USER'S MANUAL

Omniflex

Maxiflex M126xA3 Maxilarm CPU

SCOPE: Maxiflex A3 Series Maxilarm CPU is a distributed industrial alarm annunciator. Based on the Maxiflex 1000 Series Product Range, it is a highly reliable and flexible annunciation system. It can operate as a single, standalone device or be distributed using the Conet/c field bus network or Ethernet using the Conet/e protocol. It is designed to work with Omniflex's Omni-4000 Windows based alarm management package (CC018A).When used in conjunction with Omniflex OPC Server (CC026A) the Maxilarm A3 CPUs can work with any third party SCADA that supports the OPC interface. Maxilarm A3 CPUs time tags to 1ms, drives local annunciator fascias, has facilities for control pushbuttons, audible warning device outputs and supports remote I/O routing and control.

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1.   Getting Started

What Is Maxilarm?

Maxilarm is the front-end component of a complete annunciator system. It may be used with any SCADA system, as long as the SCADA supports OPC (OLE for Process Control).

It may also be used with Omni-4000 for Windows an Omniflex developed Alarm Management Package. Maxilarm usually comes as part of an entire alarm management system with Maxiflex Hardware, Network cabling and Supervisory systems.

The Maxilarm A3x CPU is based on the Maxiflex P3 CPU range. It therefore supports all the standard features of the P3 CPUs as well as the Maxilarm controller function.

Note : This manual covers Maxilarm functionality only. For all other functions and features of the A3 CPU, please refer to the Maxilfex P3 User Manual.

The Maxilarm system

Omni-4000 master station(s)

If the Maxilarm system includes Omni-4000, the Omni-4000 manuals describe that system fully.

Briefly, Omni-4000 for Windows (CC018A) is not a SCADA package but an Alarm Management Package developed by Omniflex, which can be used with Maxilarm equipment. It is ideal for an Alarm Station within a control room, alongside the SCADA system, but may also be used on its own without any SCADA. Omni-4000 provides a comprehensive alarm management facility for fast fault analysis and has been used in power stations and general industry.

Third party SCADA master

This could be any available SCADA system used in conjunction with Omniflex Conet OPC Server (CC026A).

Maxilarm front-end hardware

The following items in the Maxiflex range can be used in a Maxilarm annunciator system:

Table 1: Description of their modules and their uses

MODEL	MODULE DESCRIPTION	USED FOR
M1021	3 I/O MASTER BASE (EXPANDABLE)	BASE FOR SYSTEM
M1022	7 I/O MASTER BASE (EXPANDABLE)	"
M1031	5 I/O EXPANDER BASE (used with M1021A)	"
M1032	8 I/O EXPANDER BASE (used with M1022A)	"
M1102	24 V dc LOGIC PSU	POWER SUPPLY FOR 24 V dc SYSTEMS
M1151	110/220 V ac LOGIC/FIELD PSU	PSU FOR MAINS WITH NO BATT BACKUP, PLUS WITH ISOLATED 24 V dc OUTPUT FOR POWERING FIELD CONTACTS (UP TO 2A SUPPLY)
M1152	110/220 V ac/12V LOGIC + CHRGR (0.5A CHRG) PSU	PSU FOR MAINS WITH BATTERY BACKUP
M1264	32 BIT CPU WITH INTEGRAL CONET PORT	CPU WITH MAXILARM FUNCTION
M1265	32 BIT CPU WITH ETHERNET PORT	CPU WITH MAXILARM FUNCTION
M1322	16 DIG INPUT (10-30 V dc) LOGIC ISO. COMMON.	ALARM INPUTS AND PUSH-BUTTON INPUTS
M1323	16 DIG INPUT (30-60 V dc) LOGIC ISO. COMMON.	"
M1326	32 DIG INPUT (24VDC)	"
M1760	32 CH SOE MODULE (24VDC)	ALARM OUTPUTS, GROUP ALARM OUTPUTS , AUDIBLE OUTPUTS AND BEACON OUTPUTS
M1761	32 CH SOE MODULE (48VDC)	"
M1342	32 DIG OUTPUT	"
M1330	8DI8RO MODULE	"
M1341	16 DIG OUTPUT LOGIC ISOLATION	
M1372	8 RELAY O/P, 2A 250V AC N/O CONTACTS	"

2. Maxilarm Overview

Description

Maxilarm is a powerful distributed Alarm Annunciator system that comprises 3 main components:

- The Front-end Maxiflex equipment
- The Conet Network (ie. Conet/e (Ethernet) or Conet/c (twisted pair))
- The Master Station

The flexible hardware solution with a range of bases, power supplies and I/O modules, enables the user to configure the alarm annunciation system to exact plant requirements. This can be done both locally and remotely over the Conet network.

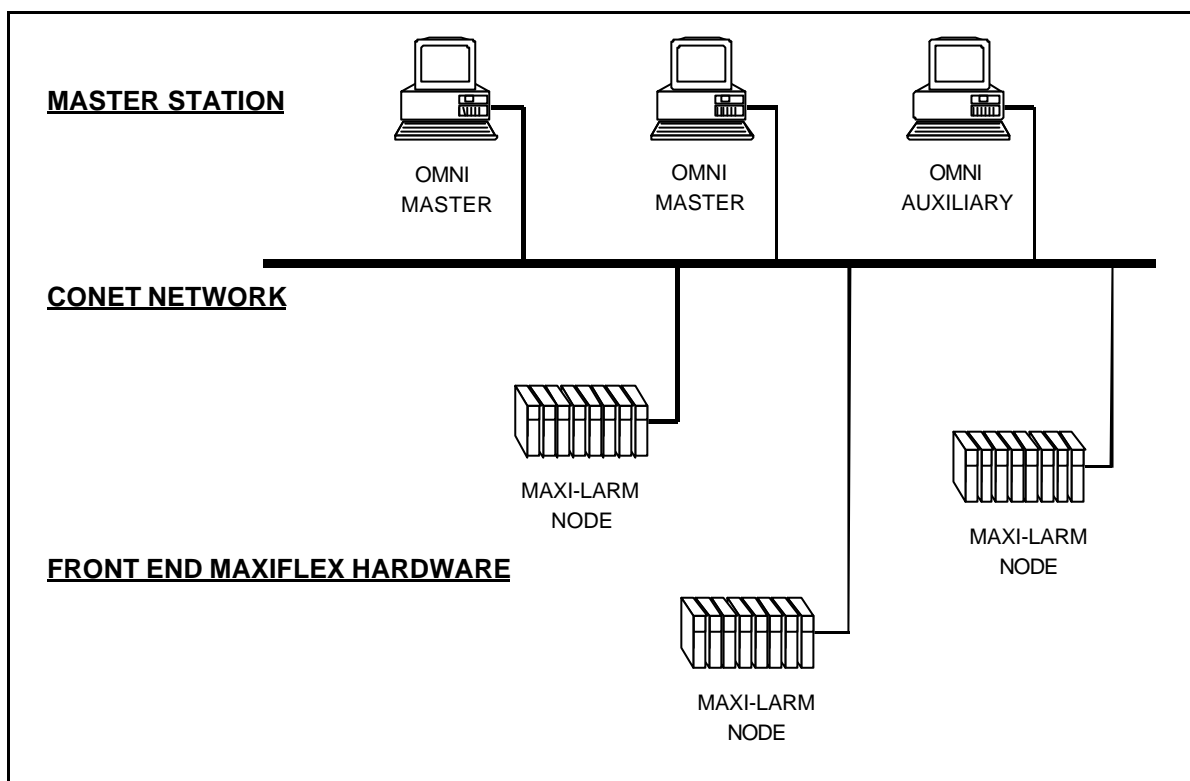Figure 2.1 below is a system overview of a typical Maxilarm system.

Figure 2.1: Maxilarm System Diagram

Alarm events captured in the A3 CPU can be sent up to 4 PC's operating as Master Stations (eg. Omni4000 or other SCADA systems). These can be arranged as Master Stations or Auxilliary Stations as required.

Conet/c allows up to 127 nodes.

Conet/e allows up to 65000 nodes.

Maxilarm derives its powerful flexibility by combining Omniflex's standard network capabilities with the function of alarm annunciation and sequential events recording. The figure below shows the basic features of Maxilarm for a system using a single node to provide full functionality.
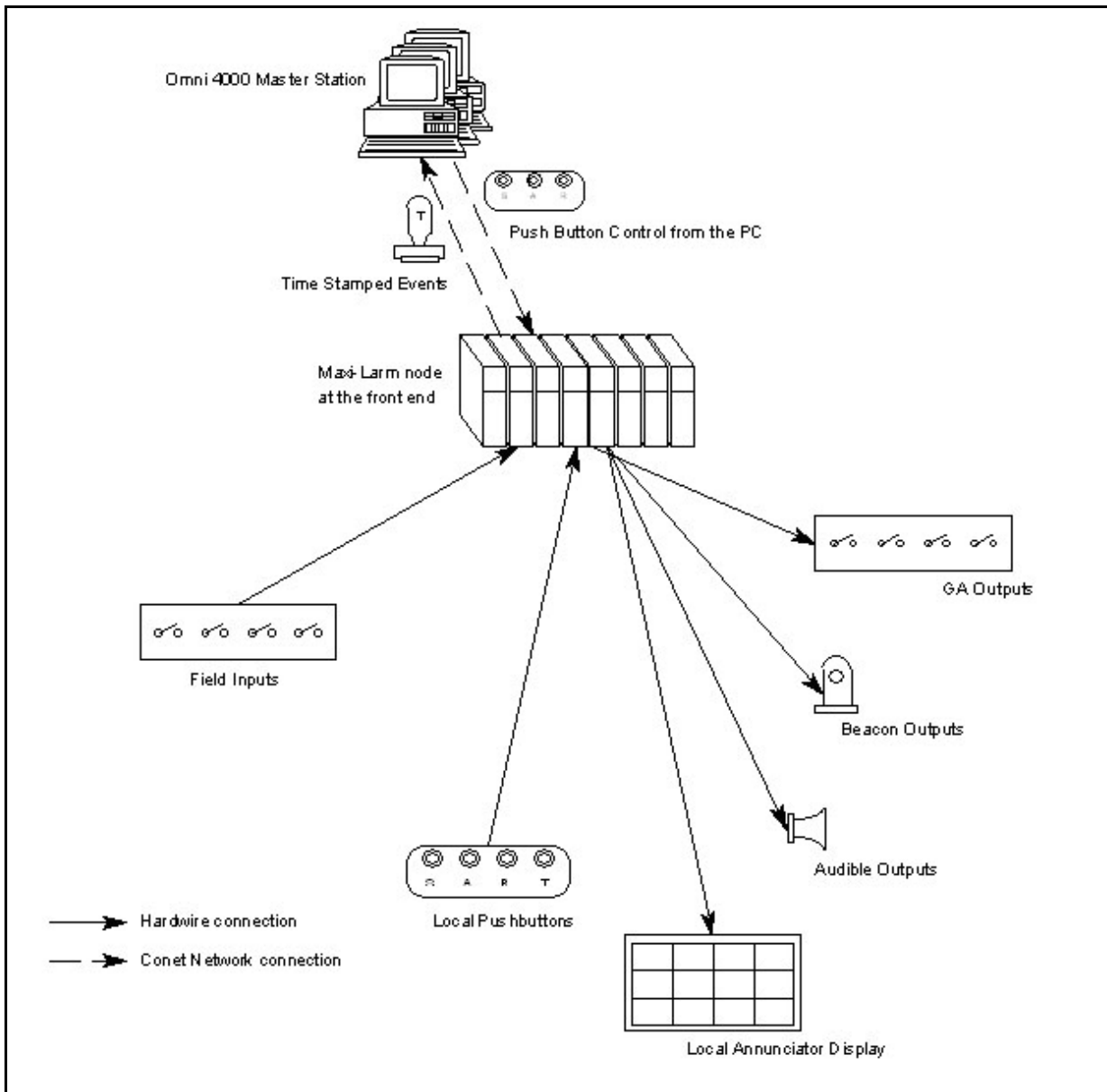
Figure 2.2: A Simple Implementation of Maxilarm

Field Inputs are scanned by the Maxiflex Hardware at the front end and repeated from the same node if required. The user is able to configure the particular inputs that require repeating.

Once a field input has changed state and moved into alarm, the Maxilarm node will run the annunciation sequence configured for that alarm and send a message to the Master Station indicating that an event has occurred.

The sequence may be controlled locally with the standard pushbutton controls (SILENCE, ACKNOWLEDGE, RESET and TEST) as well as remotely from the Master station. Note that the lamp test control from the Master Station is not supported.

Lamps, Audibles, Beacons and Group Alarm outputs may all be driven from the front end according to the sequence selected.

Maxilarm extends its distributed flexibility by utilising standard network utilities provided with the operating system of the CPU known as the Queue Service and Subscriber Service. These services provide the facility to relay the current status of input information of the "source" node to any remote devices that require it. These remote devices can then process this input information as if it were from the local hardware. As it is input information and not just alarm information, pushbutton controls are also relayed remotely enabling very flexible control of the alarm annunciation process.

Figure 2.3 below shows a typical distributed annunciation system using two nodes to process a given set of field inputs.
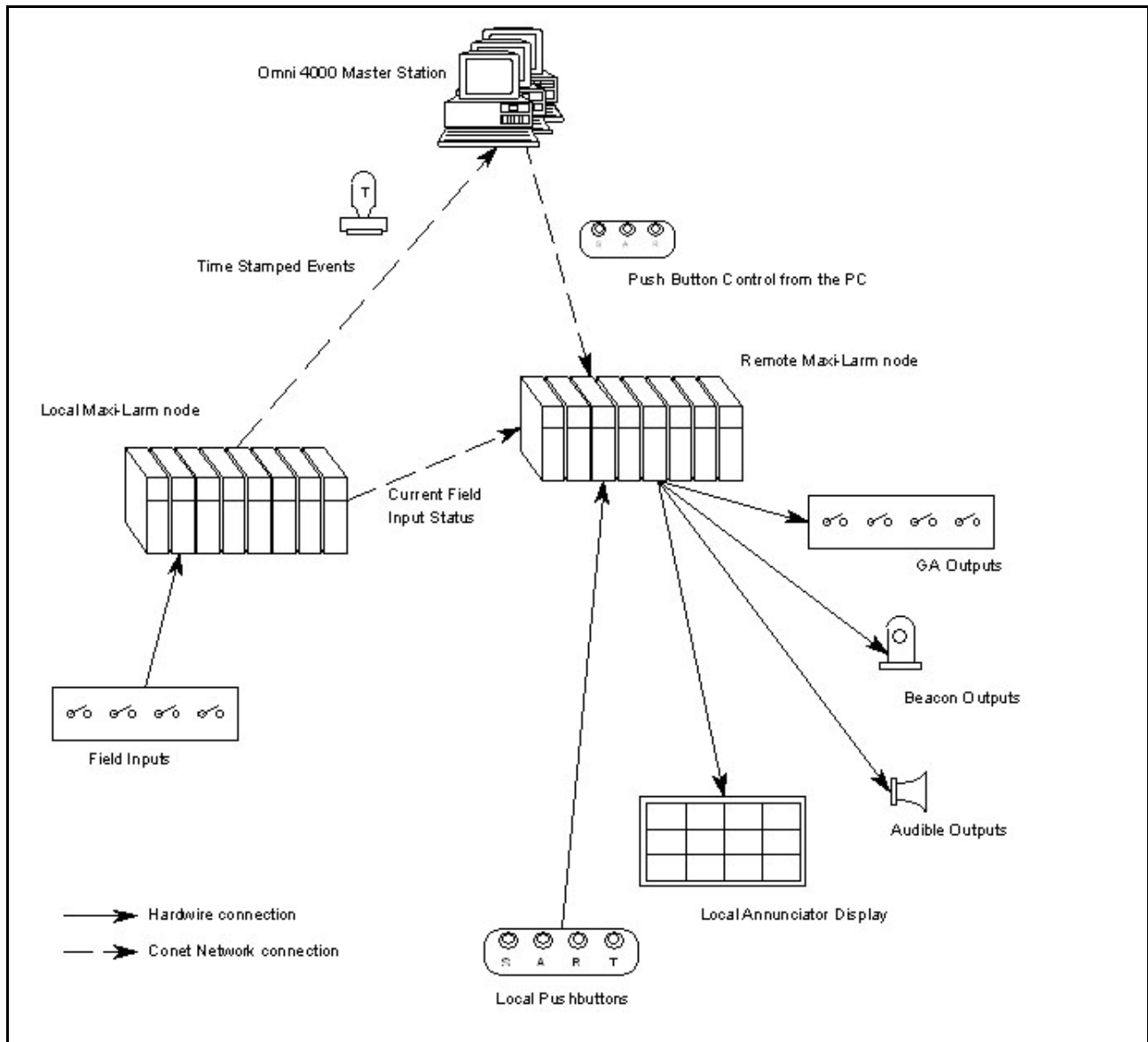

Figure 2.3: A Typical Distributed Annunciation System using Maxilarm

Main Features

Hardware

As Maxilarm is an application that runs on the Maxiflex platform, there is a wide range of module configurations available. The user is able to make up an annunciator to suit particular system requirements, and has a choice of:

♦ Bases

♦ Power Supplies (with optional battery back-up)

♦ I/O Modules

Alarm Annunciation

Alarm Inputs

Any alarm point in a Maxilarm A3 CPU may have one of two sources of input:

♦ Local Hardware Input

♦ DIT Input

Local hardware inputs provide the front-end, field input interface to Maxilarm via digital input modules. These inputs may be normally open or normally closed and an ON and OFF delay time may be configured uniquely for each input.

The DIT or Data Interchange Table is an internal block of memory that is accessible to the Maxilarm application and the Conet network. The block of memory comprises 30 000 16-bit registers and an alarm point may use any bit throughout the entire block as an input for annunciation.

As internal status conditions are maintained in the DIT, the user is able to alarm any abnormal internal status conditions. Status indications can range from the current status of local inputs, to lamp outputs and the current status of alarms. Hence a **DIT Input** is any bit in the DIT.

The Subscriber Service is a means of updating blocks of data in the DIT of one node to the DIT of another, thus providing a means of remote inputs. The Subscriber Service is most suitable for remote status indication where a scan rate of 200ms is acceptable.

Alarm Outputs

Any alarm point can drive three different kinds of inputs:

♦ Lamp Outputs

♦ Audible Outputs

♦ Beacon Outputs

A lamp output can be "wired" to any alarm point and only one alarm point can drive a particular lamp output.

Audible and beacon outputs are handled by way of audible or beacon groups. There are 8 groups of audibles and beacons and each group has one output. Any number of alarms may be "wired" to any audible or beacon group but not to more than one group.

These groups can be operated in one of two modes, prioritised or normal. In the normal mode, audibles and beacons will be driven simultaneously, e.g. if an alarm point in group 6 goes into alarm and an alarm point in group 2 goes into alarm, the audible and beacon outputs for both groups will be driven simultaneously. In prioritised mode, the groups are weighted by group number such that group 1 is given higher priority than group 2. For example, when the audible or beacon of group 6 is being driven because of an abnormal alarm point in that group, and an alarm point in group 2 goes abnormal, then the audible or beacon for group 6 is turned off and that of group 2 is driven.

Note that the operational mode can be set separately for beacons and audibles.

Flash Synchronisation Output

A single flash synchronisation output is available on Maxilarm. The output pulses at the normal lamp fast flash rate (160 flashes per minute) so that the user may hook up external equipment and be synchronised with the lamp outputs.

The output address must be to an output module that has already been configured for lamp outputs.

Pushbuttons

For alarm sequence control there are 8 groups of pushbuttons available per node. Each group supports four types of input control: SILENCE, ACKNOWLEDGE, RESET and TEST. The TEST input is a lamp test control that Iluminates the lamp outputs of all alarm points associated with that pushbutton group.

Any number of alarm points may be a member of any single pushbutton group.

A push-button input may derive its source from local hardware, the DIT or the input Queue in exactly the same way as alarm inputs. This means, as it does for alarm points, that pushbutton control may be carried out remotely. In fact, pushbutton control can come from the Master Station (Omni-4000) as well as another Maxilarm node on the network.

Group Alarms

Group Alarms or "GA's" are also configurable for the system. Up to 16 GA groups are permitted per node where any number of alarm points may be members of any number of GA groups. In other words an alarm point, may be a member of more than one group.

A single output is configurable for each GA group. GA group outputs are typically driven from a relay output module.

A GA group can be setup to operate in one of four different ways:

♦   GA follows Input State (Type 1)

♦   GA follows Alarm State (Type 2)

♦   GA acts as Ringback Horn (Type 3)

♦   GA acts as Multiple Reflash (Type 4)

When the GA follows the input state, the GA output is energised when one or more of the inputs of alarms points in that group is abnormal and de-energised when all inputs are normal.

When the GA follows the alarm state, the GA output is energised when one or more of the alarm points in that group goes into alarm. The output will be de-energised when the last of the alarm points in the group have returned from the alarm state.

When acting as a ringback horn the GA output is normally energised and remains energised when one or a number of inputs of alarm points in the group are abnormal. When any one of the inputs return to normal, the GA output is de-energised and only when the RESET pushbutton has been pressed will the output move back to the normal energised state even if some inputs are still in the abnormal state. Any input returning to normal will de-energise the output again.

A multiple reflash GA provides indication of subsequent abnormal conditions when an input of an alarm point in the group is already in the abnormal state. The normal state of the GA output is de-energised and when a single input of a member alarm point goes abnormal, the output is energised. When another input goes abnormal, the GA output will de-energise momentarily (500ms) and then re-energise to indicate the abnormal condition. When all inputs have returned to normal, the output will de-energise.

Alarm Sequences

Maxilarm comes with 30 sequences for which any alarm point may be configured to drive. These sequences can be broadly categorised as follows:

♦ Normal Sequences

♦ Timer Sequences

♦ First Out Sequences

♦ User Defined Sequences

Normal sequences are simply those that have neither timer nor first out functionality.

Each timer sequence has a configurable timer for each sequence. While the time period is configurable per sequence, each alarm point that uses that sequence is timed independently of each other.

First out sequences are used by alarm points that belong to a first-out group. Note that all alarm points in a first-out group must use the same sequence.

The first three types of sequences total 27 sequences, with the remaining 3 being user defined sequences. The user may design his own special alarm sequence according to more specific requirements and tie it to any alarm point in the system. Refer to the Advanced User's Guide for details on designing your own sequence.

First-out Groups

There are 16 first-out groups available per node. Any number of alarm points may belong to any single first-out group.

A first-out group is a means of indicating the alarm point that was the first to go abnormal out of the group. This is made possible by the first-out sequences provided. There is therefore a very close relationship between first-out groups and first-out sequences.

As a result the rule must be enforced that **all alarm points belonging to the same first-out group must drive the same first-out sequence**.

Sequential Event Recording

Accurate sequential event recording is made possible by the using the M1760/1 32SOE Modules as digital input modules. In addition to detecting for change of states, Maxilarm also time stamps the change of state to a 1ms resolution with these modules.

A large input buffer or queue (for alarm inputs) with compact data records allows Maxilarm to store up to 9000 change of states before the queue overflows per M1760/1 32SOE Module. This assumes that Maxilarm has not processed any change of states at all. However, in reality, Maxilarm is continuously processing records from the queue while newer records are being placed into the queue.

Compact time stamped information is placed in the input buffer along with the change of state information providing a most accurate method for time stamping events. Further down the processing chain, the time stamp information is translated into a more coherent format that is sent with the Queue Service messages to the Master Station. OMNI-4000 is able to receive these messages and log all messages to disk for analysis at a later stage.

Time Synchronisation

OMNI-4000 has the ability to transmit time synchronisation messages to all Maxilarm nodes on the network. This is done on a regular basis and keeps all nodes precisely synchronised.

Configuration

All of Maxilarm's configuration information is stored in the CPU using the Data Interchange Table. This means that configuration is possible over the network and provides an easy mechanism for the configuration package comprising the AES configurator and Omniset to configure Maxilarm A3 CPUs.

The method of configuration is such that once all the DIT registers have been updated, the node is instructed to read the new configuration from the DIT. At this time the node stops all alarm processing for a few seconds and resumes once the entire configuration section of the DIT has been examined. This means that the node can be re-configured on-line safely and quickly.

Details on the DIT are available in a separate document. Please consult the System Integrator or Omniflex agent for more information.

Networking Facilities

Conet/c

Maxilarm uses Omniflex's field-proven CONET field bus local area network as the communication medium between all Maxiflex front-end nodes up to 4 Omni-4000 master stations (or other SCADA masters).

Conet is a true token-passing local area network that operates at 62,5 kbaud on twisted pair cable up to 10 km in distance. Up to 127 nodes can be connected to the network and these can be added or taken away while live. The system simply includes newcomers and by-passes leavers automatically. Conet has been field proven since 1982 in the most rigorous of electrical environments, from substations to electric arc furnaces in foundries. It has been continually upgraded, while still retaining upward compatibility at all times.

Conet/e
Omniflex's Conet protocol implemented on standard TCP/IP protocol using 10/100 Ethernet media.

Data Interchange Table

This is a large block of memory consisting of 65500 16-bit registers in which all I/O data and program data are stored. Configuration is available via the Omniset configuration utility.

Queue Service

The Queue Service provides the mechanism for time-stamped data to be stored temporarily before transmission over the network to the master station. The queue is polled from the Omni4000 system using the Conet OPC Server or it can automatically initiate the transmission.

There are four queue heads available allowing support for 4 Omni4000 stations.

Subscriber Service

This allows one node to retrieve blocks of information from the DIT of another node either on a regular time basis or on a change of state basis. This is the mechanism used for reading the status information of a remote node.

The Subscriber Service will respond to changes of state not faster than 200ms.

Program Port Service

This enables the CPU to be programmed via the programming port.

3.   Maxilarm Specifications

Alarm Inputs

Qty:	Up to 240 for annunciation
Type:	Voltage inputs rated from 9 V to 30 V dc (M1322A,M1760A) or 30 V to 60 V dc (M1323A,M1761A) (local inputs)
	Bit inputs in the DIT (remote status inputs)
Module Indications:	1 Green LED per input on module (local only)
Input Sensing:	N/O or N/C per input
(M1760/61 Only)	
De-Bounce Filter:	Fixed at 15 ms (Hardware)
Into Alarm Delay:	Variable from 0 to 65 5350 ms per input in 10 ms intervals
Return To Normal Delay:	Variable from 0 to 65 5350 ms per input in 10 ms intervals
Inhibit (Shelving):	Per input
Time Tagging:	Each input time tagged to 1 ms

Pushbutton Inputs

Qty:	Up to 32
Type:	Voltage inputs rated from 9 V to 30 V dc (M1322A,M1330A,M1760A) or 30 V to 60 V dc (M1323A,M1761A) (local inputs)
	Bit inputs in the DIT (remote status inputs)
Function:	SILENCE, ACKNOWLEDGE, RESET, TEST
De-Bounce Filter:	Fixed at 15 ms (Hardware)
Delay Timers:	None
Inhibit (Shelving):	Per input
Module Indications:	1 Green LED per input on module

Lamp Outputs

Qty:	Up to 240
Type:	Open collector outputs M1341B - NPN transistor rated from +5 V dc to 90 V dc rated at 100 mA maximum
	M1342A
Purpose:	Fascia displays
Lamp Flash States:	OFF
	ON
	SLOW FLASH (40 flashes/minute)
	FAST FLASH (160 flashes/minute)
	INTERMITTENT FAST FLASH
Module Indications:	1 Red LED per output on module

Audible Outputs

Qty:	Up to 8
Types:	Relay outputs (M1372A) - SPST (Single Pole Single Throw) rated at 250 V ac at 10 A resistive load
	Open collector outputs M1341B - NPN transistor rated from +5 V dc to 90 V dc rated at 100 mA maximum
Field Devices:	Any audible warning device
Module Indications:	1 Red LED per output on module

Beacon Outputs

Qty:	Up to 8
Types:	Relay outputs (M1372A) - SPST (Single Pole Single Throw) rated at 250 V ac at 10 A resistive load
	Open collector outputs M1341B - NPN transistor rated from +5 V dc to 90 V dc rated at 100 mA maximum
Field Devices:	Any visible warning device
Module Indications:	1 Red LED per output on module

Group Alarm Outputs

Qty:	16	
Types:	Relay outputs (M1372A) - SPST (Single Pole Single Throw) rated at 250 V ac at 10 A resistive load	
	Open collector outputs M1341B - NPN transistor rated from +5 V dc to 90 V dc rated at 100 mA maximum	
Alarm Point Allocation:	Any alarm point may be associated with more than 1 GA.	
Group Alarm Types:	Type 1:	GA follows Input state
	Type 2:	GA follows alarm state
	Type 3:	GA acts as ring-back horn
	Type 4:	GA acts as MRF (Multiple Reflash)
Module Indications:	1 Red LED per output on module	

First-out Groups

Qty:	16
Types:	Dependent on First-out Sequence
Alarm Point Allocation:	An alarm point may only be a member of one First-out group
Restrictions:	All members of a First-out group must drive the same Sequence

Alarm Sequences

Total Built-in Standard:	27
User Configurable:	3
Selectability:	Any alarm point can have any sequence (apart from the restriction of First-out groups)
Qty Std Timer Sequences:	13 (from sequences 8 to 20)

Qty Sequence Timers:	16 (additional three for user sequences).
Sequence Timer Delay:	Variable from 0 to 655350 ms in 10ms intervals
Qty Std First-out Seqs:	7 (from sequences 21 to 27)
Sequence Types:	Refer to Appendix B

Network Communications

Conet/c -TwistedPair

Network Type:	Conet field bus LAN
No of Nodes:	127
Speed:	62 500 baud
Isolation:	1500 V_{rms} at each node
Distance:	Up to 10 km
Medium:	Shielded twisted pair
Termination:	Uses 1 x C6169 field termination board at each node.
CPU Connection:	Sub-miniature DB9 connector
Indicators:	Tx, Rx and Token LEDs.
	Fault indication with all 3 steady on

Conet/e

Type :	10/100 Base T (RJ45 Connection)

DIT Service

Register Qty:	30 000 Dynamic ; 1500 Static
Register Size:	16 bit

Queue Service

Function:	Time stamped event reporting
Transmit Type:	Solicited from Conet OPC Server (CC026A)
Qty:	4 Nodes from 1 queue

Subscriber Service

Function:	Reading status data from DITs of remote nodes
Data Source:	Any Omniflex device supporting the Subscriber Service & DIT
Limits:	Up to 120 DIT registers per Subscription
	Up to 64 Subscription Services per node
Update Time:	Selectable from 1 to 120 seconds and on change of state if required

Conet time synchronisation

NOTE: this only applies to systems incorporating Conet OPC Server (CC026A).

Method:	Conet broadcast message at address 0 on network
Source:	Omni-4000 master.
Update Time:	30 seconds
Resolution:	1 second
Accuracy:	within 20ms

Power supply

The Maxilarm PSU can be any standard MAXIFLEX PSU. See General Instructions in the Appendices for details on each PSU in the range. See your system documentation for details on the specific PSU in the system.

4. Data Interchange Table (DIT)

DIT overview

The **D**ata **I**nterchange **T**able is a set of memory locations that allow configuration and status information to be accessed easily by both the application software and the network. Maxilarm specific DIT registers are divided into two distinct sections, namely configuration and dynamic data.

Please refer to the P3 User Manual for details regarding the register layout for other CPU functions.

Maxilarm alarm point configuration

All parameters specific to all alarm points in the system are specified here. These may range from input address, sequence type, group alarm output address and other such parameters that have to be specified uniquely for each alarm point in the system.

It comprises DIT registers 57507 - 59945.

Maxilarm dynamic data

The Dynamic portion of the DIT comprises the status of all information that changes with time during normal operation of the Maxilarm software. This information is both read from and written to by both the application software and the network.

It comprises DIT registers 5500 - 5848.

Maxilarm Configuration Registers

Following is a "short-form" of the DIT that provides a quick reference of the function and use of registers used by Maxilarm.

Many of the registers have similar functions and these will be omitted. For a full DIT register reference refer to the standard P3 User Manual document.

DIT REGISTER	DESCRIPTION
System Settings	
57507	Beacon & Audible Priority Mode
57647	Flash Synch Output Address
Beacon & Audible Groups	
59866 - 59985	Beacon & Audible Group Membership for Alarms 1-240
57591 - 57598	Audible Output Address (Audibles 1-8)
57599 - 57606	Beacon Output Address (Beacons 1-8)
Pushbuttons	
57527 - 57590	Pushbutton Type & Input Address (Groups 1-8)
59746 - 59865	Pushbutton Group Membership (Groups 1-8)
Group Alarms	
57786	G.A. Reflash Timer
59266 - 59505	G.A. Group Membership (Groups 1-16)
57664 - 57679	G.A. Ouput Address (Groups 1-16)
57648 - 57663	G.A. Type (Groups 1-16)
First Out Groups	
59506 - 59745	First Out Groups (Alarms 1-240)
Alarms	
57796 - 58275	Alarm Type & Input Address.(Alarms 1-240)
58786 - 59025	Alarm Sequence (Alarms 1-240)
57680 - 57696	Alarm Sequence Timers (Sequence 8-30)
59026 - 59265	Lamp Ouput Address (Lamps 1-240)

Maxilarm Dynamic Registers

DIT REGISTER	DESCRIPTION
Pushbutton Status	
5772 - 5773	Pushbutton Status (Pushbutton Groups 1-8)
Alarm Status	
5834 - 5848	Alarm Status Information (Alarms 1-240) Bit 7 of 5834 is the Status for Alarm 1. Bit 15 of 5848 is Status for Alarm 240.
Inhibit Timers	
5740 - 5755	Group Alarm Inhibit Timers
5500 - 5739	Alarm Inhibit Timers for Alarms 1-240

Appendix A. Maxilarm Sequences

1. Sequence Type Descriptions

NO	DESCRIPTION	ISA EQUIVALENT
1	LAMP FOLLOWS INPUT	--
2	FLEETING ALARM, MANUAL RESET	M-1
3	ALARM ONLY (NO LOCK IN)	--
4	FLEETING ALARM, MANUAL RESET, WITH RINGBACK	R-1-10
5	FLEETING ALARM, MANUAL RESET, FOR MOTOR ALARMS	--
6	FLEETING ALARM, AUTO RESET	--
7	FLEETING ALARM, AUTO RESET, FOR MOTOR ALARMS	--
8	FLEETING ALARM, MANUAL RESET, TIMER ON ALARM	A-1-4
9	ALARM ONLY (NO LOCK IN), TIMER ON ALARM	--
10	FLEETING ALARM, MANUAL RESET, WITH RINGBACK, TIMER ON ALARM	R-1-10
11	FLEETING ALARM, MANUAL RESET, TIMER ON HORN	--
12	FLEETING ALARM, ,MANUAL RESET, TIMER ON REFLASH	--
13	FLEETING ALARM, MANUAL RESET, FOR MOTOR ALARMS, TIMER ON ALARM	--
14	FLEETING ALARM, TIMER ON RETURN TO NORMAL	--
15	PULSE MONITORING ALARM, MANUAL RESET, TIMER ON	--
16	FLEETING ALARM, AUTO RESET, TIMER ON INPUTS	--
17	FLEETING ALARM, AUTO RESET, TIMER ON HORN	--
18	FLEETING ALARM, AUTO RESET, TIMER ON	--
19	FLEETING ALARM, AUTO RESET, FOR MOTOR ALARMS, TIMER ON	--
20	PULSE MONITORING ALARM, AUTO RESET, TIMER ON	--
21	MULTIPLE GROUP, FIRST OUT, MANUAL RESET	F2M-1
22	MULTIPLE GROUP, FIRST OUT, AUTO RESET, FIRST OUT RESET INTERLOCK	F3A-1-3
23	SINGLE GROUP, FIRST OUT, MANUAL RESET, FIRST UP CONTINUOUS FLASH	--
24	MULTIPLE GROUP, FIRST OUT, MANUAL RESET WITH NO SUBSEQUENT ALARM STATE, SILENCE PUSHBUTTON	F1M-1
25	MULTIPLE GROUP, FIRST OUT, AUTO RESET	--
26	SINGLE GROUP, FIRST OUT, AUTO RESET, FIRST UP CONTINUOUS FLASH	--
27	MULTIPLE GROUP, FIRST OUT, AUTO RESET WITH NO SUBSEQUENT ALARM STATE, SILENCE PUSHBUTTON	F1A-1
28	USER DEFINED SEQUENCE	--
29	USER DEFINED SEQUENCE	--
30	USER DEFINED SEQUENCE	--

Table A.1: Sequence Type Descriptions

2. Sequence state tables

The following table outlines the output status for all of the sequence states implemented in this version of Maxilarm:

SEQUENCE STATE #:	LAMP OUTPUT:	AUDIBLE OUTPUT:	BEACON OUTPUT:	TIMER STATUS:	FIRST OUT STATUS:
1	OFF	OFF	OFF	OFF	INACTIVE
2	FAST FLASH	ON	ON	OFF	INACTIVE
3	FAST FLASH	OFF	ON	OFF	INACTIVE
4	STEADY ON	ON	ON	OFF	INACTIVE
5	STEADY ON	OFF	ON	OFF	INACTIVE
6	STEADY ON	OFF	OFF	OFF	INACTIVE
7	SLOW FLASH	OFF	OFF	OFF	INACTIVE
8	OFF	OFF	OFF	ON	INACTIVE
9	FAST FLASH	ON	ON	OFF	ACTIVE
10	FAST FLASH	OFF	ON	OFF	ACTIVE
11	INTERMITTENT FAST FLASH	ON	ON	OFF	ACTIVE
12	INTERMITTENT FAST FLASH	OFF	ON	OFF	ACTIVE
13	SLOW FLASH	OFF	OFF	OFF	ACTIVE
14	FAST FLASH	ON	ON	ON	INACTIVE
15	FAST FLASH	OFF	ON	ON	INACTIVE
16	STEADY ON	OFF	OFF	ON	INACTIVE
17	STEADY ON	OFF	OFF	OFF	INACTIVE
18	OFF	OFF	OFF	ON	INACTIVE

Table A.2: Sequence State Definitions

3. Sequence state diagrams

Following are the sequence state diagrams currently implemented for this version of Maxilarm.

The following abbreviations are used:

FF - fast flash
SF - slow flash
IFF- intermittent fast flash
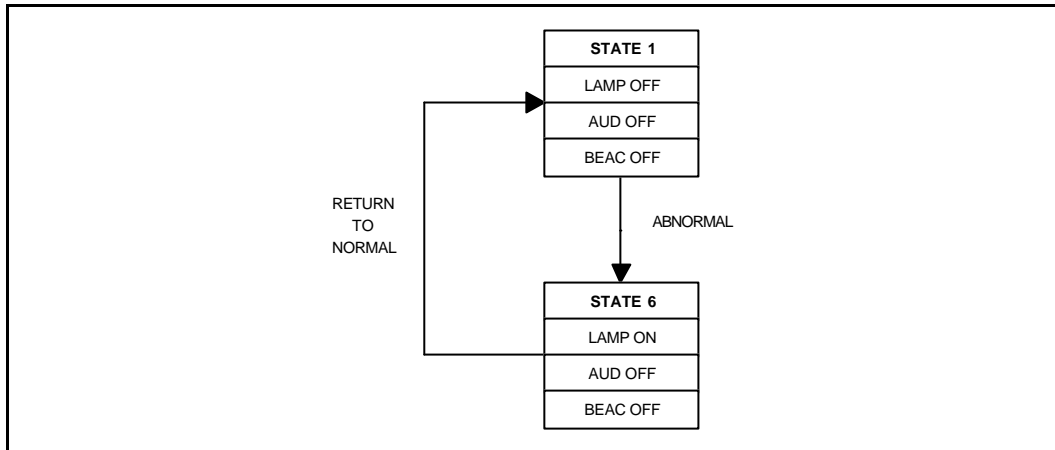
Sequence 1: Lamp follows input
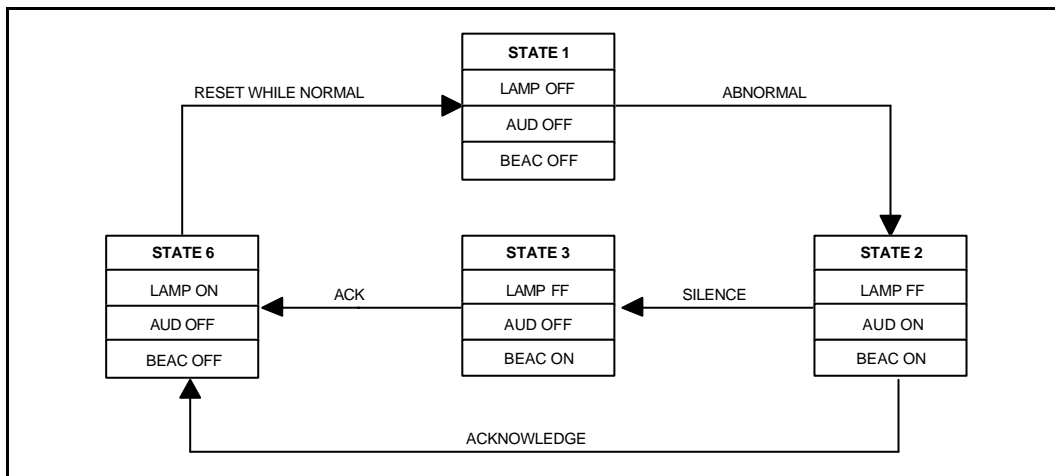
Sequence 2: Fleeting Alarm, Manual Reset

STATE 1

LAMP OFF

AUD OFF

BEAC OFF

RETURN TO NORMAL

ABNORMAL

RETURN TO NORMAL

RETURN TO
NORMAL

STATE 6

LAMP ON

AUD OFF

BEAC OFF

STATE 3

LAMP FF

AUD OFF

BEAC ON

STATE 2

LAMP FF

AUD ON

BEAC ON

ACK

SILENCE

ACKNOWLEDGE
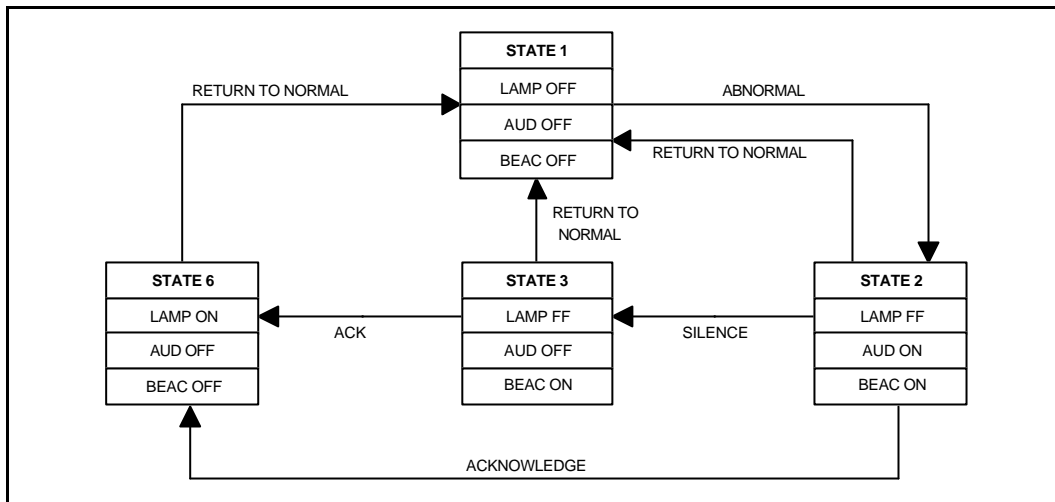
Sequence 3: Alarm only, no lock in

STATE 1

LAMP OFF

AUD OFF

BEAC OFF

RESET WHILE NORMAL

ABNORMAL

ABNORMAL

ACK. WHILE NORMAL

STATE 7

LAMP SF

AUD OFF

BEAC OFF

STATE 3

LAMP FF

AUD OFF

BEAC ON

STATE 2

LAMP FF

AUD ON

BEAC ON

ACK. WHILE
NORMAL

SILENCE

ACK. WHILE
ABNORMAL

STATE 6

LAMP ON

AUD OFF

BEAC OFF

RETURN TO NORMAL

ACK. WHILE ABNORMAL
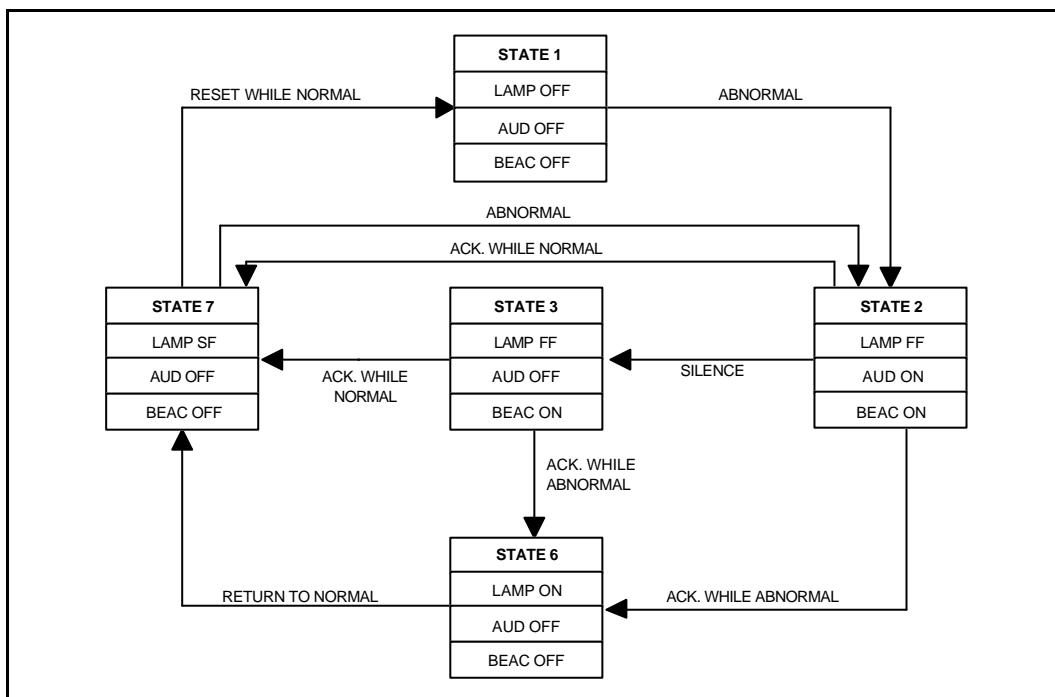
Sequence 4: Fleeting Alarm, Manual Reset, with ringback
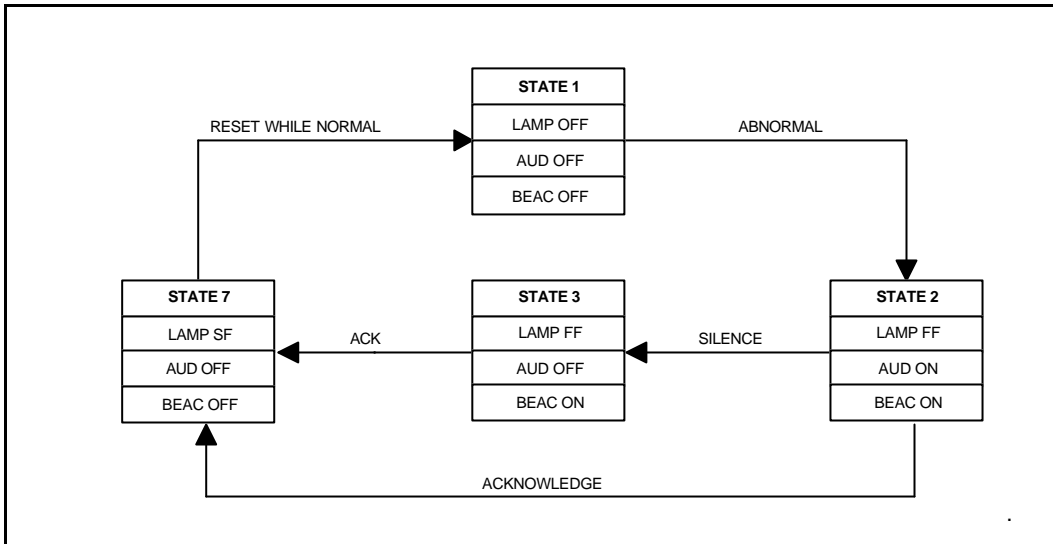
Sequence 5: Fleeting Alarm, Manual Reset, for Motor Alarms
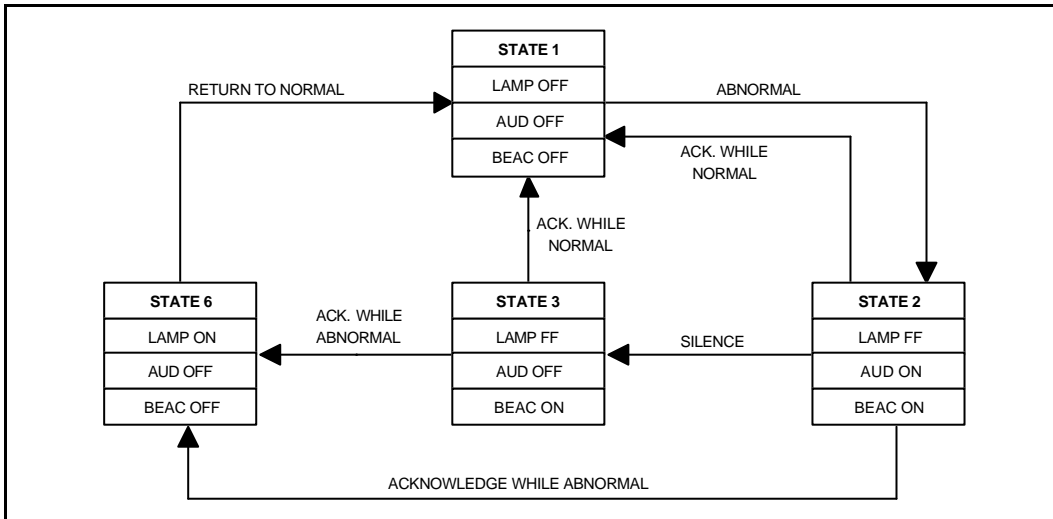
Sequence 6: Fleeting Alarm, Automatic Reset,
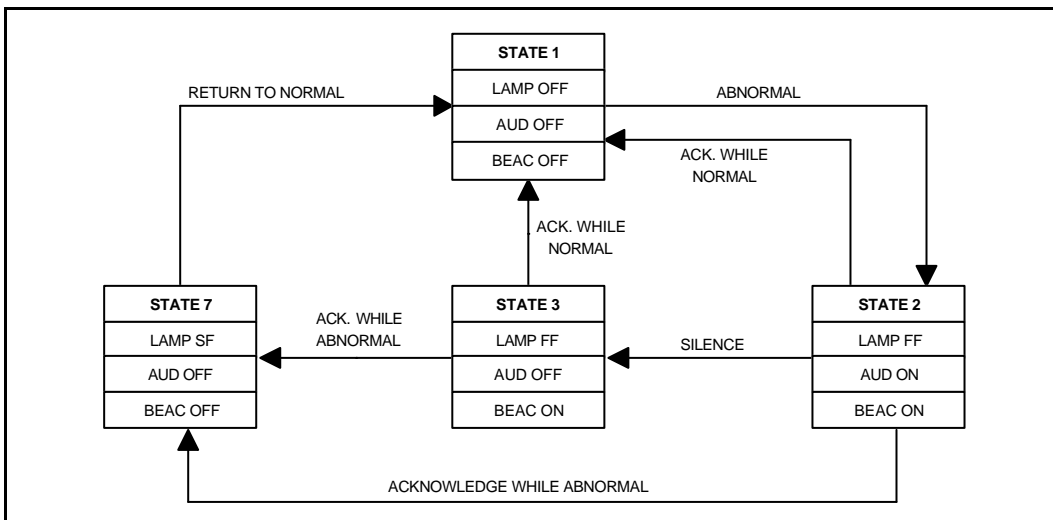
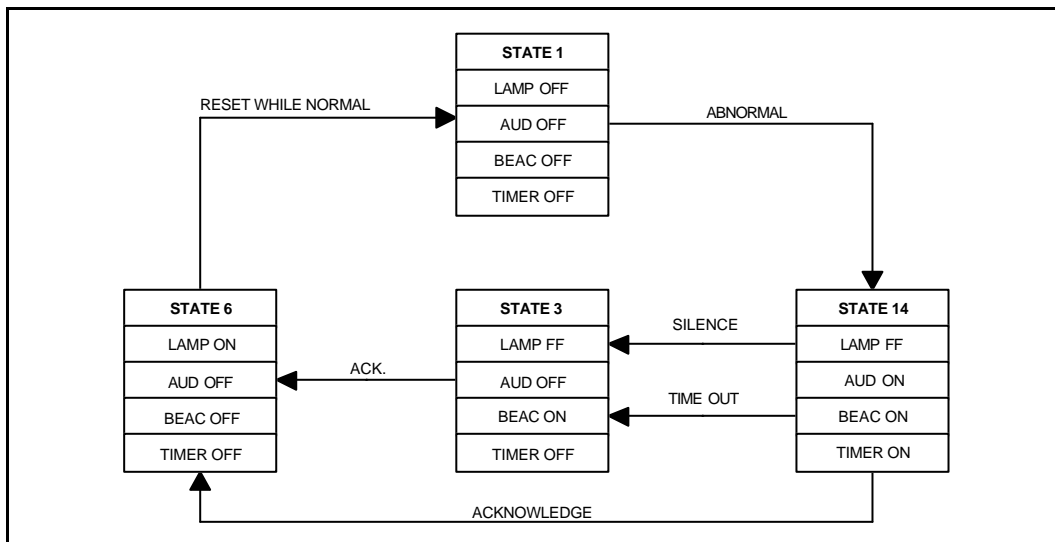*Sequence 7: Fleeting Alarm, Automatic Reset, for Motor Alarms*
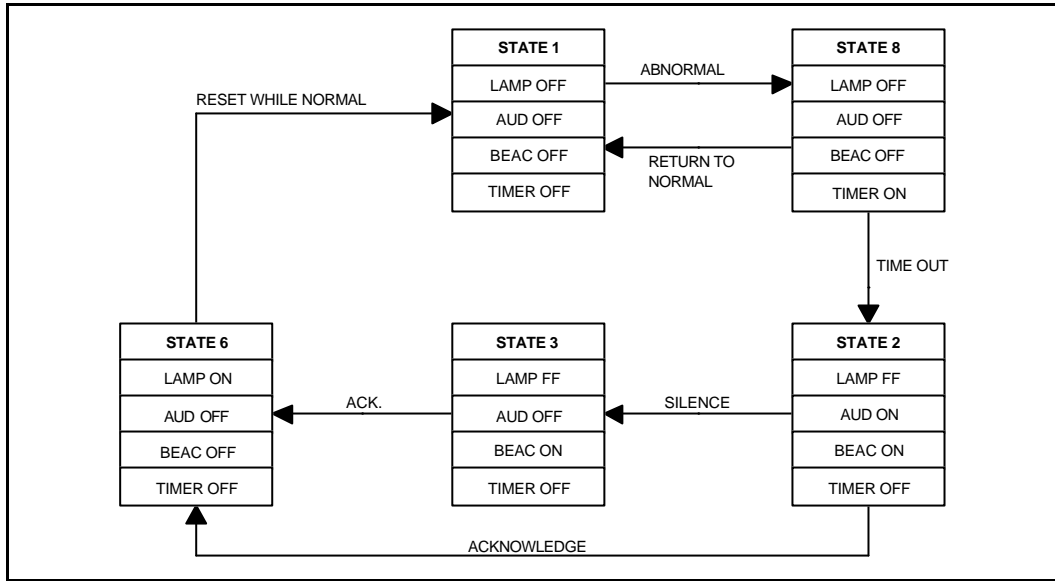
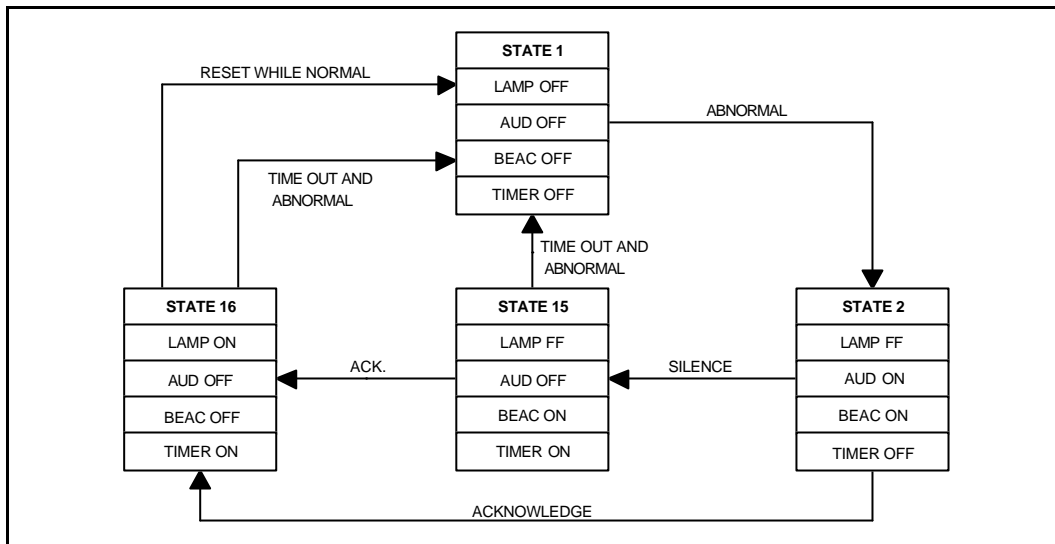*Sequence 8: Fleeting Alarm, Manual Reset, Timer on Alarm*
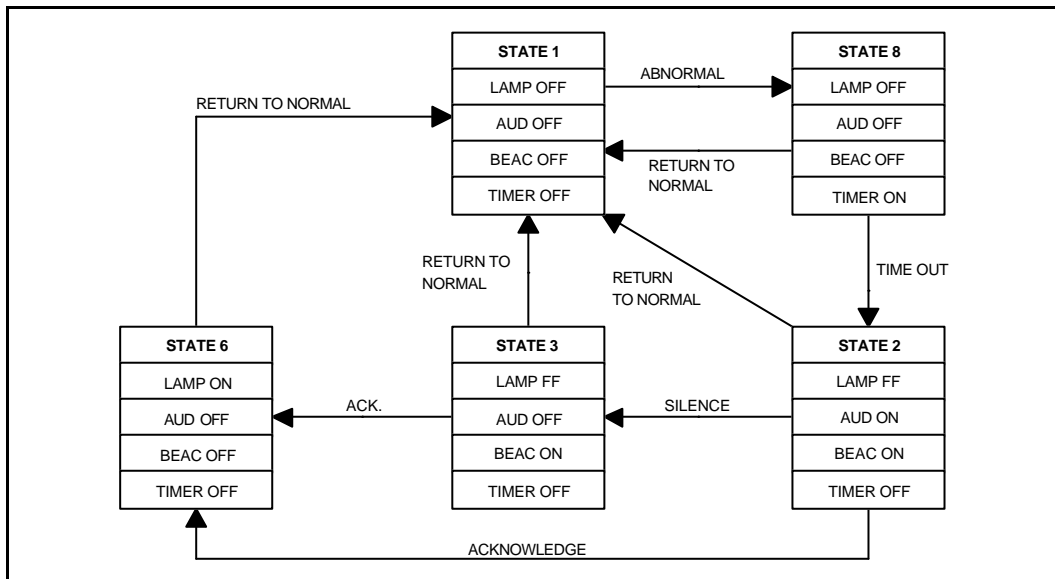
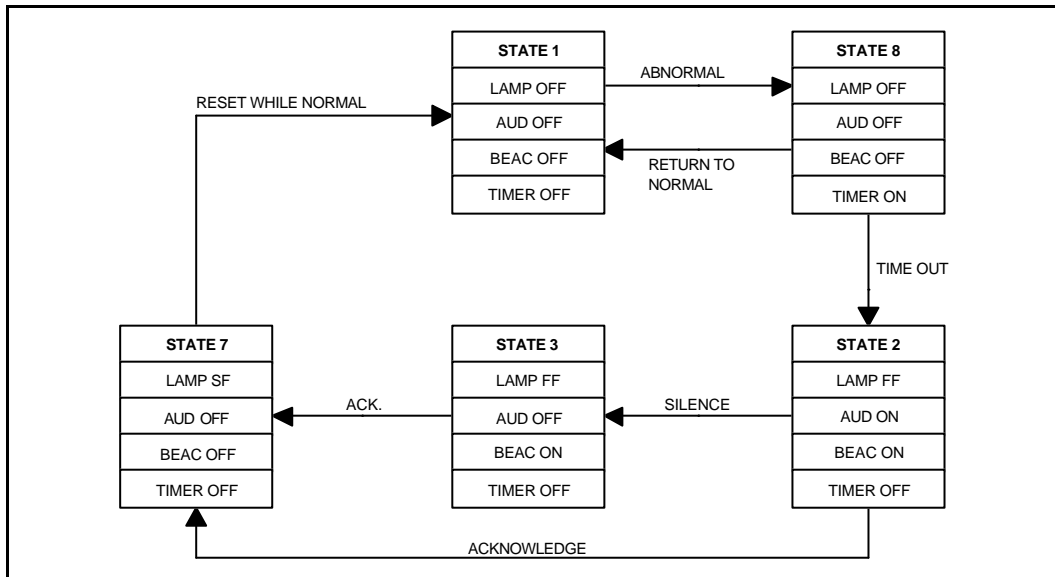*Sequence 9: Alarm only, no lock in, Timer on Alarm*

Sequence 10 Diagram

STATE 1
LAMP OFF
AUD OFF
BEAC OFF
TIMER OFF

RESET

ABNORMAL →

RETURN TO NORMAL

STATE 8
LAMP OFF
AUD OFF
BEAC OFF
TIMER ON

ABNORMAL

ACK. WHILE NORMAL

TIME OUT

STATE 7
LAMP SF
AUD OFF
BEAC OFF
TIMER OFF

ACK. WHILE NORMAL

STATE 3
LAMP FF
AUD OFF
BEAC ON
TIMER OFF

SILENCE

STATE 2
LAMP FF
AUD ON
BEAC ON
TIMER OFF

ACK. WHILE ABNORMAL

STATE 6
LAMP ON
AUD OFF
BEAC OFF
TIMER OFF

RETURN TO NORMAL

ACK. WHILE ABNORMAL

Sequence 10: Fleeting Alarm, Manual Reset, with Ringback, Timer on Alarm

Sequence 11 Diagram

STATE 1
LAMP OFF
AUD OFF
BEAC OFF
TIMER OFF

RESET WHILE NORMAL

ABNORMAL

STATE 6
LAMP ON
AUD OFF
BEAC OFF
TIMER OFF

ACK.

STATE 3
LAMP FF
AUD OFF
BEAC ON
TIMER OFF

SILENCE

TIME OUT

STATE 14
LAMP FF
AUD ON
BEAC ON
TIMER ON

ACKNOWLEDGE

Sequence 11: Fleeting Alarm, Manual Reset, Timer on Audible

Sequence 12 Diagram

STATE 1
| LAMP OFF |
| AUD OFF |
| BEAC OFF |
| TIMER OFF |

STATE 16
| LAMP ON |
| AUD OFF |
| BEAC OFF |
| TIMER ON |

STATE 15
| LAMP FF |
| AUD OFF |
| BEAC ON |
| TIMER ON |

STATE 2
| LAMP FF |
| AUD ON |
| BEAC ON |
| TIMER OFF |

Transitions: RESET WHILE NORMAL; TIME OUT AND ABNORMAL; ABNORMAL; TIME OUT AND ABNORMAL; ACK.; SILENCE; ACKNOWLEDGE

Sequence 12: Fleeting Alarm, Manual Reset, Timer on Reflash

STATE 1
| LAMP OFF |
| AUD OFF |
| BEAC OFF |
| TIMER OFF |

STATE 8
| LAMP OFF |
| AUD OFF |
| BEAC OFF |
| TIMER ON |

STATE 7
| LAMP SF |
| AUD OFF |
| BEAC OFF |
| TIMER OFF |

STATE 3
| LAMP FF |
| AUD OFF |
| BEAC ON |
| TIMER OFF |

STATE 2
| LAMP FF |
| AUD ON |
| BEAC ON |
| TIMER OFF |

Transitions: RESET WHILE NORMAL; ABNORMAL; RETURN TO NORMAL; TIME OUT; ACK.; SILENCE; ACKNOWLEDGE

Sequence 13: Fleeting Alarm, Manual Reset, for Motor Alarms, Timer on Alarm
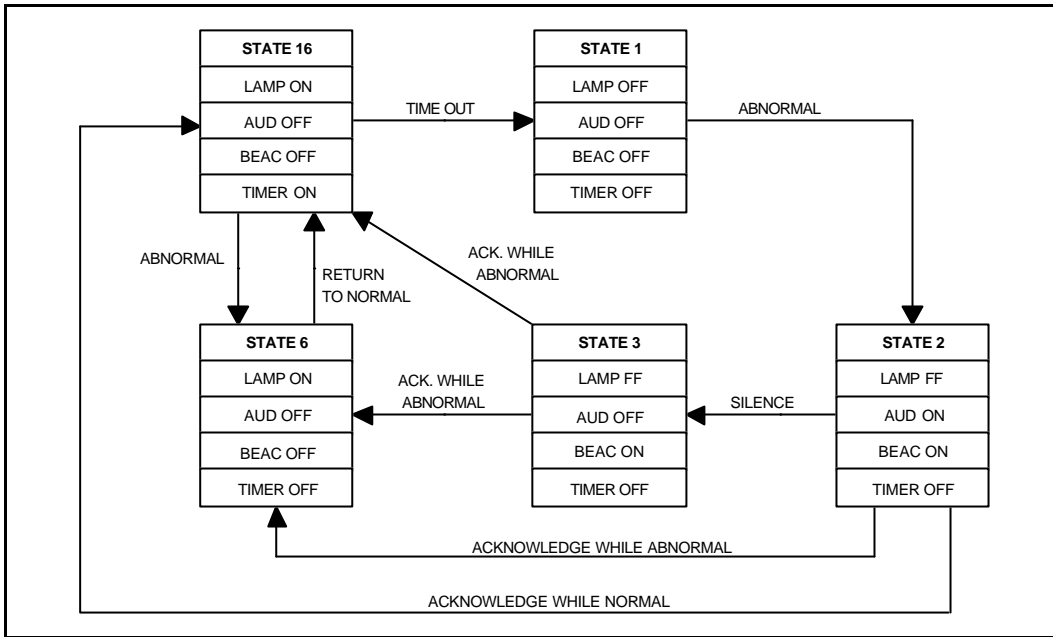
Sequence 14: Fleeting Alarm, Timer on Return to Normal
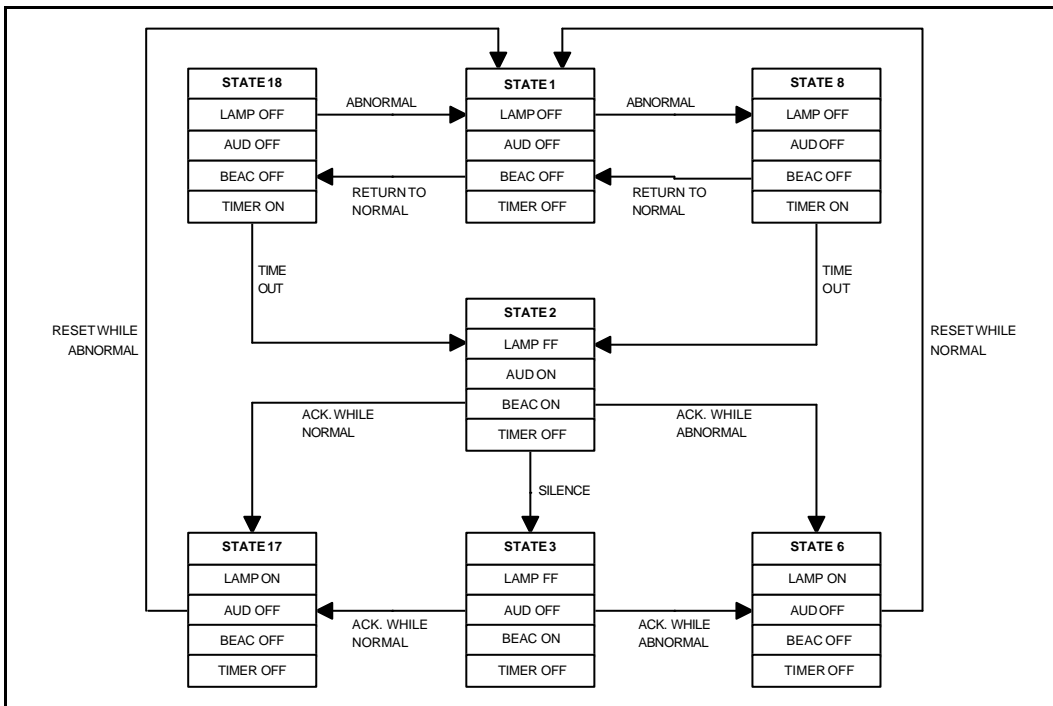
Sequence 15: Pulse Monitoring Alarm, Manual Reset, Timer on Alarm
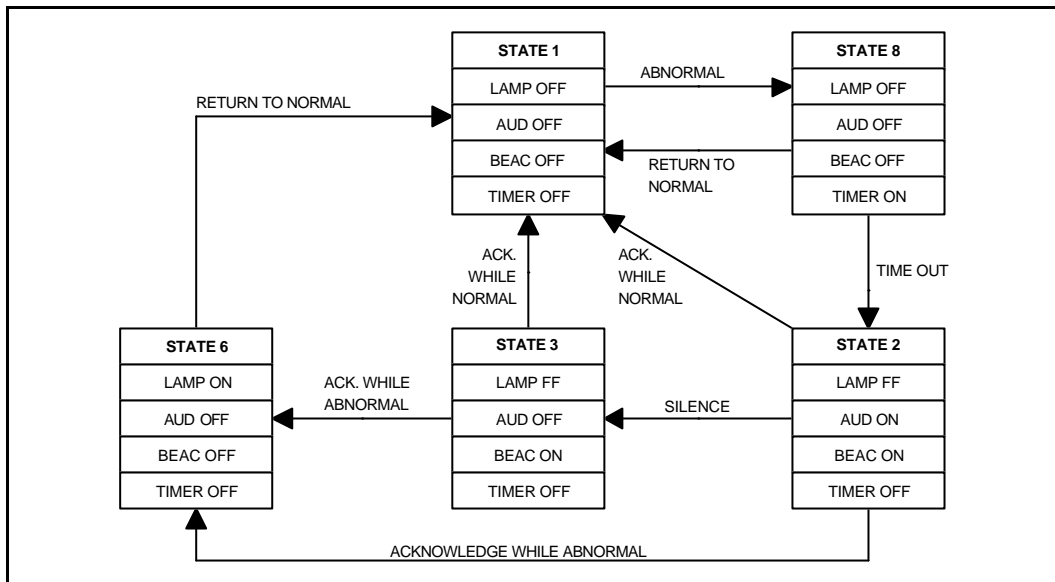
Sequence 16: Fleeting Alarm, Auto Reset, Timer on Inputs
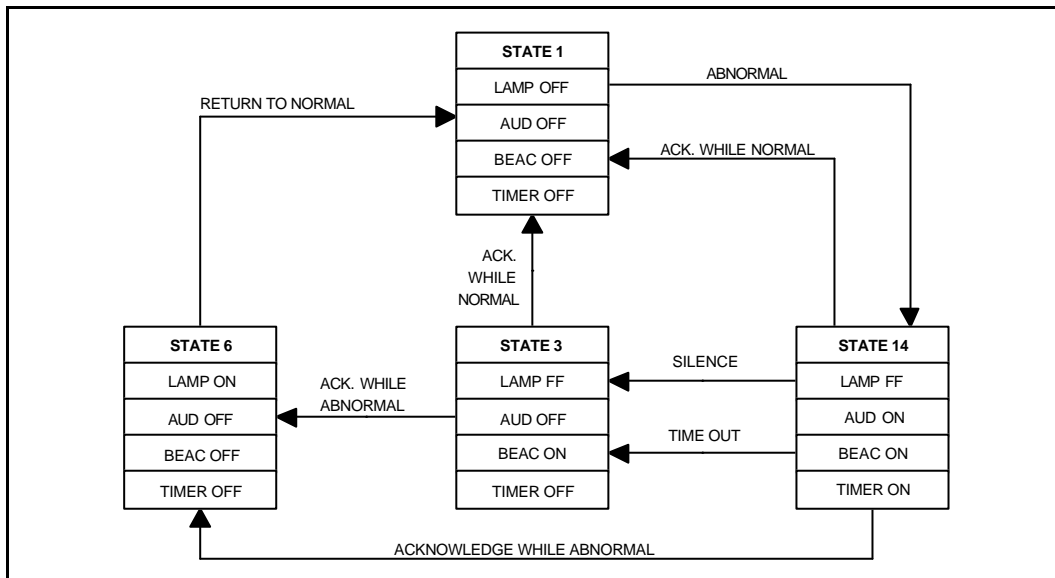
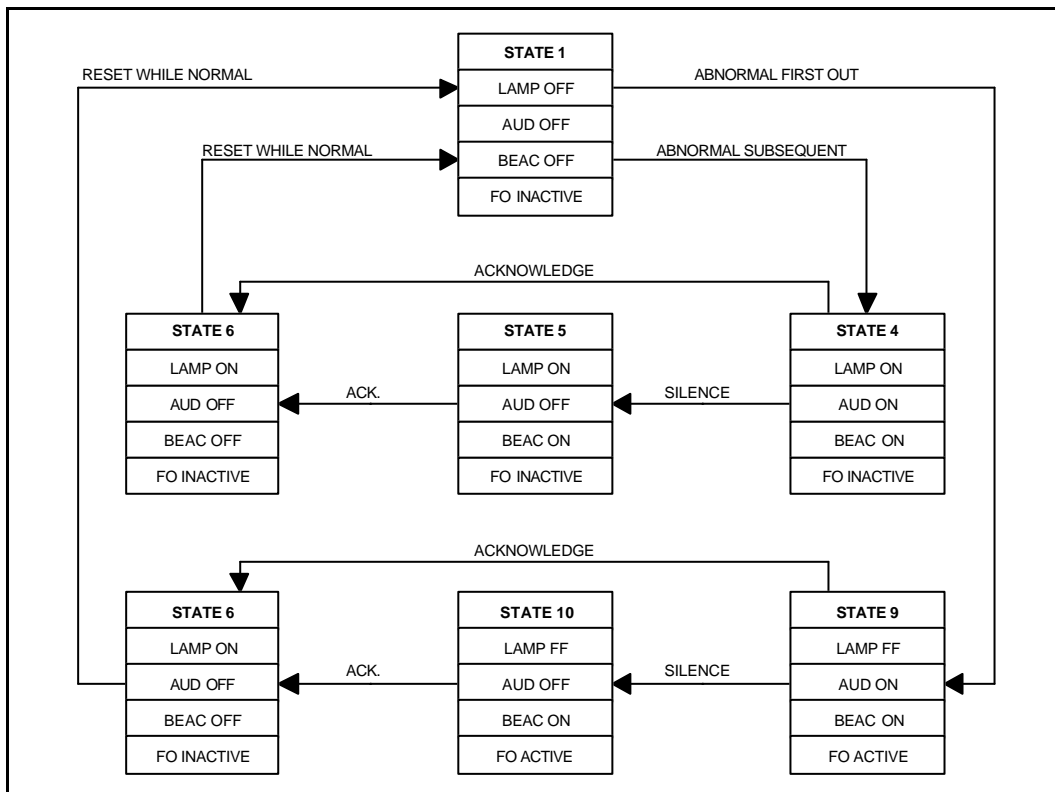**Sequence 17: Fleeting Alarm, Auto Reset, Timer on Audible**
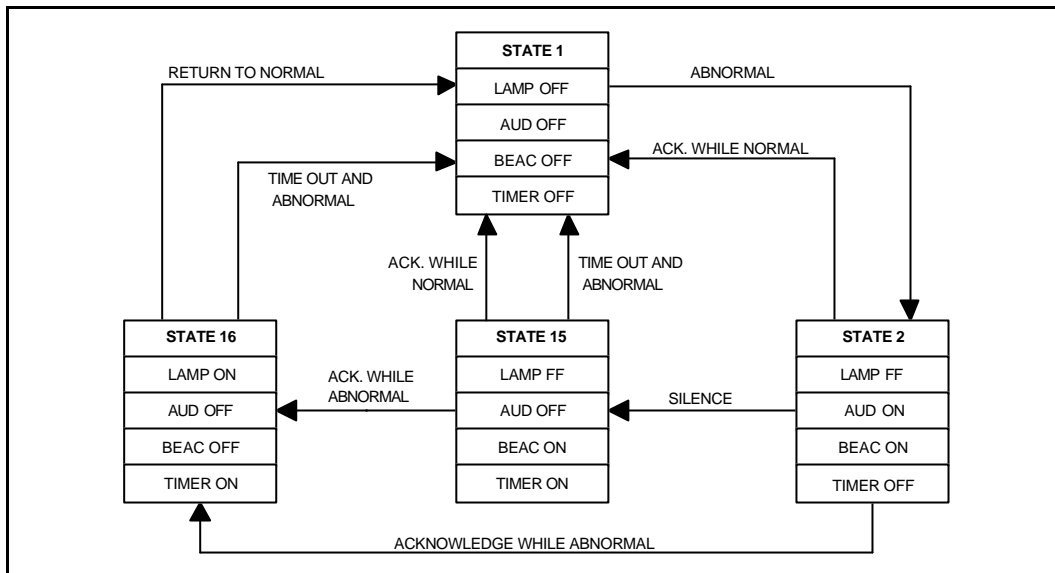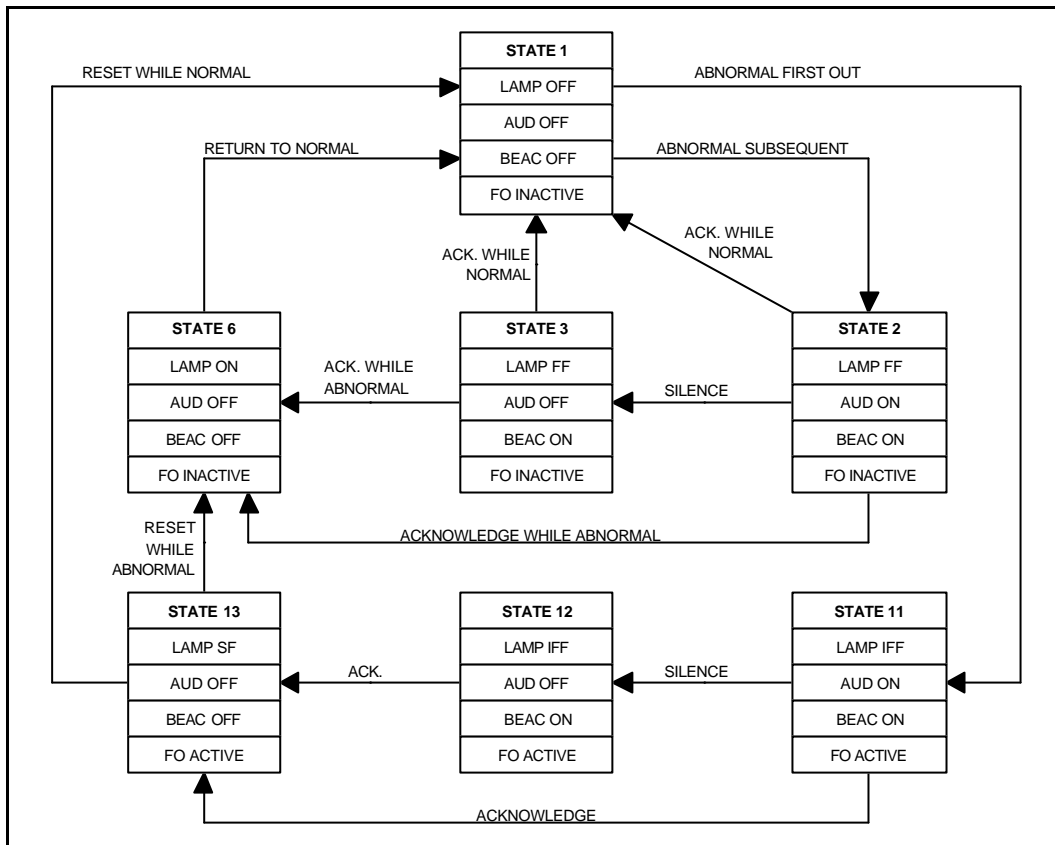
Sequence 18: Fleeting Alarm, Auto Reset, Timer on
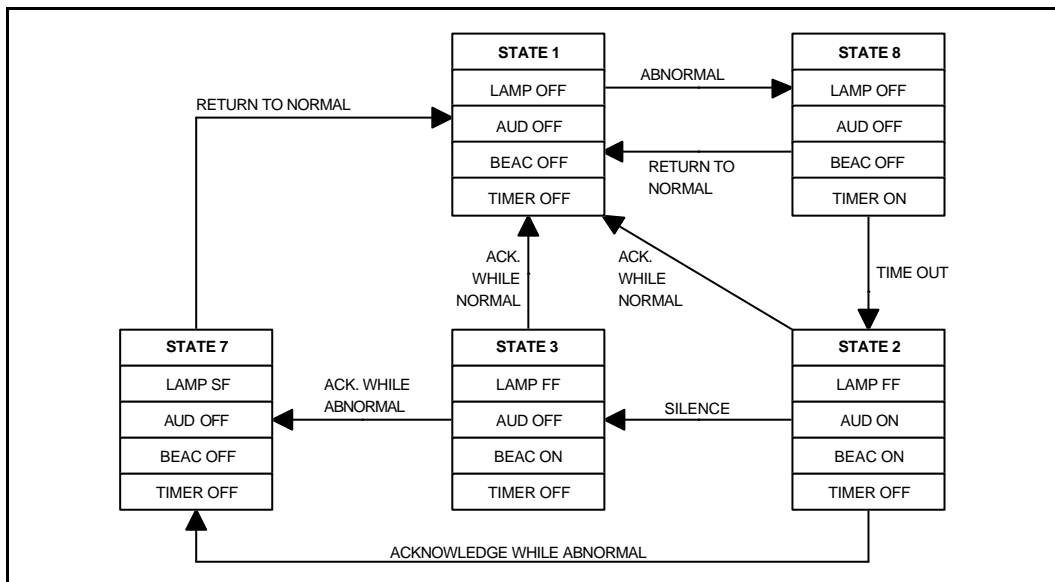
*Sequence 19: Fleeting Alarm, Auto Reset, for Motor Alarms, Timer on*

## Sequence 20: Pulse Monitoring Alarm, Auto Reset, Timer on

STATE 18
- LAMP OFF
- AUD OFF
- BEAC OFF
- TIMER ON

STATE 1
- LAMP OFF
- AUD OFF
- BEAC OFF
- TIMER OFF

STATE 8
- LAMP OFF
- AUD OFF
- BEAC OFF
- TIMER ON

ABNORMAL · RETURN TO NORMAL · ABNORMAL · RETURN TO NORMAL

TIME OUT · TIME OUT · ABNORMAL · RETURN TO NORMAL

STATE 2
- LAMP FF
- AUD ON
- BEAC ON
- TIMER OFF

ACK. WHILE NORMAL · ACK. WHILE ABNORMAL · SILENCE

STATE 17
- LAMP ON
- AUD OFF
- BEAC OFF
- TIMER OFF

STATE 3
- LAMP FF
- AUD OFF
- BEAC ON
- TIMER OFF

STATE 6
- LAMP ON
- AUD OFF
- BEAC OFF
- TIMER OFF

ACK. WHILE NORMAL · ACK. WHILE ABNORMAL

Sequence 20: Pulse Monitoring Alarm, Auto Reset, Timer on

Sequence 21: Multiple Group, First Out, Manual Reset

STATE 1
- LAMP OFF
- AUD OFF
- BEAC OFF
- FO INACTIVE

RESET WHILE NORMAL · ABNORMAL FIRST OUT · RESET WHILE NORMAL · ABNORMAL SUBSEQUENT · ACKNOWLEDGE

STATE 6
- LAMP ON
- AUD OFF
- BEAC OFF
- FO INACTIVE

STATE 5
- LAMP ON
- AUD OFF
- BEAC ON
- FO INACTIVE

STATE 4
- LAMP ON
- AUD ON
- BEAC ON
- FO INACTIVE

ACK. · SILENCE

ACKNOWLEDGE

STATE 6
- LAMP ON
- AUD OFF
- BEAC OFF
- FO INACTIVE

STATE 10
- LAMP FF
- AUD OFF
- BEAC ON
- FO ACTIVE

STATE 9
- LAMP FF
- AUD ON
- BEAC ON
- FO ACTIVE

ACK. · SILENCE

Sequence 21: Multiple Group, First Out, Manual Reset

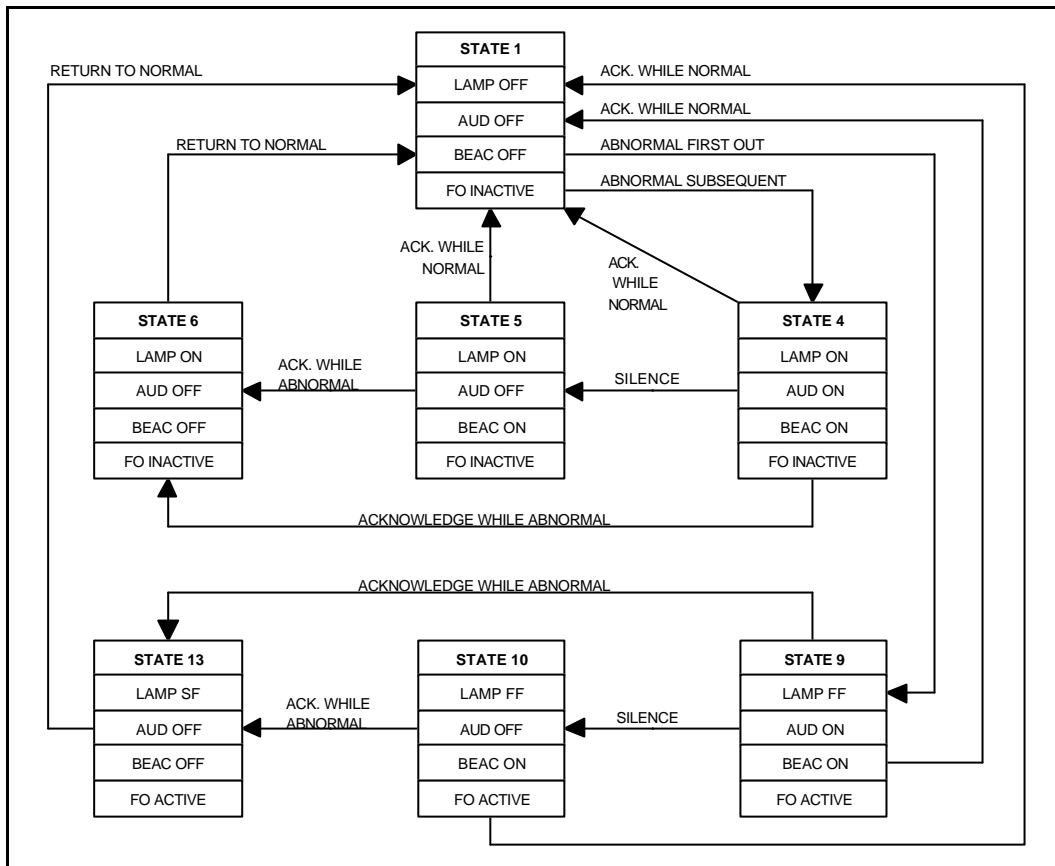**Sequence 22: Multiple Group, First Out, Auto Reset, First Out Reset Interlock**
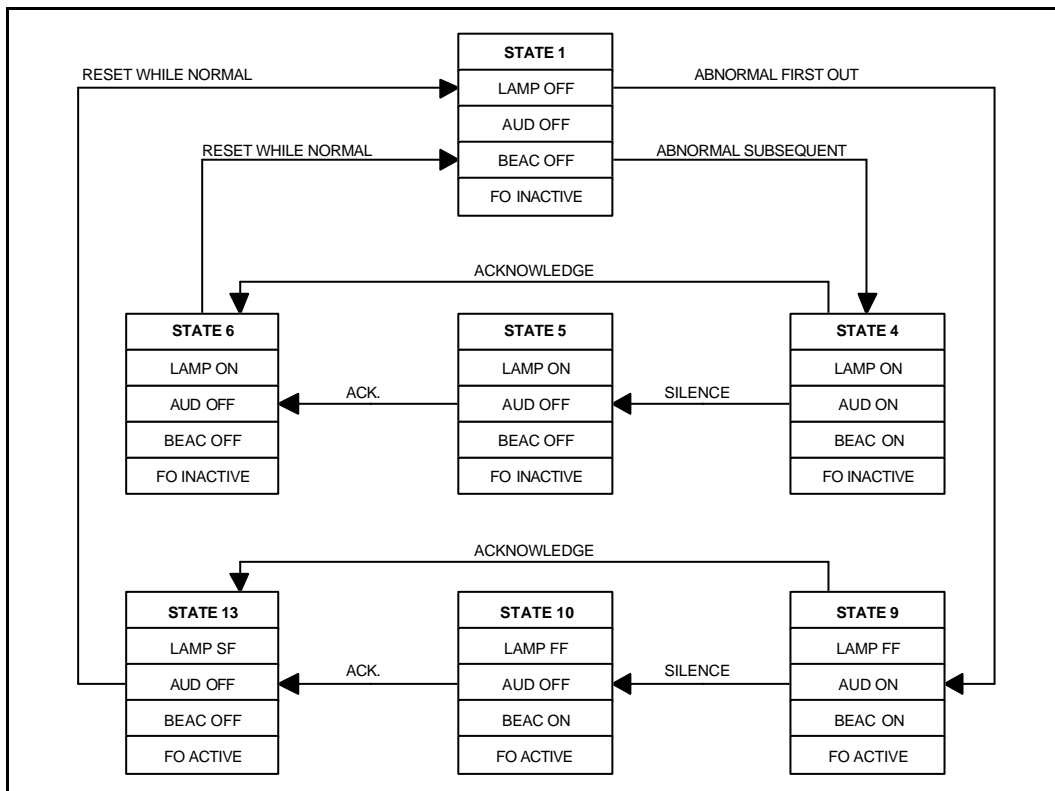
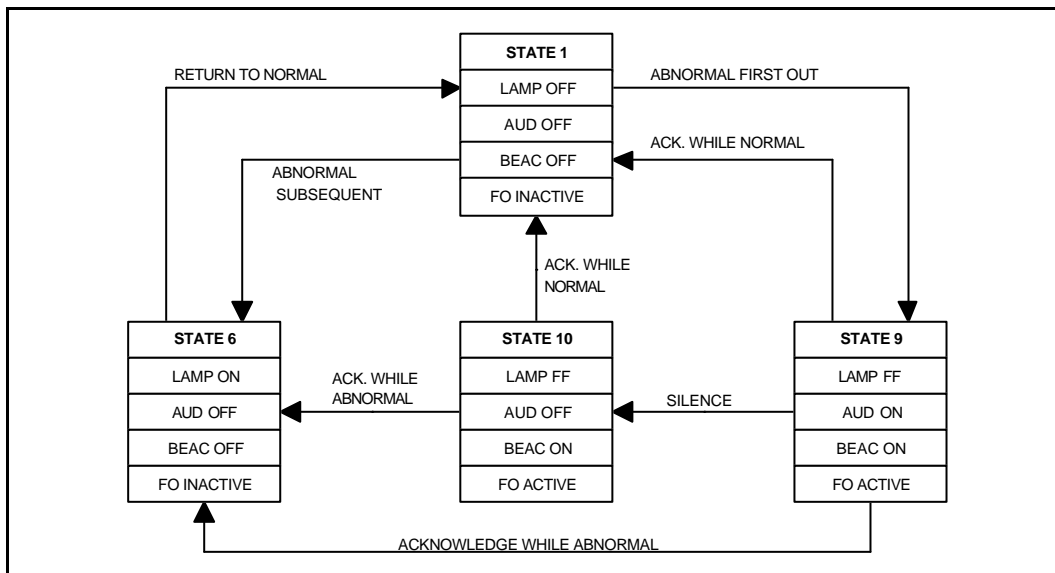**Sequence 23: Single Group, First Out, Manual Reset, First Up Continuous Flash**
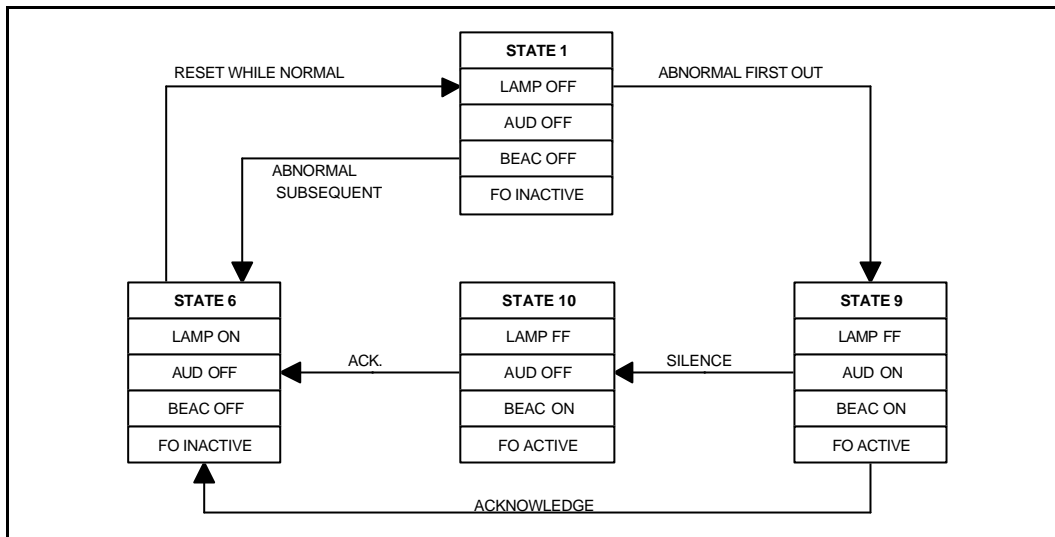
Sequence 24: Multiple Group, First Out, Manual Reset with no Subsequent Alarm State Silence Push Button
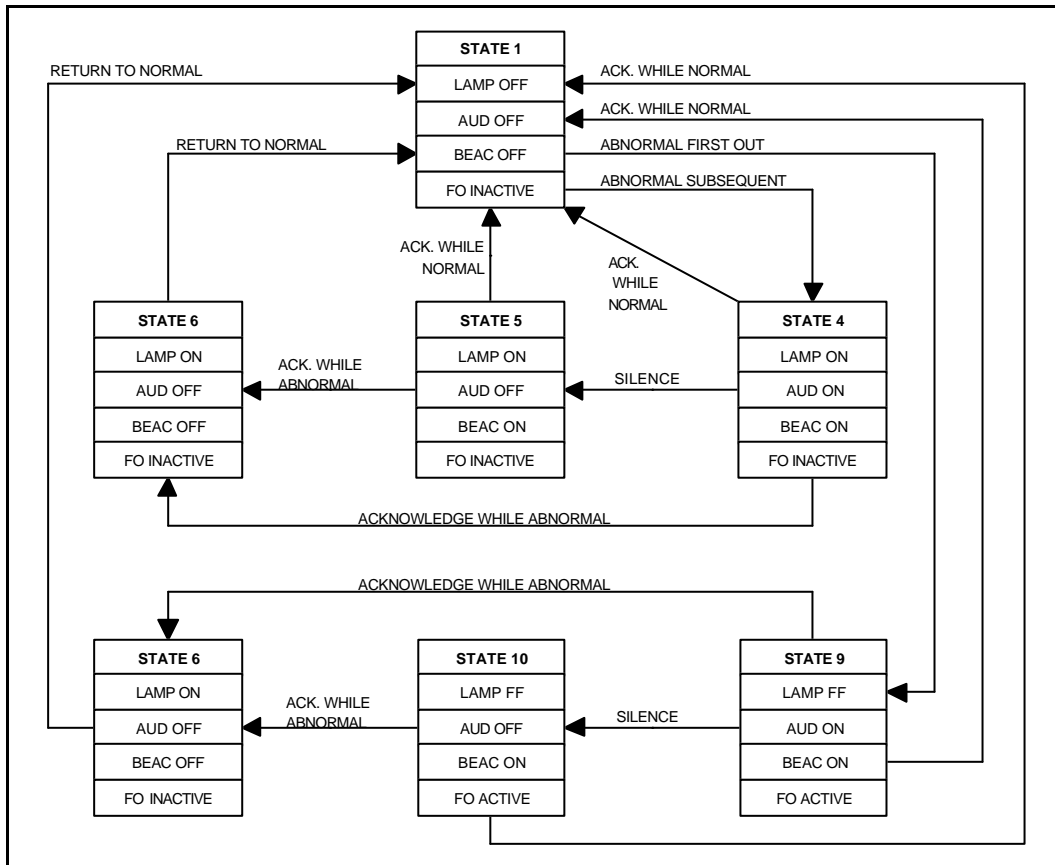
Sequence 25: Multiple Group, First Out, Auto Reset

Sequence 26: Single Group, First Out, Auto Reset, First Up Continuous Flash

**Sequence 27: Multiple Group, First Out, Auto Reset with no Subsequent Alarm
State Silence Push Button**

4. User Defined Sequences

User defined sequences are an advanced feature of Maxilarm which requires details of the DIT Layout as well as information on constructing user defined sequences. This information is available in a separate document. Please consult the System Integrator or Omniflex agent for a copy of this document.

History Sheet

Issue	Rev	Date	Description of changes
001	01	May 2011	Initial issue.
002	02	May 2011	Minor Corrections after proof Read