Connecting a MultiIFAX to a Building Management System

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Connecting a *MultiIFAX* to a Building Management System

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Issue 2.0

As further enhancements are made to the *IFAX* system, the specification contained in this document may change without notice. It is important to make sure only the latest issue is in use. Wherever possible, any changes will be backwards-compatible with earlier specifications. Changes made to this document, since the previous issue, are marked with a line in the margin.

The information contained in this document is confidential. It is supplied for the sole purpose of linking a B.M.S. to an *IFAX* system.

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Chapter 1

Introduction

The *IFAX* system is a family of Fire Alarm Control Panels. The panels can provide a link to a Building Management System (B.M.S.) / Environmental Management System (E.M.S.). This document will refer to all such systems as B.M.S.'s.

The *IFAX*-to-B.M.S. link, where applicable, adheres to international standards. This document follows the Reference Model of Open Systems Interconnection (OSI) (ISO 7498: 1984, BS 6568: Part 1: 1988).

The current implementation allows for all events that occur at the *IFAX* to be reported to the B.M.S. There is no provision for a B.M.S. to control the *IFAX*.

A single B.M.S. link can be used for a network of *IFAX*'s, with all *IFAX*'s reporting their events back to the one B.M.S.

Conventions used in this manual


This document is designed to be read in conjunction with the online Help System supplied with the *OnSite* computer program. This symbol in the margin indicates a reference to the online Help system. It can be accessed by selecting `Contents` from the `Help` menu of the *OnSite* program or by pressing `F1` at any time during the program.

Chapter 2

Mechanical and Electrical Characteristics

Mechanical Characteristics

The connector is a 9-way 'D-type' connector, as specified in ISO 2110: 1989 (E). The connector has male (pin) contacts. The connector has two standard-threaded locking posts.

The connector is situated at the lower edge of the Main Board on the door of the *IFAX* system and is marked J11. It is possible to order special Repeater control units with a connector installed.

Electrical characteristics

The connections meet the electrical specifications of EIA-232-D and CCITT V.28. All connections are ground-referenced to the *IFAX* system and its mains supply.

Contact Assignments

Pin	Circuit	Function	Direction
1		No connection	
2	104/BB	Received Data	*IFAX* ← B.M.S.
3	103/BA	Transmitted Data	*IFAX* → B.M.S.
4	108.2/CD	DTE Ready	*IFAX* → B.M.S.
5	102/AB	Signal Ground	*IFAX* — B.M.S.
6		No connection	
7	105/CA	Request to Send	*IFAX* → B.M.S.
8	106/CB	Clear to Send	*IFAX* ← B.M.S.
9		No connection	

The circuit numbers are those specified by CCITT recommendation V.24, followed by the circuit numbers used by EIA-232-D.

The metal case of the connector is connected to an External Ground within the *IFAX* system and should be used as a shield for the interconnecting cable.

Received Data is received by the *IFAX* system. This B.M.S. protocol does not use Received Data, but no data should be transmitted to the *IFAX* system as the connection is used for other purposes. This connection should be permanently 'LOW' or permanently 'HIGH'. It can be made permanently high by connecting it to DTE Ready (pin 4).

At a later date, the Received Data connection may provide a B.M.S. with control over the *IFAX* system.

Transmitted Data is sent from the *IFAX* system (DTE) to the B.M.S. (Data Circuit-terminating Equipment, DCE).

DTE Ready, formerly called Data Terminal Ready (DTR), is sent from the *IFAX* system to the B.M.S. It is permanently 'ON'. Absence of this signal may be used by the B.M.S. to detect either a power-off condition in the *IFAX* system or the disconnection of the interconnecting cable (see EIA-232-D, paragraph 2.1.5).

Signal Ground is the reference for the signals.

Request to Send (RTS) is sent from the *IFAX* system to the B.M.S. It provides hardware flow control for the Received Data connection. This connection can be ignored.

Clear to Send (CTS), also known as Ready for Sending, provides hardware flow control for the Transmitted Data connection. It is sent from the B.M.S. to the *IFAX* system while the B.M.S. is ready to receive data from the *IFAX* system. When Clear To Send is 'OFF' the data code element currently being transmitted will be completed and no more codes will be transmitted until this signal is 'ON'. If it remains 'OFF' for more than twelve seconds, the *IFAX* system will assume that the B.M.S. is powered off or the interconnecting cable is disconnected.

Chapter

3

Data Transmission Protocol

Data is transmitted from Transmitted Data contact when there is data available and when the Clear to Send is 'ON'.

It is sent in bit serial format according to ISO 1177: 1985. There is one start bit, followed by eight data bits (least significant bit first), followed by two stop bits.

The most significant data bit is always zero (0). The remaining seven data bits comprise a code as defined by ISO 646.

Transmission proceeds at 4800 bits per second (bps).

Chapter 4

Protocol of Message Packets

The serial connector is used as a B.M.S. connection port only when it has been configured to do so by the *OnSite* computer program.

All codes that are transmitted by the *IFAX* system are 'printable' codes in the range <SPACE> (code 32) to '~' (code 126). The only exception to this is the carriage return / line feed (CR/LF) character pair (code 13, code 10) that is sent at the end of each packet. Each packet comprises not more than 256 characters, followed by a CR/LF pair.

Each packet starts with a character that determines the type of the remainder of the packet.

The following event message packet format is that defined as default by the *OnSite* program. It is possible to transmit the event message packets in other formats, as defined in the Messages dialogue box in *OnSite*.

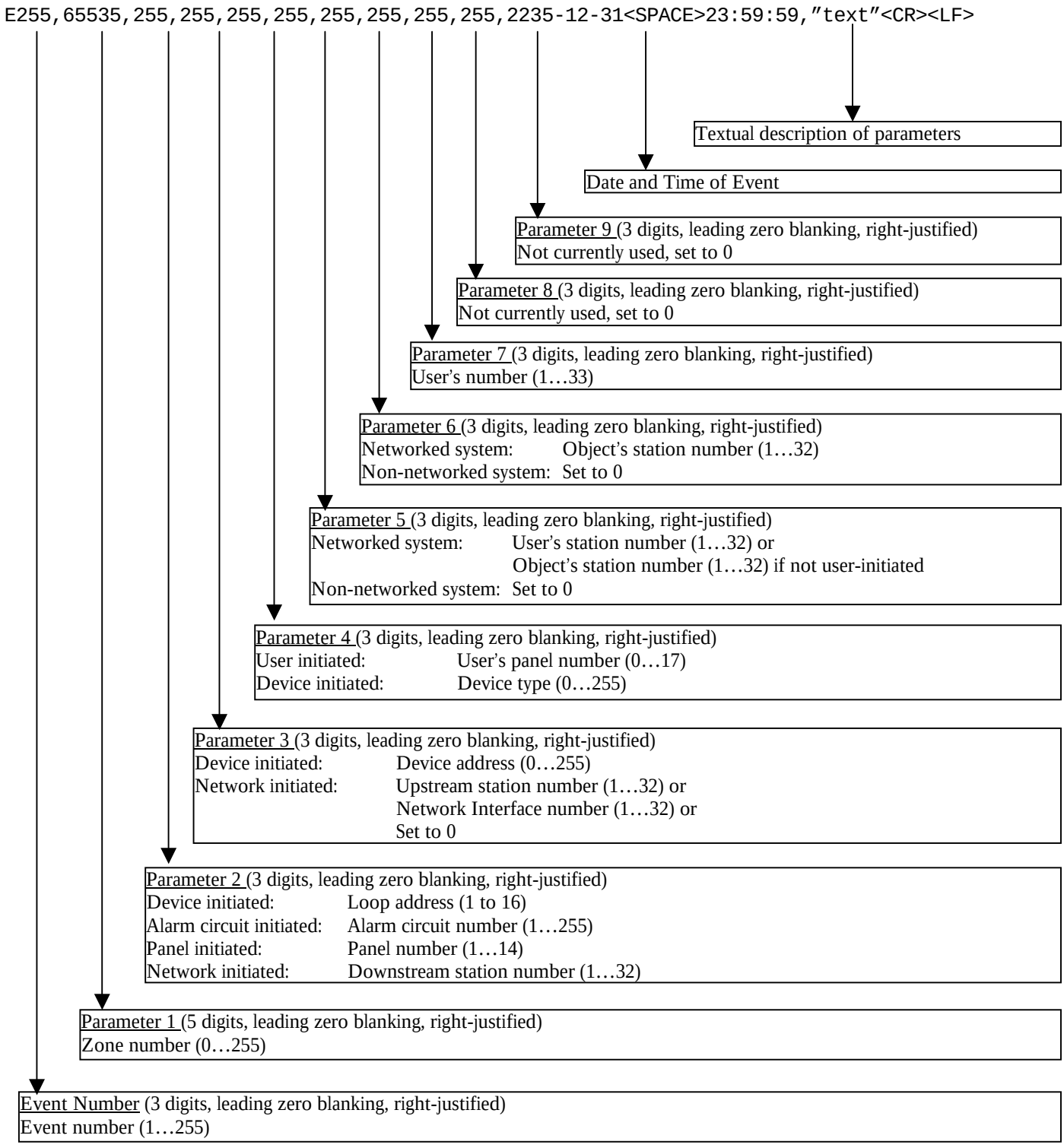
An event message packet starts with the character 'E'. An event message packet is transmitted for every event that occurs in the *IFAX* system.

All other packets should be ignored. This includes 'null' packets, which consist of just a CR/LF pair.

Each event message packet comprises 65 to 105 characters, followed by the CR/LF pair. The packet is a sequence of parameters, separated by commas. The first parameter is the event number, describing the type of event. The event number determines the meaning of each of the other parameters.

The meaning of the parameters for each event number is described in more detail in the following section.

The structure of the event message packet is as follows:


E255,65535,255,255,255,255,255,255,255,255,2235-12-31<SPACE>23:59:59,"text"<CR><LF>
Textual description of parameters
Date and Time of Event
Parameter 9 (3 digits, leading zero blanking, right-justified)
Not currently used, set to 0
Parameter 8 (3 digits, leading zero blanking, right-justified)
Not currently used, set to 0
Parameter 7 (3 digits, leading zero blanking, right-justified)
User's number (1…33)
Parameter 6 (3 digits, leading zero blanking, right-justified)
Networked system: Object's station number (1…32)
Non-networked system: Set to 0
Parameter 5 (3 digits, leading zero blanking, right-justified)
Networked system: User's station number (1…32) or
Object's station number (1…32) if not user-initiated
Non-networked system: Set to 0
Parameter 4 (3 digits, leading zero blanking, right-justified)
User initiated: User's panel number (0…17)
Device initiated: Device type (0…255)
Parameter 3 (3 digits, leading zero blanking, right-justified)
Device initiated: Device address (0…255)
Network initiated: Upstream station number (1…32) or
Network Interface number (1…32) or
Set to 0
Parameter 2 (3 digits, leading zero blanking, right-justified)
Device initiated: Loop address (1 to 16)
Alarm circuit initiated: Alarm circuit number (1…255)
Panel initiated: Panel number (1…14)
Network initiated: Downstream station number (1…32)
Parameter 1 (5 digits, leading zero blanking, right-justified)
Zone number (0…255)
Event Number (3 digits, leading zero blanking, right-justified)
Event number (1…255)

Each event is initiated by a source. The initiator may be a sensor, sensor circuit, zone, panel, alarm circuit or an 'user'. The user for an event may be:

- an operator at the main control panel (user number 1 to 32 and panel number 0)
- an operator at a repeater control unit (user number 1 to 32 and panel number 1 to 14)
- [panel number 15 is not used]
- an internal operation, such as sensor initiated (user number 33 and panel number 16)
- an external operation, such as from an external computer (user number 33 and panel number 17).

The Device's Type (parameter 4) is that allocated by the *OnSite* program through definitions in the `IFXDEV.DAT` file.

The Alarm Circuit's Type (parameter 1) is from the following table:

0	Undefined Output
1	Sounder
2	Beacon
3	Remote Signal
4	Auxiliary Relay (monitored)
5	Auxiliary relay (unmonitored)
6	Internal Alarm Sounder

The date and time sections of the message conform to complete representation, extended format as defined by ISO 8601 : 1988 (BS 7151 : 1989), paragraphs 5.2.1.1 and 5.3.1.1.

The text section of the message may be empty, but the quotation marks will always be present. The text consists of 0 to 40 ASCII characters from the set[1]

`ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz`
<space>`0123456789,.;:'?!%&*()+-=#$/<>[]^`{}`

There are no embedded carriage returns, line feeds or tab characters. Device-based events have text describing the zone and device address[2]. Other events have undefined text. Future versions of this protocol may define uses for the text section for events that are not device-based. For the present, the text section should be ignored unless the event is device-based.

[1] Any double-quotation marks(`"`) are automatically converted to single quotation marks(`'`).

[2] On a networked-system, the device-based text **does not** include any description of the station.

Chapter 5

Meaning of Event Numbers

This section should be read in conjunction with the online Help system supplied with the *OnSite* program. Selecting *IFAX Events and Messages* from the *Contents* page of the Help system will access a detailed description of each event, how it is displayed on the *IFAX* and the parameters for the event.

Most event numbers have pre-determined meanings, but some event numbers are reserved for 'site-specific' events.

Some event numbers are used internally by the *IFAX* system and will never be transmitted as an event.

Some event numbers are currently undefined; these may be used at a later date, but they will conform to the same style.

Special 'procedures' may be configured to generate any of these events. This use of events is outside the scope of this document and should be documented as site-specific alterations to the standard Technical Manual by the person who writes the special 'procedures'.

In a networked system, the event record at each station records all events from all stations, except for network faults and fault recoveries (these are generated independently at each station). For more details, see the *IFAX* document *System Networking*.

Parameters 8 and 9 are currently set to 0 for all events. Later versions of *IFAX* software may define these parameters and use numbers in the range 0 to 255.

Chapter

6

Event Messages and *IFAX* States

In order to mirror the state of the *IFAX* system the B.M.S. should implement a set of state machines.

This chapter describes recommended state machines for devices, loops and alarm circuits. It is possible to construct state machines for other *IFAX* objects.

It is not feasible to implement a zone state machine for *IFAX*-95 systems as some devices in a zone may be in a Device Alarm State, while others are in a Device Disabled State, for example.

Each state machine is described below in some detail. Each state machine moves from one state to another on receipt of an appropriate event message. Note that some events affect several state machines.

These state machines do not include any transitions generated by 'site specific' events.

Device State Machine

The B.M.S. will need to implement a state machine for each device address (1 to 126), if it wishes to follow events at the device level. This includes all 126 addresses for each loop that is implemented, even if there is no device at a particular address (the address could generate an *Extra Sensor* event).

States: Device Healthy, Device Fault, Device Alarm, Device Disabled, Device Test., Device Warning

Unless otherwise stated, the events only affect a particular device state machine if both the loop number (parameter 2) and the device address (parameter 3) match those for the state machine.

The loop-based events only affect a particular device state machine if the loop number (parameter 2) matches that of the state machine.

The zone-based events only affect a particular device state machine if the zone number (parameter 1) matches the zone number of the device. This implies that the B.M.S. must contain a table showing the zone number for each device. The B.M.S. cannot obtain this information from the *IFAX* system.

The state machine is mostly 'history-independent', in that any particular event will always cause a transition to a fixed state, regardless of the previous state. The exceptions to this are Event 16: Configured with Sensors and the Re-enabled events. The state machine starts in the Device Healthy State.

The following events will cause the Device state machine to enter the Device Fault State (if the parameters match those for the particular device):

Event 67: Missing Sensor
Event 68: Incorrect Sensor Type
Event 69: Failed Sensor
Event 70: Extra Sensor
Event 82: Multiple Sensor Address
Event 85: Sub-Circuit Fault at Sensor
Event 86: Alarm Circuit Fault at Sensor
Event 194: Device at Reserved Address
Event 195: Incorrect Group Address

The following events will cause the Device state machine to enter the Device Warning State (if the parameters match those for the particular device):

Event 71: Pre-Alarm
Event 89: Device Test Failed
Event 90: FIRE Warning
Event 138: Sensor Class Change
Event 191: Compensation Exceeded
Event 192: Working Life Exceeded

The following events will cause the Device state machine to enter the Device Alarm State (if the parameters match those for the particular device):

Event 128: Sensor Fire
Event 131: Sensor Alarm
Event 133: Sensor Room Alarm
Event 134: Sensor Intruder
Event 136: Sensor Bomb Alert
Event 137: Sensor Evacuate
Event 141: Sensor Alert

The following events will cause the Device state machine to enter the Device Healthy State (if the parameters match those for the particular device):

Event 9: Sensor Healthy
Event 11: Event Record Started
Event 16: Configured with Sensors *(All device state machines that are not in **Device Disabled** State)*

The following events will cause the Device state machine to enter the Device Healthy State (if the parameters match those for the particular device and the Device state machine is in the Device Disabled State):

Event 48: Zone Re-enabled *(Parameter 1 must match zone of device)*
Event 49: Sensor Re-enabled
Event 50: Loop Re-enabled *(Parameter 2 must match loop number of device)*

The following event will cause the Device state machine of all devices to enter the Device Healthy State:

Event 0: System is Healthy

The following events will cause the Device state machine to enter the Device Disabled State (if the parameters match those for the particular device):

Event 112: Zone Disabled *(Parameter 1 must match zone of device)*
Event 113: Sensor Disabled
Event 114: Loop Disabled *(Parameter 2 must match loop number of device)*

The following event will cause the Device state machine to enter the Device Test State (if the parameters match those for the particular device):

Event 139: Sensor Test

Not all transitions between states will occur with the current *IFAX* implementation, but it is simpler to implement the state machine as if they will occur.

Loop State Machine

The B.M.S. will need to implement a state machine for each loop that is implemented (1 to 16 or less), if it wishes to follow events at the loop level.

States: Loop Healthy, Loop Fault, Loop Disabled.

The Loop Fault State does not indicate that devices on the loop are in the Device Fault State. The Loop Disabled State indicates that *all* devices on the loop are in the Devices Disabled State and that loop faults are disabled.

Unless otherwise stated, the events only affect a particular loop state machine if the loop number (parameter 2) matches that for the state machine.

The state machine is mostly 'history-independent', in that any particular event will always cause a transition to a fixed state, regardless of the previous state. The exceptions to this are Event 16: Configured with Sensors and Event 50: Loop Re-enabled. The state machine starts in the Loop Healthy State.

The following events will cause the Loop state machine to enter the Loop Fault State (if the parameters match those for the particular loop):

Event 24: Interference Level
Event 72: Loop Short Circuit
Event 74: Loop Open Circuit
Event 77: Loop Driver Module Incompatible Software
Events 78 and 79: Loop Driver Module Hardware Failure
Event 81: Loop Driver Module Hardware Failure
Event 84: Communication Failure between Main Board and Loop Driver Module
Event 188: Loop Earth Fault

The following events will cause the Loop state machine to enter the Loop Healthy State (if the parameters match those for the particular loop):

Event 4: Loop Healthy
Event 11: Event Record Started
Event 16: Configured with Sensors *(All Loop state machines that are not in **Loop Disabled** State)*

The following event will cause the Loop state machine to enter the Loop Healthy State (if the parameters match those for the particular loop and the Loop state machine is in the Loop Disabled State):

Event 50: Loop Re-enabled

The following event will cause the Loop state machine of all loops to enter the Loop Healthy State:

Event 0: System is Healthy

The following events will cause the Loop state machine to enter the Loop Disabled State (if the parameters match those for the particular loop):

Event 114: Loop Disabled

Alarm Circuit State Machine

The B.M.S. will need to implement a state machine for each alarm circuit that is implemented (1 to 255), if it wishes to follow events at the alarm circuit level.

Only alarm circuits that are local to the control panel are able to generate fault events.

States: Alarm Circuit Healthy, Alarm Circuit Fault, Alarm Circuit Disabled.

Unless otherwise stated, the events only affect a particular alarm circuit state machine if the alarm circuit number (parameter 2) matches that for the state machine.

The state machine is mostly 'history-independent', in that any particular event will always cause a transition to a fixed state, regardless of the previous state. The exceptions to this are Event 17: Powered Up, Event 99: Control System Fault and the Re-enabled events. The state machine starts in the Alarm Circuit Healthy State.

The following events will cause the Alarm Circuit state machine to enter the Alarm Circuit Fault State (if the parameters match those for the particular alarm circuit):

Event 73: Alarm Circuit Short Circuit
Event 75: Alarm Circuit Open Circuit
Event 189: Alarm Circuit Earth Fault

The following events will cause the Alarm Circuit state machine to enter the Alarm Circuit Healthy State (if the parameters match those for the particular alarm circuit):

Event 5: Alarm Circuit Healthy
Event 11: Event Record Started
Event 17: Powered Up *(Not in **Alarm Circuit Disabled** State)*
Event 99: Control System Fault *(Not in **Alarm Circuit Disabled** State)*

The following events will cause the Alarm Circuit state machine to enter the Alarm Circuit Healthy State (if the parameters match those for the particular alarm circuit and the Alarm Circuit state machine is in the Alarm Circuit Disabled State):

Event 51: Alarm Circuit Re-enabled
Event 52: Alarm Group Re-enabled *(Alarm circuit type is defined as in the group)*

The following event will cause the Alarm Circuit state machine of all alarm circuits to enter the Alarm Circuit Healthy State:

Event 0: System is Healthy

The following events will cause the Alarm Circuit state machine to enter the Alarm Circuit Disabled State (if the parameters match those for the particular alarm circuit):

Event 115: Alarm Circuit Disabled
Event 116: Alarm Group Disabled *(Alarm circuit type is defined as in the group)*

Chapter 7

Examples

Devices entering and leaving an Alarm condition

1. Device at address 23 on loop 1, of type 3, in zone 4, enters an alarm condition. Non-networked system.

2. The following event message is transmitted to the B.M.S.:
```
E128,    4,  1, 23,  3,  0,  0,  0,  0,  0,1998-01-27 16:24:53
```

3. At the B.M.S., the device state machine for Loop 1 Address 23 enters the Device Alarm State.

4. User 17 at repeater panel 5, silences the sounders, then activates a system reset.

5. The following event messages are transmitted to the B.M.S.:
```
E 14,    0,  0,  0,  5,  0,  0, 17,  0,  0,1998-01-27 16:26:46
E 13,    0,  0,  0,  5,  0,  0, 17,  0,  0,1998-01-27 16:29:04
```

6. Device at Loop 1 Address 23 returns to a healthy condition

7. The following event message is transmitted to the B.M.S.:
```
E  9,    4,  1, 23,  3,  0,  0,  0,  0,  0,1998-01-27 16:29:13
```

8. At the B.M.S., the device state machine for Loop 1 Address 23 enters the Device Healthy State.

Appendix

Other *IFAX* Technical Publications

Many other technical publications are available from the Multi Alarm website: http://www.multialarm.co.uk/.

Relevant Standards

EIA-232-D-1986	Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.
ISO 646: 1973	Information processing - ISO 7-bit coded character set for information interchange.
ISO 1177: 1985 (E)	Information processing - Character structure for start-stop and synchronous character oriented transmission. (Also known as BS 4505: Part 2 : 1990).
ISO 2110: 1989 (E)	Information technology - Data communication - 25-pole DTE/DCE interface connector and contact number assignments. (Also known as BS ISO 2110: 1989).
ISO 7498: 1984	Information processing systems - Open Systems Interconnection - Basic Reference Model and Addendum 1: Connectionless mode transmission. (Also known as BS 6568: Part 1: 1988).
ISO 8601: 1988	Data elements and interchange formats - Information interchange - Representation of dates and times. (Also known as BS 7151 : 1989).
CCITT Recommendation V.24: 1989	List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment.
CCITT Recommendation V.28: 1989	Electrical characteristics for unbalanced double-current interchange circuits.

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