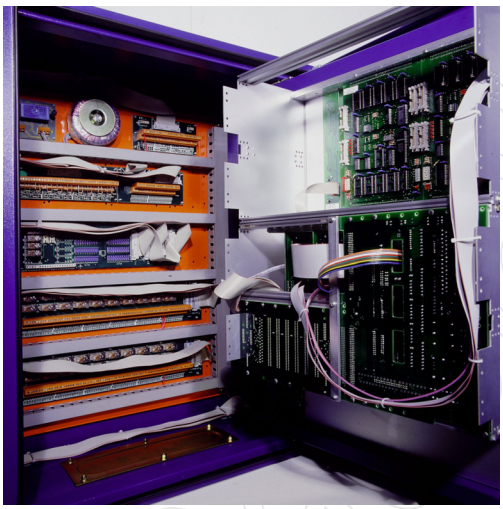
FMZ5 multifunctional control panels

FMZ5 multifunctional control panels are based on the concepts of modularity and distributed processing. They are capable of handling signals from all types of fire, alarm, and control field



sensors as well as supervising and controlling the status of field devices and logging local and remote signals. FMZ5 control panels use a multi-level HW architecture in which each function board has its own dedicated processor. Function board processors dialogue with a master processor on the control panel's main processor board. On higher levels, a number of sub-panels can be networked to a main control panel and even to a host computer. FMZ5 hardware is completely modular. Function boards are simply plugged in to the motherboard, so that the system can be expanded whenever required.

FMZ5 control systems are specifically designed to provide integrated security, covering the functions of fire detection and automatic extinguishing, the control of intruder alarm systems and plant alarm systems, and the control of closed circuit TV systems. FMZ5 control panels use VDS standard current controlled lines to link up with field sensors and actuators dedicated to fire extinguishing and all other remotely controllable functions. The ease with which a number of FMZ5 control panels can be interconnected also allows a significant reduction in the amount if cabling needed in distributed systems. One simple four wire serial cable is all that is needed to exchange data and control all I/O lines.



Great care has been taken in designing FMZ5 range of control panels to ensure the security of data and control signals and the immunity of the entire security system to external tampering. The success with which this objective has been achieved makes FMZ5 panels ideal for use even in the most arduous industrial environments. FMZ5 panels can interface with other similar panels via current loop or RS232 serial lines. Interfaces with dedicated sub-systems such as CCTV systems, on the other hand, use parallel cables in order to be able to handle larger installations.

The extremely modular design of FMZ5 control panels is based on standard 19" industrial rack architecture. Each individual rack has one or more motherboards into which the individual function boards or power supply boards are plugged. Motherboards are interconnected either directly or by flat cable. Field lines are connected to terminal boards which are connected to the function and processing boards again via flat cables. This system totally eliminates traditional wiring and offers tremendous advantages in terms of reliability and the ease and speed with which repairs can be made in case of malfunction or damage.

System architecture

The architecture of a distributed FMZ5 system is usually based on a number of sub-panels used as concentrators and distributed at strategic points around the building complex. These sub-panels

are all connected to and subordinate to the main control panel. The control centres in which the main panels are installed are normally manned and are located at the strategic nerve centres of the building complex. This distribution minimises the lengths of cabling needed to reach peripheral sub-panels. The location of individual sub-panels (concentrators) is obviously also determined to suit the number and type of peripherals and utility installations in the building. Sub-panels are connected to the main panel in the control centre by means of four wire serial cables. The network thus created may be cabled either in star configuration, with each sub-panel connected to the main panel by a separate cable, or in a loop configuration. Even mixed star-loop configurations are possible to make the most rational use of particular building layouts. Loop size is virtually limitless provided an adequate number of amplifiers is installed.

Sub-panels handle the building security functions. Each sub-panel can therefore have its own analog and digital inputs and outputs, its own local display and control devices (operator interface), and its own synoptic function monitoring displays. On top of these functions, the main panel in the control centre can also be connected to one or more host computers for the display and management of alarm systems. The host computer/s connected to the main control panel are kept permanently updated with all system status information, and can send the main panel all the commands needed to perform any permitted operation. Host computers are usually equipped with colour graphic monitors capable of displaying maps of the building complex and showing the status of all controlled alarms and functions. Host computers can also be connected to printers to provide hard copy listings of events and operator actions.

The standard configuration of modular FMZ5 19" rack control panels includes a keyboard and alphanumeric display. FMZ5 panels can also be equipped with LED status display and push-button function control boards, however. The number of analog input/output boards installed depends on the application to which the particular sub-panel is dedicated.

All panels are powered at 230 Vac 50 Hz. Power supply functions are performed by dedicated boards installed in the panels, which incorporate backup batteries to provide uninterrupted power in case of mains failure.

Sub-panels can operate completely autonomously of the main control panel. They can therefore continue to fulfill local functions in the unlikely event of a failure or breakage in the serial connection with the main control panel. This distributed processing architecture makes Caccialanza & C's FMZ5 systems effectively modular in practice as well as in design, and guarantees the maintenance of partial functionality even in case of localised malfunctions.

Types of FMZ5 control panel

Type 1 control panels





Type 1 control panels are 6 unit 19" rack panels designed to handle up to 40 analog inputs and 40 digital outputs. Type 1 control panels come complete with alphanumeric display, keyboard, and serial interface.

Type 2 control panels

Type 2 control panels are also 6 unit 19" rack panels. In addition to the main processor board, type 2 panels can house up to 4 standard analog/digital input/output boards.



Type 3 control panels



Type 3 control panels are 12 unit 19" rack panels. In addition to the function boards installed in type 2 control panels, they can also house LED status display and push-button function control boards.

Type 4 control panels

These are 19" rack panels of at least 12 units. They can house the same boards as type 1 and 2 control panels but can also be fitted with alarm display and control boards as well as LED status display and push-button function control boards. Type 4 control panels are not normally equipped with an alphanumeric display and keyboard.

Type 5 control panels





These are similar to type 2 control panels but feature a second 6 unit 19" rack to expand the data bus. This enables up to 12 analog/digital I/O boards to be installed.

Type 6 control panels

These are similar in specifications to type 5 panels but feature LED status display and push-button function control boards. The number of units/racks can be varied to suit system requirements, but normally this type of control panel is housed in a modular 42 unit cabinet. Type 6 panels are most common type of main control panel.

Boards

FMZ5 control panels incorporate a variable number of modular boards, either plugged directly one into the other or interconnected via flat cables. The following types of board may be installed:

- Motherboards: These are the boards into which individual function boards are plugged.
- Function boards: These are the boards which perform the individual system functions.
- Power supply boards.
- Interface and auxiliary boards.

The lines to and from field devices (sensors and actuators) terminate at special terminal boards which are connected to the other boards in the control panel by flat cables. This architecture ensures that it is a quick and easy on-site operation to replace individual system boards and to add further function boards to the system.

Motherboards

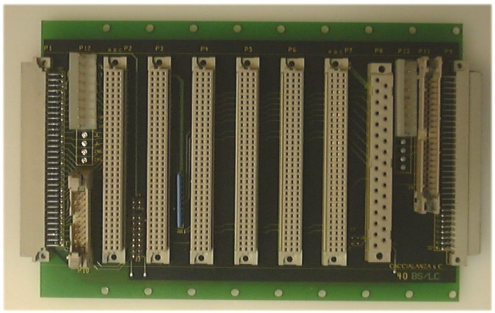
Various types of motherboards are produced to fit the needs of the different types of control panel. All motherboards are designed for installation as the base board of a standard 6 unit 19" rack. Motherboards installed in different racks are interconnected by plug-in flat cables.

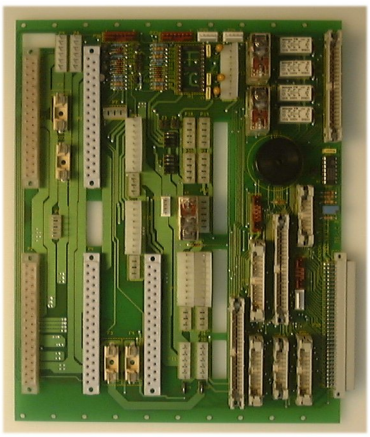
This is the list of the boards:

Part Number	Description	Layout Nr.	View Nr.
3195000109	FMZ5/40	39040116	BF540000
3195000909	FMZ5/48	39040187	BF548000
3409200209	FMZ5/70	39044707	BF570000

FMZ5/40 motherboard

This type of motherboard and system bus board is designed to receive the FMZ5/61 main processor boards, FMZ5/42 auxiliary boards, and FMZ5/41 alarm line control boards. The number of daughter boards installed in each motherboard depends on the configuration requirements of the control panel. The FMZ5/40 motherboard also has a slot for an FMZ5/D converter board. Each FMZ5/40 motherboard can be connected to other identical motherboards via flat cables to expand the system bus to whatever dimensions are required.

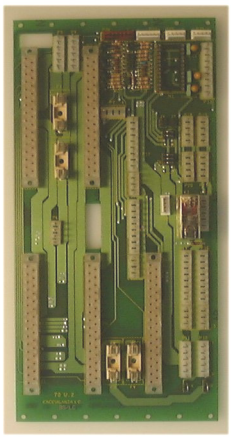




FMZ5/48 motherboard

This type of motherboard is designed to house the FMZ5/BA1 or FMZ5/BA4 power supply boards and to interconnect with system peripherals such as displays, keyboards, serial lines, etc.. One FMZ5/48 board is required in each sub-control panel or main control panel.

FMZ5/70 motherboard



This type of motherboard is designed to house the power supply boards needed to support system auxiliaries. It can house FMZ5/BA1 and FMZ5/BA4 power supply boards and FMZ5/D converter support boards. The number of these boards installed again depends on the power requirements of local and remote auxiliaries in terms of current and voltage.

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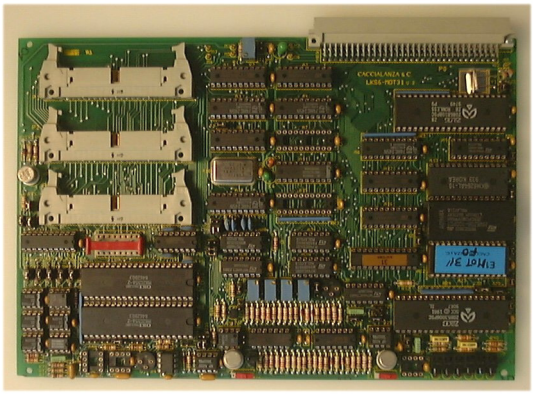
Function boards

These are the intelligent boards of the FMZ5 system. Their purpose is to provide individual functions and to coordinate the functioning of other boards. Function boards can be broadly subdivided into field signal acquisition boards, peripheral control boards, and system status supervision, control, and display boards.

The boards available in the system are the following:

Part Number	Description	Layout Nr.	View Nr.
4640013109	FMZ5/31	46193106	BF531000
3195000219	FMZ5/41	39040127	BF541000
3195000409	FMZ5/43	39040146	BF543000
3195000519	FMZ5/44	39040156	BF544000
3195000609	FMZ5/45	39040167	BF545000
3195000809	FMZ5/47	39040176	BF547000



FMZ5/31 main processor board

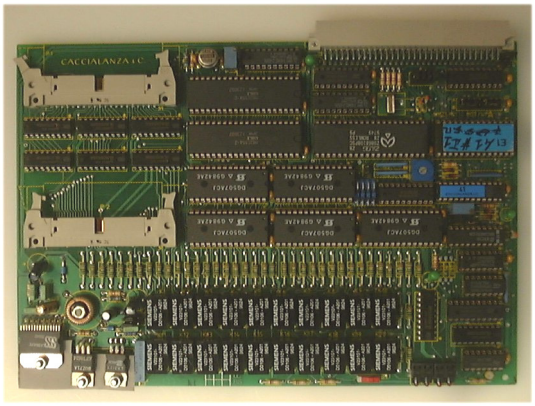
This type of main processor board is designed for either sub-panels or main control panels. On board are installed a Z8 microprocessor and three types of memory, RAM, EPROM, and non-volatile RAM. The FMZ5/31 also incorporates an RS232 serial port for connection to a host computer plus another current loop serial port for connections with other similar system devices.

One of the main functions of the FMZ5/31 main processor board is the control of the local bus to which all the other boards in the control panel, with particular reference to the I/O control boards, are connected.

The FMZ5/31 main processor board can be directly connected to an alphanumeric display for the visualisation of line and control panel status and a keyboard.

The FMZ5/31 also provides the physical interface for FMZ5/43 and FMZ5/44 LED status display and push-button function control boards.

FMZ5/41 alarm control board



This function board is designed to manage field alarm and detection lines (inputs) and relay and actuator control lines (outputs). The board incorporates a microprocessor of the Z8 family and a dedicated EPROM. The FMZ5/41 can handle up to 40 analog inputs and 40 digital outputs. Analog input lines are current controlled over range between 0 and 20 mA.

The FMZ5/41 has its own built-in DC/DC current converter to generate the currents required by the various controlled lines. The FMZ5/41 uses an

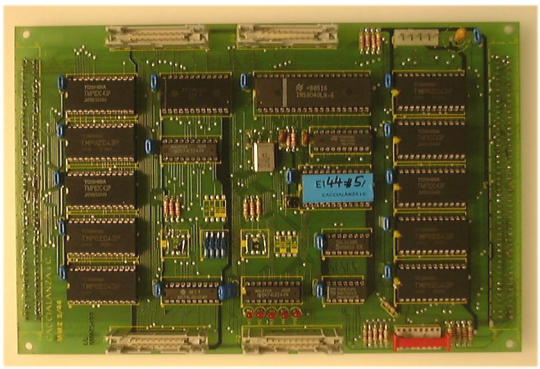
analog/digital converter and a set of multiplexers to convert current-carried analog data from the field into digital signals for local processing.

Each FMZ5/41 board has its own distinct address so that the sub-panel or main panel bus can access it and the lines it handles individually. The system bus carries line status information from the FMZ5/41 boards to the main processor board and line control instructions from the main processor board to the FMZ5/41 boards.

The FMZ5/41 is capable of performing autonomous connect and disconnect operations on the lines it handles to ensure system safety, as well as cyclical interrogation of each line to ascertain its status.

Digital outputs can likewise be controlled either by the local FMZ5/41 board or from the main processor board.

FMZ5/44 LED status display and push-button function control board

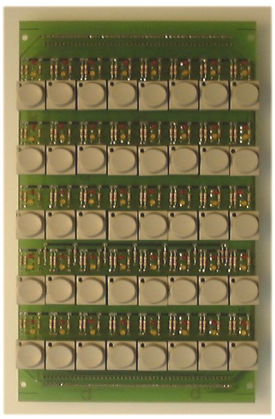


The FMZ5/44 board handles local display and control functions. It has its own on-board microprocessor and RAM and off-board EPROM. The FMZ5/44 is designed to plug directly into FMZ5/43, FMZ5/45, and FMZ5/47 LED status display and push-button function control boards.

The 40 inputs of the FMZ5/44 can be connected to up to 40 function control push-buttons. The board's 120 outputs are designed to drive status display LEDs.

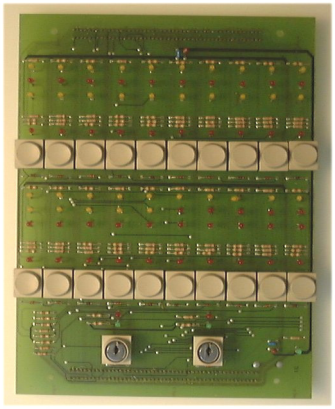
Each FMZ5/44 can be individually addressed. All the devices connected to the control panel can therefore be controlled and can display their status over the system bus and via the FMZ5/42 auxiliary board under the supervision of the main processor board.

FMZ5/43 LED status display and push-button function control board



This board is designed to display alarm conditions and panel status, and to permit the direct entry of commands via push-buttons. (Commands of this type serve mainly to connect and disconnect lines from the system.) The FMZ5/43 board is a dumb board, with no processor or memory of its own, and is designed to plug directly in to the intelligent FMZ5/44 board. LED status display and push-button function control boards are installed in the control panel right at the front to simulate a traditional but easily expandable LED and push-button control panel.

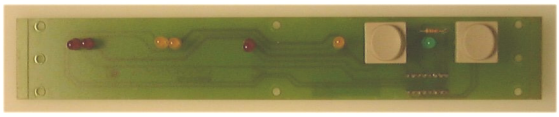
Each FMZ5/43 board can handle up to 40 lines to signal their malfunction and alarm statuses and to disconnect them from the system if necessary. The board provides individual push-button controls to manually disconnect each of the 40 lines.



FMZ5/47 LED status display and push-button function control board

Like the FMZ5/43 board, this board also serves to display status and to provide manual push-button controls. The FMZ5/47 has fewer inputs and outputs than the FMZ5/43, however, and is designed more specifically to handle manual and automatic extinguishing devices. The FMZ5/47 is fitted with key-locked push-buttons for the more critical functions. Technical specifications and installation are as for the FMZ5/43 board.

FMZ5/45 LED status display and push-button function control board



This board is designed mainly for the display of control panel alarm and malfunction conditions. It also provides local buzzer acknowledge/reset and alarm line acknowledge/reset functions. These functions can also be executed via the alphanumeric display and keyboard operator interface.

The FMZ5/45 is designed to be driven by the intelligent FMZ5/44 board. If the control panel has no operator interface other than the alphanumeric display and keyboard, the FMZ5/45 board can be controlled via the inputs and outputs provided by the FMZ5/42 auxiliary board.

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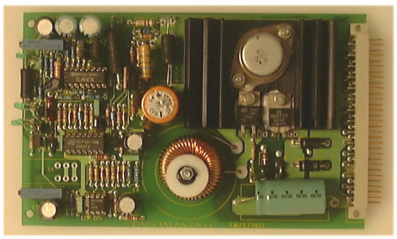
Power supply boards

This is the set of the power supply boards foreseen in the system:

Part Number	Description	Layout Nr.	View Nr.
3195006109	FMZ5/911	39043916	BF591100
3195006209	FMZ5/912	39043926	BF591200
3195006409	FMZ5/915	39043936	BF591500
3195005509	FMZ5/BA1-12	39042255	BF5BA110
3195005809	FMZ5/BA1-24	39042255	BF5BA120
3195005609	FMZ5/BA4-12	39043266	BF5BA410
3195005909	FMZ5/BA4-24	39043266	BF5BA420
3195002009	FMZ5/D2	39043197	BF5D5150
3195002109	FMZ5/D1	39043196	BF5D5140

FMZ5/BA1 power supply board

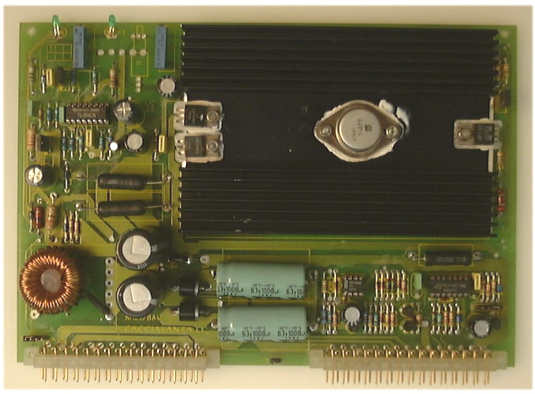


The FMZ5/BA1 board provides the system's DC power. The board itself is powered from the mains via a transformer. FMZ5/BA1 power supply boards can be jumpered in the factory to supply a maximum of 4A at 12V or a maximum of 2A at 24V.

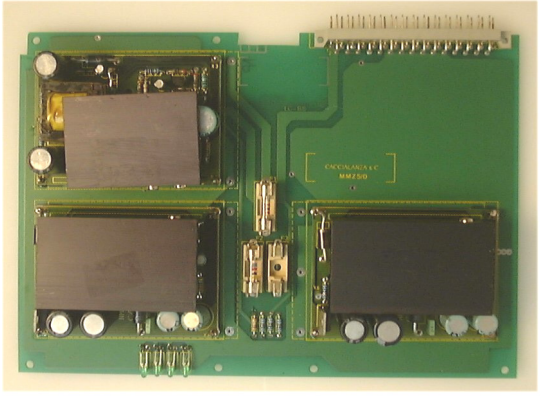
Another of the board's functions is to charge the system's backup batteries and to warn of mains power failure.

FMZ5/BA4 power supply board

This board shares the same technical specifications as the FMZ5/BA1, but delivers twice the power. The FMZ5/BA4 is again factory jumpered to deliver 8A at 12V or 4A at 24V.

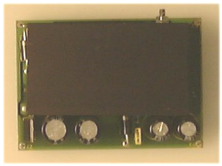


FMZ5/D DC/DC converter support board



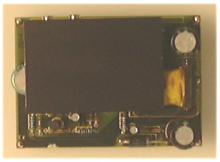
This board is designed to support the FMZ5/911 and FMZ5/912 DC/DC converter boards. One FMZ5/D must be installed in each bus section of the sub-panel to provide power for the boards installed. The FMZ5/D board is available in two levels of equipment to suit the power requirements of the boards installed in that particular bus section.

FMZ5/911 DC/D converter board



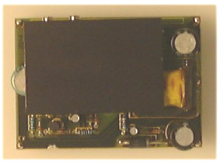
This DC/DC converter transforms 12V input power into the regulated and stabilised 5V output needed to drive the microprocessors and other digital devices in the control panel.

FMZ5/912 DC/DC converter board



This board converts the 12V input into the +15V and -15V outputs needed to drive the analog/digital converters on the line control boards. The FMZ5/912 DC/DC converter board also generates the voltages needed to power the RS232 serial lines.

FMZ5/915 DC/DC converter board



The FMZ5/915 is a DC/DC converter board which converts the +12V input into a -12V output. Its primary function is to boost the voltage needed to drive sensors which require more than 12V.

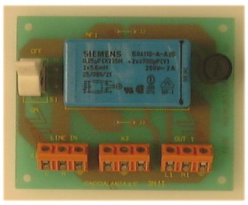
Interface and auxiliary boards

Interface boards connect up the lines coming in from the field, those going out to the field, and the serial communication lines. Auxiliary boards on the other hand perform the specific functions needed for particular operations.

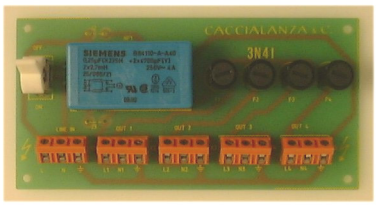
Those are the different functions:

Part Number	Description	Layout Nr.	View Nr.
4640010839	FMZ5/8FO	46190808	BF508FO0
3195007409	FMZ5/10	46191006	BF510000
3195004509	FMZ5/18	39044180	BF518000
4640011819	FMZ5/18F	46191806	BF518F00
3195004109	FMZ5/FMA	31055270	BF5FMA00
3195004309	FMZ5/FME	31055290	BF5FME00
3195004209	FMZ5/FML	31055280	BF5FML00
3195004219	FMZ5/FML2	31055282	BF5FML20
3195004409	FMZ5/FMS	31055260	BF5FMS00
3195005109	FMZ5/N1	39043216	BF5N1000
3195005209	FMZ5/N4	39043246	BF5N4000
4640010909	FMZ5/SLR	46190906	BF5SLR00
3193155909	FMZ5/SME	31049596	BF5SME00
3193155509	FMZ5/SMR	31049556	BF5SMR00

FMZ5/N1 mains power interface board



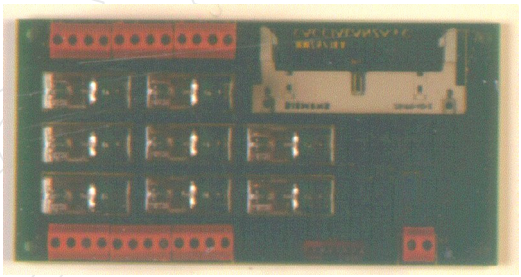
The FMZ5/N1 is designed to allow devices requiring 230V 50Hz power to be connected to the system. It incorporates a mains filtre and protective fuse and power terminals capable of connecting wires of up to 2.5 mm2 in cross section.



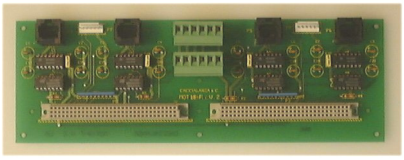
FMZ5/N4 mains power interface board

As for the FMZ5/N1 but capable of interfacing up to 4 230V 50Hz power users and delivering a total current of up to 4A.

FMZ5/18 serial line interface board



This serial line interface board can be programmed by DIP switches to handle two current loop channels or one RS232 and one current loop channel. The FMZ5/18 has a special connector for plugging in serial line testers for testing the functioning of serially linked logic blocks in sub and main control panels and via these, other system connections.

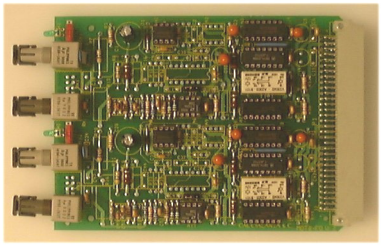


FMZ5/18F optical fibres serial line interface board

The board is designed to control the serial line in the main panel HZ or il local panels UZ for the optical fibres version of the system. The board is designed to house up to two FMZ518FO optical interface cards.

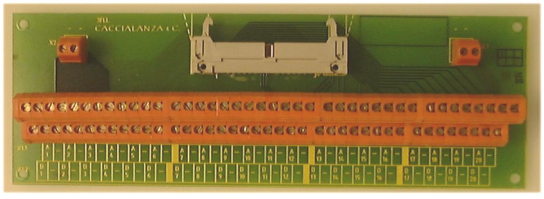
For each section a transformation of the incoming and outgoing signals is foreseen into the RS 232 standard, with a total capability of 4 independent COMs connectable.

FMZ5/8FO transceivers board



This board is equipped with two pairs of optoelectric transducers to perform the receive and transmit function of the optical fibre and can be operated in a loop.

The unit is also equipped with the sectioning devices which are required to insulate a portion of the communication loop (both transmit and receive fibres)

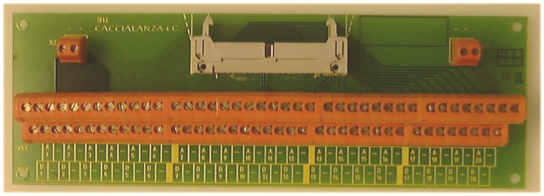


FMZ5/FML terminal board

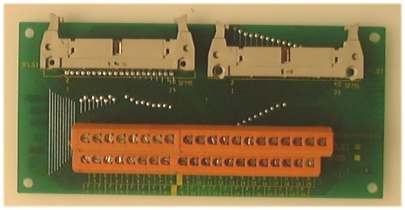
The FMZ5/FML terminal board is designed to connect inputs from the field (sensor and detection devices). It can be equipped with auxiliary power

supply modules to handle sensors requiring different voltages. FMZ5/FML terminal boards are connected to the motherboard via a flat cable. They can connect field line wires of up to 2.5 mm2 in cross section.

FMZ5/FME terminal board



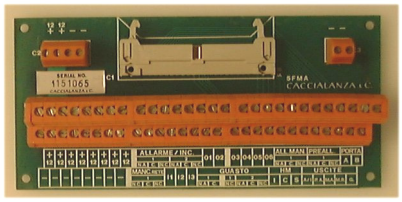
The FMZ5/FME terminal board is designed to connect outputs to the field (e.g. intruder alarm and device control lines). FMZ5/FME boards connect to the control panel and to the lines themselves in exactly the same way as FMZ5/FML boards.



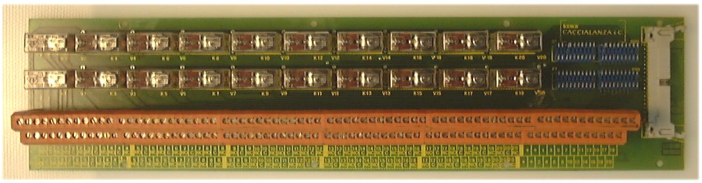
FMZ5/FMS terminal board

This type of terminal board is designed to provide external connections for warning display and control signals generated by the control panel in response to fire, intruder, or malfunction alarms. FMZ5/FMS boards do not insulate their outputs from the system. One of their main uses is to drive LED repeater panels.

FMZ5/FMA terminal board



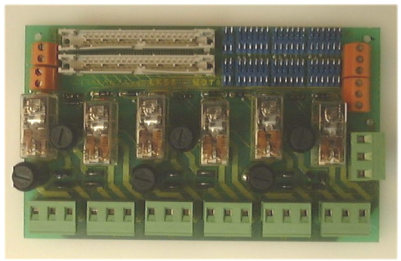
This type of terminal board provides connections for general control panel functions (relays, auxiliary power supplies, etc.). Outputs are not insulated from the system other than by one or two switch contacts.



FMZ5/SMR relay board

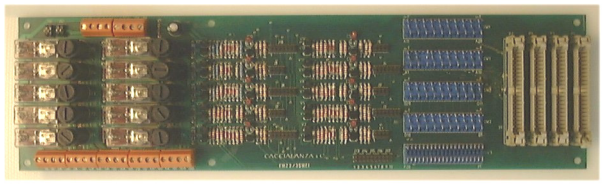
This is a 20 relay board. Each relay has two free switching contacts. These relays can be operated by alarm and malfunction signals from the control panel.

FMZ5/SLR relay board



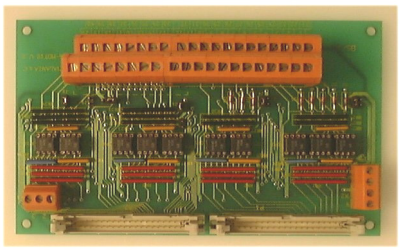
This is a power relay board designed to provide direct mains power. It is fitted with 6 single contact relays for currents of up to 4A, 230V. Each contact is protected by its own fuse. The board can power up to 6 devices at user programmable voltages up to 230V.

FMZ5/SME actuator control board



This type of board is designed to operate actuators in the field, and particularly fire extinguishing devices. The board is fitted with a fuse for each user, and provides a signal to the control panel for the display of fuse and power status.

FMZ5/SME boards can be interfaced with FMZ5/41 alarm control boards to provide line current control and pre-alarm and extinguishing alarm functions. FMZ5/SME boards can drive 10+10 lines with pre-alarm and alarm functions.



FMZ5/10 optoisolated terminal board

The FMZ5/10 optoisolated terminal board is designed to connect lines carrying signals from the field. This type of optoisolated terminal board may be needed if e.g. electrical disturbances make it essential to insulate the field from the rest of the system.

Host computers

The host computer is the "brain" of the entire system and controls all the connected service and security devices.

The main functions of the host computer are:

- to display the status of devices in an intelligible, user-friendly manner;
- to provide a user friendly interface for operator instructions;
- to run the system automatically;
- to handle more than one parameter at the same time.

The computer used as host needs a hard disk and a high resolution graphic colour monitor. A printer can be added to the configuration if required. The monitor automatically displays alarm activity on any field line in the system.



The software can be customised during installation to display maps of the building and its security system, showing all the alarm and control lines involved. These graphics can be used to enable and disable (connect and disconnect) individual field lines and, if necessary, even enable and disable local functions in sections of the field. Line alarm status is displayed automatically. One of the functions of the main program screen is to show in real time the total number of alarms and malfunctions detected in the system. Individual alarms are displayed in greater detail at cyclical intervals. Individual lines (in normal or alarm condition) can be selected either by keying in their identification code on the keyboard or by highlighting them with the mouse on the screen. Both methods automatically load

the definitions and specifications of the line selected so that the dialogue box displayed contains the right commands for that particular type of line. The mouse can also be used to call up a list of lines in alarm status, and to select from this list an individual line on which to perform an operation.

The host computer can be used to detect alarms, recognise operator codes, acknowledge and reset alarms (obviously once the physical event which triggered the alarm has been eliminated). The operator can also be asked to key in his identity code to associate with alarm conditions. The code keyed is then saved together with alarm data and acknowledge time in a log. Once an alarm has been acknowledged, it can be cancelled from the screen, and further notes on it added to the log. All system events can be printed out on paper as well as recorded on hard disk.

Special software is available to evaluate alarm conditions per period, per type of alarm, and per line. Partial, selective logs can also be saved to diskette for subsequent analysis and archiving. There is also an automatic line management program which allows line enabling and disabling schedules to be drawn up and even varied from day to day over the period of a whole year.

The FMZ5 system can be configured to include a main host computer plus a variable number of backup hosts. These can be configured to take over functions if a fault develops in the main host or in other dedicated hosts in the system. This openness also enables data to be acquired from the system and operations on field lines performed from computers which are not normally used as part of the security system but which can be linked in to it as and when required.

System components

All types of fire detection and anti-intruder sensors can be connected to the FMZ5 control panel. Likewise the FMZ5 control panel can drive any type of actuator for automatic extinguishing and auxiliary control, as well as the various types of local or central warning panels. The FMZ5 control panel can also support systems like closed circuit television, badge reader networks with or without personnel timekeeping functions, and remote, microprocessor controlled fire monitor systems. The functioning of systems like these can be controlled either directly by the main control panel or indirectly via dedicated sub-panels, and as already stated, FMZ5 control panels can be connected to one or more host computers to provide a graphic user interface for alarm management, log generation, and operations control from a central control room.

For fire detection purposes FMZ5 control panels can be connected to the following types of sensor, all of which are powered from the control panel over the field line:

- double chamber ionisation smoke detectors
- optical smoke detectors
- differential temperature and/or temperature threshold detectors
- modulated infrared flame detectors
- standard, wall mounted, or recessed manual fire alarm push-buttons
- sealed manual fire alarm push-buttons
- photocell smoke detectors
- ultraviolet flame detectors

Note that the last two types of detector are not powered over the field line but require separate power lines to be laid. Of course, these power lines can be run through the same cable channels.

All the above types of sensor can be supplied in special versions for use in areas where there is a risk of explosion. Sensors which do not have a separate power supply can (and should) be protected with Zener safety barriers. These protection systems can be installed in a section of the control panel or, as is more convenient in most cases, in special panels or cabinets located near the

danger areas. Devices with a separate power supply, on the other hand, are normally supplied in special explosion proof versions instead.

FMZ5 control panels can drive all sorts of automatic extinguishing devices and systems, including environment saturation systems and specific object protection systems, and can control extinguishing devices either independently or in strategic groups. Larger extinguishing systems can be built up using multiple cylinder batteries, in which extinguishing zones can be selected and operated autonomously by means of flow control valves. CO2 can be used as extinguishing medium as can any other non-toxic, non-polluting Halon gas substitute product. Extinguishing systems must operate a pre-alarm function which can be provided by the FMZ5/41 alarm control board. A range of foam extinguishing techniques can also be applied. High expansion foam can be used for environment saturation systems and medium expansion foams can be applied through local object protection nozzles. FMZ5 control panels can control both the foam generators and foam distribution and delivery devices. FMZ5 control panels can also handle open sprinkler water extinguishing systems and indoor and outdoor object protection powder extinguishing systems.



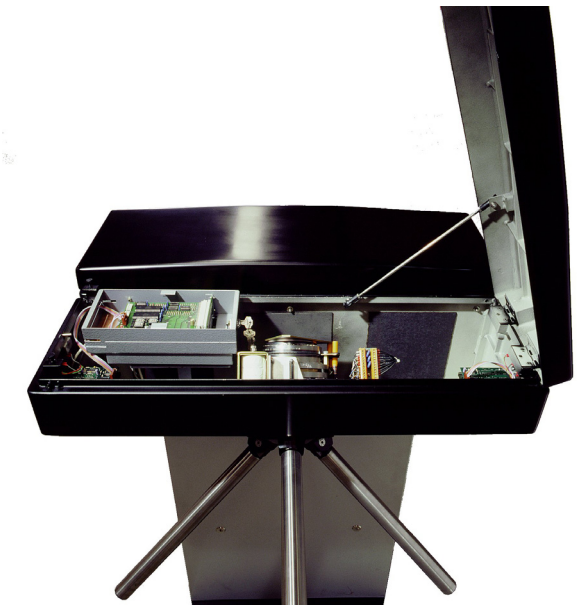
In anti-intruder applications FMZ5 control panels are capable of interfacing practically any type of active or passive sensor on the market. Though some of which do not require separate power lines, in most cases (and particularly with indoor and outdoor microwave sensors, indoor and outdoor modulated active infrared barriers, passive infrared sensors, and combination microwave and infrared sensors), a separate power line has to be laid. Multi-wire cables can be used to provide these sensors with power from the auxiliary power supply boards in the control panel, to provide anti-tamper supervision (whether the line is enabled or not and whether its alarm is operational or not), and to control all the anti-intruder functions required. These supervision and control functions are provided by FMZ5/41 alarm control boards using two separate current controlled input lines.

Electronic or electro-mechanical switches installed outside the control panel can be used to connect or disconnect individual field lines or sections of the installation according to a fixed timetable or whenever required. Disconnection systems of this type can be programmed to run in addition to the alarm control software, and can again be controlled from the FMZ5 control panel or a host computer.

The CCTV systems interfaceable with FMZ5 control panels are normally videocamera systems (based on solid state units). These are supervised from the control panel to detect tampering and are connected, via video lines switched at a video crossbar, to a number of monitors. The number and size of devices in the CCTV system obviously depends on the requirements of the installation.

Video crossbar switching can be performed manually or by an internally controlled automatic cycle. Crossbar functioning can also be controlled from the FMZ5 control panel to coincide with real time alarm conditions on one or more fire or intruder detection lines. The FMZ5 control panel controls the video crossbar via a parallel interface from a dedicated FMZ5/41P board. This type of board provides high speed control of systems even with a large number of nodes without penalising the other functions of the overall system.

FMZ5 control panels can be used in similar ways to control video recorder networks with automatic recording start on detection of an alarm signal, or recording from sources in predetermined sequences.



The MKL3 badge reader system can also be interfaced with FMZ5 control panels via a serial line. MKL3 systems normally work autonomously, controlling and exchanging access authorisation data with peripheral badge readers in accordance with zone, ID code, and time band programs. Daily, weekly, and monthly personnel timekeeping data is also normally processed autonomously. On the other hand information of primary importance to the integrated building security system, such as information on unauthorised access activity, controlled access line tampering and malfunctions, and auxiliary line alarms is transmitted instantly from the MKL3 badge reader system to the main FMZ5 control panel over the serial line. The MKL3 badge reader control panel can also use the serial line or the auxiliary outputs of the badge reader peripherals to switch the functioning mode of the FMZ5 control panel, sections of it, or individual lines. This may be necessary, for example, to automatically activate and deactivate volumetric type alarm sensors on the days or in the time bands in which authorised personnel are present in the areas controlled by those sensors.

How a system is designed

Before an FMZ5 based security system can be designed in detail, it is essential to know exactly what zones of the premises have to be protected, what sort of protection they require, and the number and type of sensors needed to ensure that protection. Once this information has been established, the optimal positioning and grouping of the sensors can be worked out. This in turn enables the system designer to establish the number of field lines required to connect up the sensors and actuators. Then, on the basis of the layout and the technical specifications of the building, the security system designer can proceed to define the number and location of sub-control panels to optimise the routing of field lines and make the most intelligent use of hardware modularity. The last aspect of the system specification to be ascertained is the location of the main control panel and host computer interfaces.

Once system requirements and specifications have been established, the designer can proceed to work out the number and type of lines handled by each sub-control panel. Lines can generically be divided into:

- fire detection lines with automatic detectors, optionally associated with manual fire alarm push-buttons;
- manual fire alarm push-button lines;
- extinguishing system control lines with or without pre-alarm function;
- control lines for the auxiliary peripherals of the pre-alarm system (hooters, fire warning panels, etc.), and for the extinguisher system actuators (cylinder battery pressurisation valves, etc.);
- lines for monitoring essential functional values such as pressure, temperature, alarm conditions, etc.;
- lines for displaying the status of system peripherals (malfunctions, fuel reserve warnings for backup power generators, power failure warning, etc.);

- lines for monitoring values not directly linked with the detection system but which need to be displayed at the main control centre;
- anti-intruder control lines connected to one or more sensors;
- lines for operating local alarm warning panels from the control panel;
- remote device control and feedback lines for activating and modifying functions in all or sections of the control panel.

The main control panel can use direct inputs/outputs or serial lines for connection to the rest of the system. Obviously, in small systems, one control panel can be sufficient to handle all functions without further peer to peer connections.

The next design stage involves the definition of the operator interface devices to be connected to the control panel. Both sub-panels and main control panels can be connected to alphanumeric displays and keyboards, LED status display and push-button function control boards, or a combination of both. Alphanumeric display and keyboard interfaces are normally adequate for sub-panels. This type of operator interface is always installed in sub-panels even in un-manned locations, since it enables essential diagnostic tests to be run during maintenance operations. It is important to bear in mind the potential of the FMZ5 system in terms of hierarchical structuring when choosing the type of operator interface.

Finally the system designer must decide on the number of relays the system has to interconnect and control in order to operate external devices like air conditioners, fire doors and fire windows, and automatic pre-alarm warning devices.

The system layout determined in this way then has to be transferred to special forms in order to draw up a complete and detailed materials bill and a list of system inputs and outputs. This list serves as the basis for the dimensioning of the overall system, the selection of individual function modules, and the choice of the types of control panel best suited to the application.

The network of serial links between the various sub-panels, main panel, and host computer(s) now has to be planned out, and to optimise this it can be beneficial to review the location and number of control panels previously calculated, taking into consideration the final number of field lines and connections. It may prove advantageous to increase the number of sub-panels originally estimated, or, on the other hand, combine the functions of more than one unit into a single panel, thus reducing the original total.

Finally, installed sub-panels and main panels are interconnected using four wire serial lines. The serial line network may be configured:

- in a star formation, with each sub-panel connected individually to the main control panel;
- in a loop (ring) formation;
- in a mixed star/loop configuration.

The optimal network configuration should be determined on the basis of installation specifications. Though the designer is free to use various configurations, the following requisites and design limitations must be satisfied:

- Individual loop sections cannot exceed 200 metres without the interposition of a signal amplifier.
- The maximum number of devices in any loop varies from 3 to 16 depending on the length of the connection.
- The maximum theoretical length of the loop is virtually limitless providing an adequate number of amplifiers is installed.
- Each amplified section of loop can have a maximum length of between 300 and 500 metres depending on the type of cabling used. Amplifier boards can be installed in the main control panel, in the sub-panels, or even at any suitable point along the line where a mains power outlet is available.