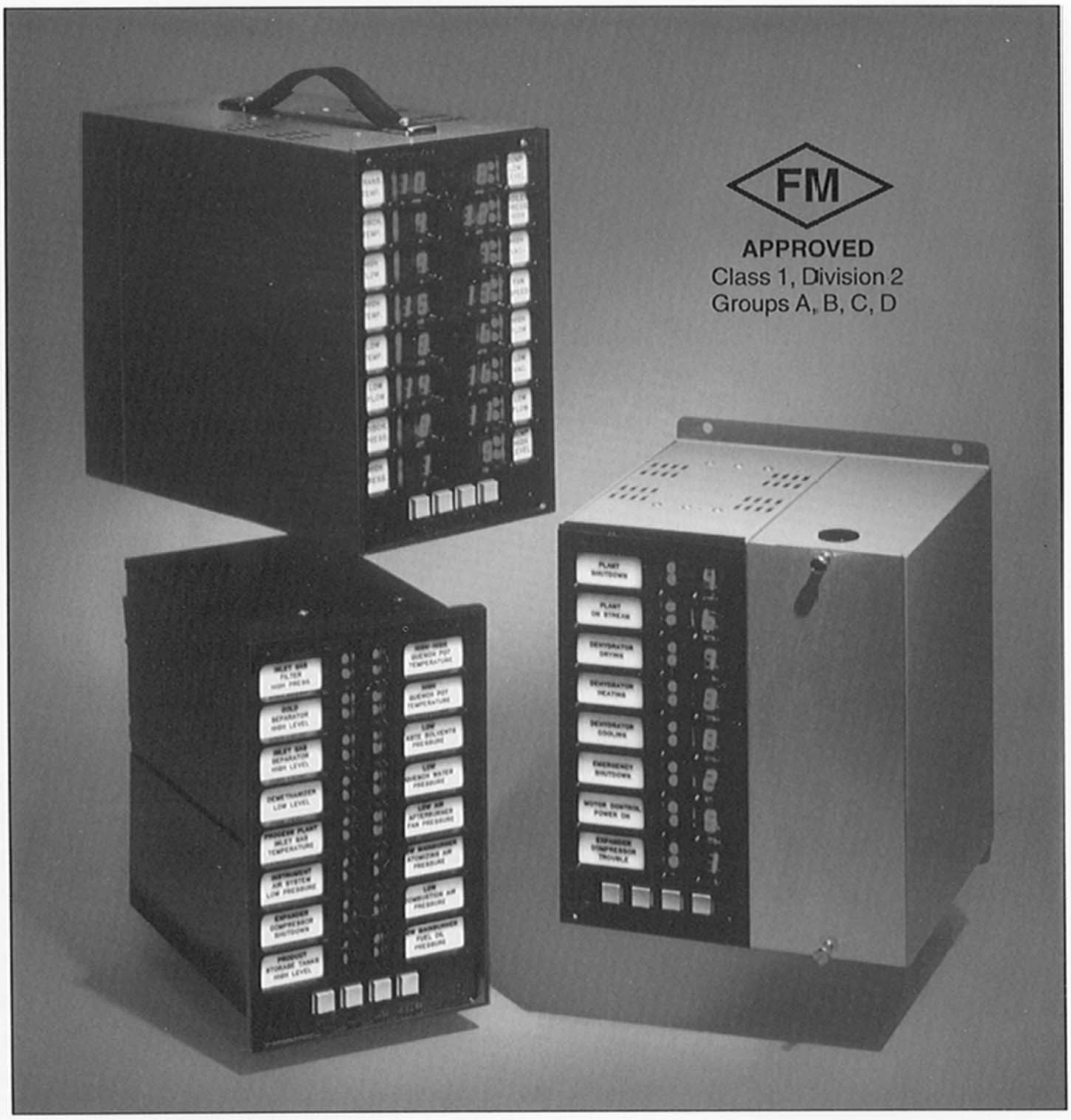
Instructions
and
Operating Manual

SERIES X100
ULTRALARM SYSTEMS



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SECTION 1

GENERAL DESCRIPTION

1-1. Introduction

This manual contains information and procedures for the installation and operation of the Ronan Series X100 Ultralarm Systems. It also includes applications data and detailed specifications for each of the X100 plug-in modules. A parts list, replacement parts ordering data and schematic diagrams are also included.

This manual is organized into seven sections as follows:

Section 1 General Description

Section 2 Applications Data

Section 3 System Description

Section 4 Module Specifications and Selection Guide

Section 5 Installation Data

Section 6 Ordering Information

Section 7 Schematic Diagrams

1-2. General Description

The Series X100 Ultralarm Systems, Figure 1-1, are innovative, self-contained, microcomputer-based annunciators designed to monitor logic-level voltages and individual or series-wired live switch contacts in control and interlock circuits of machinery and process equipment. Through proper selection of input modules and the setting of user-selectable option switches, virtually any combination of input types, annunciator sequences, and output functions may be accommodated.

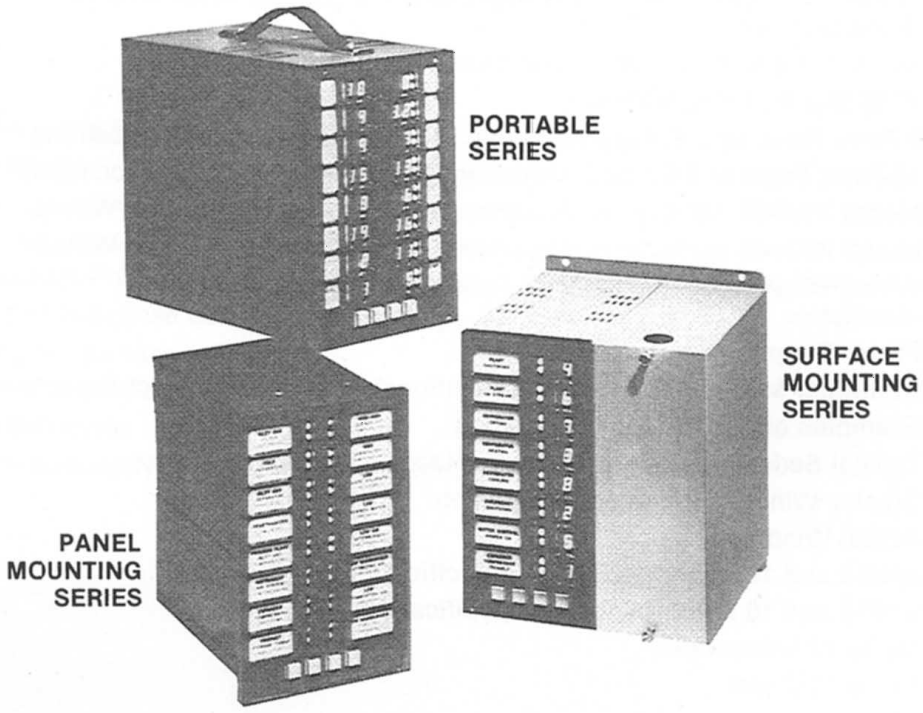


Figure 1-1. Series X100 Ultralarm Systems

Table 1-1. Functional and Electrical Specifications

Power Input	115/230VAC ± 10%, 50/60 Hz — 36 Watts
Power Indicator	Indicator Light (front panel mounted)
Power Fuse	1/2 Amp
Ambient Temperature	0 to 50°C (32 to 122°F)
Alarm Input Types	8 or 16 Dry/Live Switch Contact or Logic Level inputs, each with N.O./N.C. Switch
Field Contact Voltages	5 to 280V AC/DC
Field Contact Input Currents	1 to 10ma AC/DC
Alarm Response Time	15, 30, 60 and 120 milliseconds
First Out Alarm Resolution	0.65 to 3.0 milliseconds
Alarm Sequence Selection	Selectable via 8 position DIP switch on controller module.
First Out Grouping	Selectable via field wiring jumpers.
Display Windows	Specify engraving and color with order.
Reflash/Common Alarm Outputs	
Relay Contact	3 amps at 115V AC or 30V DC, resistive.
Transistor Output	Sink up to ½ amp from external power source.
Electrical Classification	General Purpose or Class I, Division 2, Groups A, B, C, D using hermetically-sealed relays. A power disconnect must be provided between the X100 and the power Source.

The X100 introduces the concept of user-configurable input groups to obtain the absolute chronological order of alarms within each group, where any number of groups may be created and of any size up to the capacity of the annunciator. Not only does this provide excellent diagnostic capability for resolving the causes of any fault condition, but may even prevent unexpected shutdowns if the sequence of orderly shutdowns is frequently monitored.

The Ultralarm Systems are available in eight or sixteen input configurations in three different physical chassis configurations; surface mounting, panel mounting and portable cases. All models are available with standard flashing displays or with combination flashing and numeric displays. A number of options such as NEMA enclosure mountings are also available.

The X100 functional and electrical specifications are listed in Table 1-1. Physical specifications, i.e., dimensions, weight, etc., are provided in Section 5. Key features of the X100 System are listed in Table 1-2.

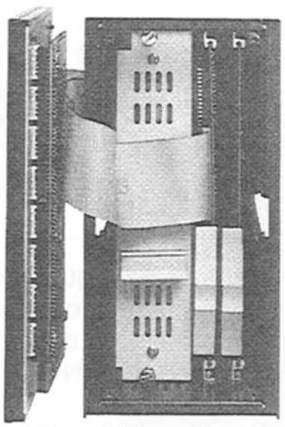
Table 1-2. X100 Features

- Panel and surface mounting units and enclosures
- Portable units for diagnostic testing
- 5 basic and 11 first-out annunciator sequences
- Standard and high-resolution input modules to interface with:
  - dry (isolated) contacts
  - live contacts (5V to 280V AC or DC)
  - logic level outputs (4.5V to 30.0V)
- High-speed microcomputer control with built-in system self-test
- Numeric displays for absolute indication of the sequence of first-out and subsequent alarms
- First-out and sequential resolution to 0.65 milliseconds
- Terminals to arrange first-out groupings
- Internal switches for selecting:
  - input response time and polarity (N.O./N.C.)
  - annunciator sequence for each point
  - slow and fast flashing rates
  - automatic delayed silence of 1 or 2 audible devices
  - single or dual horn groupings
  - interlocked silence and acknowledge pushbutton operation
  - reflash or common alarm output
- Compact, modular design including plug-in power supply and display
- TEST, SILENCE, ACKNOWLEDGE, and RESET pushbuttons on front panel

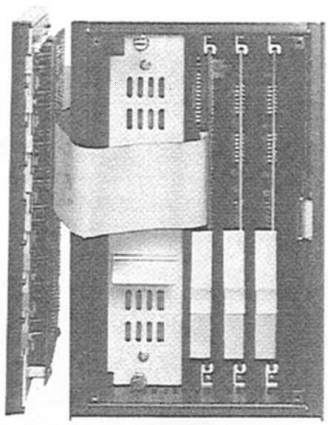
1-3. Physical Description

The X100 Systems, Figure 1-2, are modular in design and are each comprised of a Chassis, Display Panel, one or two 8-point Input Modules, Controller Module, and Power Supply Module.

The chassis assemblies, which are constructed of heavy gauge sheet metal, are the mechanical/electrical interface that house the plug-in modules and field wiring terminals. Field wiring terminals on all models are conveniently located to minimize access time during initial installation or when adding contact points or changing contact groupings.



8 Point Panel Mounting System



16 Point Panel Mounting System

Figure 1-2. X100 Modular Construction

1-4. Plug-In Modules

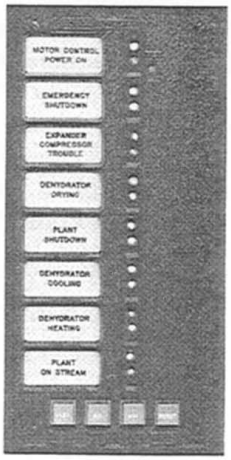
The X100 plug-in modules are standard 5″(12.7 cm) × 7.6″(19.3 cm) printed circuit boards with an etched 56-pin, two-sided PC board edge connector that mates with a connector in the back of the X100 chassis. All modules (including the power supply) employ low-voltage, solid-state integrated circuits.

1-5. Quick-Disconnect Display Panels

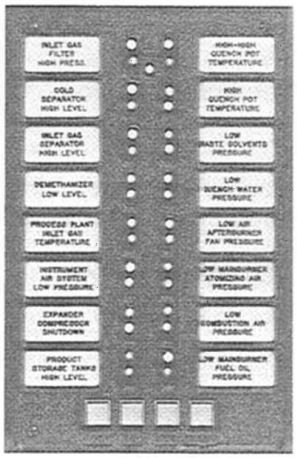
Two types of Display Panels, Figure 1-3, are available for the 8 input and 16 input model X100s. Both types have individually removable windows and interface to the control electronics via a quick-disconnect cable. The Standard Display Panels have two high-intensity LED lamps located adjacent to each window. The dual-lamp display provides five types of visual alarm status: fast flashing, slow flashing, intermittent flashing, steady on and off.

For more complex applications where the order in which certain alarms occur is important, Numeric Display Panels are available. These panels have, in addition to the standard LED lamps, a large one or two-digit display adjacent to each window. The numeric readouts capture the exact sequence in which alarms occur within each group and retain this information until the display is reset. The dual-lamp displays, not needed for the display of First-Out status, can follow a simple sequence (A, L, M or R for example) to annunciate new and acknowledged alarms, or even return-to-normal conditions for all points including the first alarm.

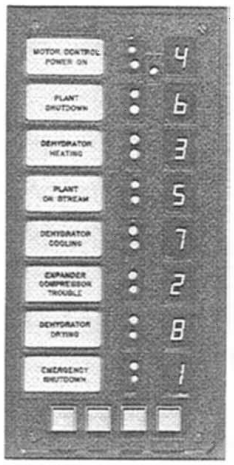
A Power-On indicator is located at the top of the panel and the system operating controls are located at the bottom of the panel. Switches include, TEST, SILENCE, ACKNOWLEDGE, and RESET. Provisions to connect a set of remote switches are provided on the field wiring terminals.



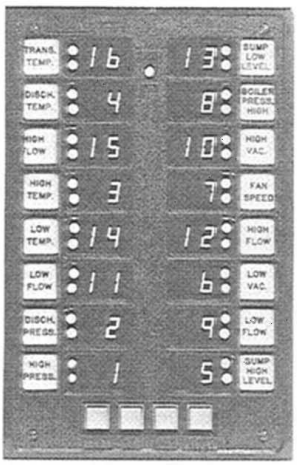
8-Point Unit with Alarm Display
Model X100-208



16-Point Unit with Alarm Display
Model X100-216



8-Point Unit with Alarm and
Numerical Display
Model X100-308



16-Point Unit with Alarm and
Numerical Display
Model X100-316

Figure 1-3. X100 Display Panels

SECTION 2

APPLICATIONS DATA

2-1. Introduction

An X100 Ultralarm System can be user-configured to monitor and annunciate individual contact points, groups of contact points for first-out and subsequent alarm sequence, or a combination of both applications simultaneously. The series X100 systems are modular in design and are based on a common internal bus system which allows interchangeability of plug-in modules from one model to the next. Dry contact, live contact, and/or logic level input modules may be installed in all models of the 8- and 16-point X100 Systems. Any combination of input modules can be installed in the 16-point modules. Standard flashing display panels or combination flashing and numeric display panels can be specified for both 8- and 16-point models as applications dictate the sophistication and level of detail that must be captured, retained, and displayed. System response time is user-selectable via a switch on the X100 controller module; response can be changed at any time as field or site requirements change simply by changing the switch setting.

The X100 is preprogrammed to annunciate all industry-standard alarm sequences plus several improved and special-purpose alarm sequences. The X100 combines user-selectable annunciator sequences with both standard and numeric display panels which when combined provide a new dimension to first-out sequence data that can be captured and displayed.

The X100 contains a microcomputer with a 2048 byte program memory. The memory has a resident program which contains 16 annunciator sequences. Any sequence can be selected to function with from one to sixteen individual contacts or to function with groups of contacts withch the user can group (first-out) via the ME terminals on the X100 terminal strip.

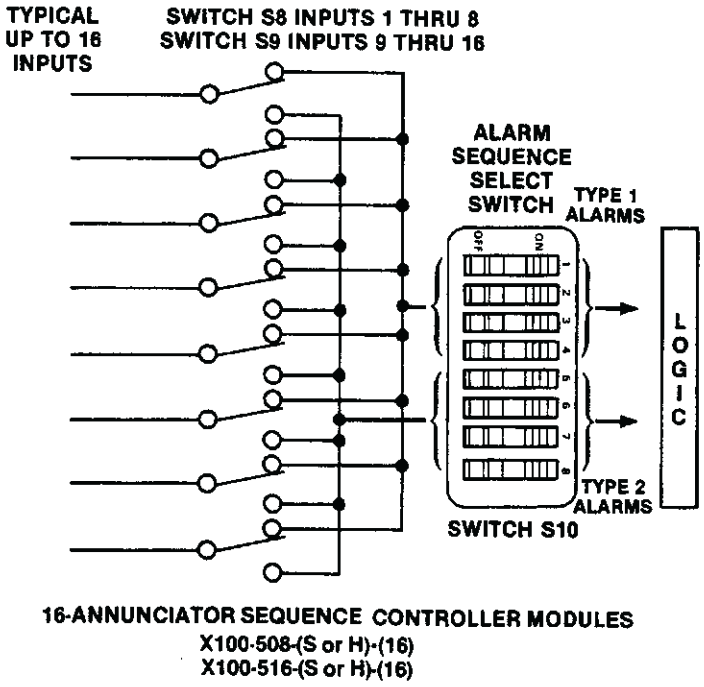


Figure 2-1. Input Grouping and Sequence Selection Switches, Simplified Diagram

Two annunciator sequences may be selected for simultaneous operation. One (1) eight-position DIP switch pack (S10) on the controller module, Figure 2-1, is used to select the desired sequence. Input grouping switches (S8 and S9) on the controller allow the user to assign the inputs to be monitored to the 8-position DIP switch. The position of the appropriate Sequence Selector Switch dictates which of the sixteen available sequences the X100 will execute. Detailed switch setting procedures are provided in Section 5.

2-2. Standard Display Panels

The standard display panels have two high-intensity LED lamps located immediately adjacent to the window that identify the function being monitored. The indicators can be set to flash at different frequencies by manually setting the flash-rate switches on the controller module. Detailed switch setting procedures are provided in Section 5.

Each Annunciator Sequence employs the display indicators to visually display on a dynamic basis, the status of the input that it is monitoring. The selectable flashing rates give the user the ability to create the display best suited to his application. To enhance the annunciating capabilities of the X100, three optional relays, which are mounted on the power supply module, provide contacts for activating one or two external audible alarms and a reflash or common alarm output. These retransmitting options are useful in applications where the X100 is located at a remote site and an alarm at the central control panel is required. A switch is provided on the controller module which allows the user to choose either the Reflash or Common Alarm function (Refer to Section 5).

Operating pushbuttons SILENCE, ACKNOWLEDGE, and RESET are located at the bottom of the display panel. A POWER ON indicator, located at the top of the panel, illuminates when AC power is applied to the X100 System. Option switches on the controller module allow the user to interlock the operation of the three pushbuttons for silencing, acknowledging, retaining, and resetting alarm status.

2-3. Numeric Display Panels

The X100 with numeric display panels add another dimension to status information that can be captured and displayed. These panels offer all of the features of the standard display panel plus a one or two-digit numeric display adjacent to the flashing indicators. The numeric display, adjacent to the alarm window, indicates the event number of a sequence of events within a group of inputs.

Features of the Numeric Display:

A. Only assigns an event number for abnormal inputs.

B. Numeric information "locks-in"so that as each input in the group goes into alarm an Event Number will be displayed.

C. Reset clears all numerics and arms the unit for a new capture of events.

D. The numeric display operation is independent of the alarm sequence used.

When numerics are used with alarm sequences, the numerics can be counted upon to capture the order of events, therefore, first-out alarm sequences are not used. Instead, it is recommended to use any one of the Basic Alarm Sequences (A, L, M, or R-4X) since the LED alarm lamps can then be used to display the input alarm status (Alarm, Acknowledged Alarm and Returned to Normal). This added flexibility allows the operator to record the sequence of alarm events using the numerics while leaving him free to note current alarm status using the LED lamps.

APPLICATIONS FOR NUMERIC DISPLAY:
"Signature Analysis" — Normal start-up or shutdown of critical equipment where it has been established that inputs to the X100 must be in a predetermined order. If the sequence varies, the operator is given indication of the malfunction.

Since all events from first to the last are indicated, the operator can give consideration to the second, or third event being the cause of a shutdown if the system is limited by external switching device (i.e., If one input uses a fast relay compared to another slower relay type or mechanical switching device).

Connecting up a shutdown group of inputs to be able to indicate in sequence for a normal shutdown allows a check for normal shutdown by reviewing the numeric display is particularly suited to be used for operation or fault conditions associated with circuit breakers or switchgear in power stations and substations.

2-4. Annunciator Sequences

An annunciator sequence is an interactive series of operator actions and visual/audible state changes of an annunciator (display or audible) following an abnormal input to the X100 (contact opening or closing). The X100 is preprogrammed to perform ten (10) or sixteen (16) different annunciator sequences which conform to the latest ISA standards. The sequences are:

Reference Number	Sequence Code	Alarm Sequence
0.	A	Automatic Reset
1.	L	Latched Reset
2.	M	Manual Reset
3.	R	Ringback
4.	R-4X	Ringback (for use with Numeric Displays)
5.	F1A	First Out (Type 1) Automatic Reset
6.	F1L	First Out (Type 1) Latched Reset
7.	F1M	First Out (Type 1) Manual Reset
8.	F3A	First Out (Type 3) Automatic Reset
9.	F3A-5X	First Out (Type 3) Automatic Reset (special flashing)
10.	F2A	First Out (Type 2) Automatic Reset
11.	F2L	First Out (Type 2) Latched Reset
12.	F2M	First Out (Type 2) Manual Reset
13.	F3L	First Out (Type 3) Latched Reset
14.	F3M	First Out (Type 3) Manual Reset
15.	F1R	First Out (Type 1) Ringback

Basic Alarm Sequences

Four basic types of annunciator sequences are in common use. The operation of each is different after process conditions return to normal. The alarm sequences offered in this instrument make use of the following basic sequence letters to designate the four basic alarm sequence types.

Basic Sequence Letter	Key Words	Description
A	Automatic Reset	The sequence returns to the normal state automatically, after acknowledge, when the process condition returns to normal.
L	Latched Reset	The sequence returns to the normal state automatically, after acknowledge and then reset, when the process condition returns to normal.
M	Manual Reset	The sequence returns to the normal state, after acknowledge, when the process condition is normal at the time the reset pushbutton is operated.
R	Ringback	The sequence provides distinct visual and audible indications, after acknowledge, when the process condition returns to normal. The sequence is then returned to the normal state by reset.

The types of flashing shown in the sequence charts such as "fast flashing" and "slow flashing" are examples based on frequent use. Option switches on the X100 are provided to vary the frequency of each flashing rate. See Section 5.

Since annunciator sequences usually include lock-in of momentary alarms, sequences in this manual include lock-in as a standard feature. A sequence option number and switch is provided to permit deleting the lock-in feature.

Variations in the basic sequences can be defined using basic sequence letter designations combined with option numbers.

First Out Designation	Key Words	Description
F1	No Subsequent Alarm State	Subsequent alarms appear in the acknowledged state. Subsequent visual displays do not flash. The audible device does not operate when subsequent alarms occur, unless still operating from the first alarm. The first out indication is reset by the acknowledge pushbutton.
F2	No Subsequent Alarm Flashing	Subsequent visual displays do not flash. The audible device operates when subsequent alarms occur. The first out indication is reset by the acknowledge pushbutton.
F3	First Out Flashing and Reset Pushbutton	Additional types of flashing are added to identify new and acknowledged first alarms. A first out reset pushbutton is added to reset the first out indication, whether the process condition has returned to normal or not.

First out sequences can be automatic reset or manual reset or can provide ringback indication when alarms return to normal. First out sequences are designated by a combination of the first out designation, the basic sequence letter designation, and option numbers.

Option Designations

Option numbers can be used with the basic sequence letter designations to define many different sequence variations. Annunciator manufacturers make use of the following option numbers to designate many of the common sequence variations.

First Out Alarm Sequences

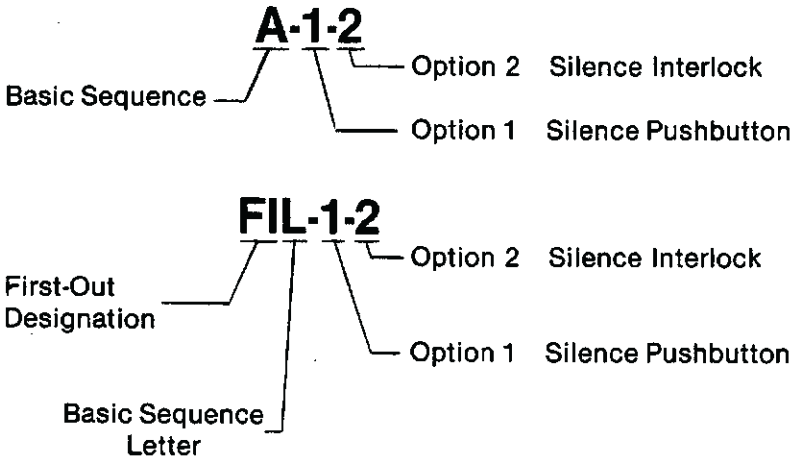
First out alarm sequences are used to indicate which one of a group of alarm points operated first. To accomplish this, the visual display indication for the alarm point that operates first must be different from the visual display indication for subsequent alarm points in that group. Only one first out alarm indication can exist in any one first out group.

Three methods for differentiating between first and subsequent alarms are in common use. Two methods make use of the usual sequence features for the first alarm and delete features for subsequent alarms. The third provides additional features to indicate first alarms. Annunciator manufacturers make use of the following first out designations to designate the three methods.

Option Number	Key Words	Description
1	Silence Pushbutton	A separate pushbutton is added to allow silencing the alarm audible device without affecting the visual displays.
2	Silence Interlock	An interlock is added to require operation of the silence pushbutton before alarms can be acknowledged.
3	Acknowledge Reset Interlock	An interlock is added to require operation of the acknowledge pushbutton before the reset operation is performed.
4	No Lock-In	The lock-in feature is deleted. Momentary alarms return to the normal sequence state without operation of the acknowledge pushbutton.
5	No Flashing	The visual display flashing feature is deleted. New alarms have the same visual display indication as acknowledged alarms.
6	No Audible	The audible device is deleted.
7	Automatic Alarm Silence	A time delay device is added to silence the alarm audible device after a set time without affecting the visual displays.
8	Common Ringback Audible	A common audible device is used to call attention to both the alarm and ringback sequence states.
9	Automatic Ringback Silence	A time delay device is added to silence the ringback audible device after a set time without affecting the visual displays.
10	No Ringback Audible	The ringback audible device is deleted.
11	Common Ringback Visual	A common type of flashing is used to indicate both the alarm and ringback sequence states.
12	Automatic Momentary Ringback	Ringback sequence momentary alarms go to the ringback sequence state without requiring operation of the acknowledge pushbutton.
13	Dim Lamp Monitor	The visual display indication is dim in the normal sequence state to reveal lamp failure.
14	Lamp Test	Operation of the test pushbutton tests the visual displays only.
1X	Priority Horns	Two audible horns selectable No.1 or No. 2 for one alarm sequence.
2X	Reflash Output	Common output signals each new incoming alarm input only clearing when all inputs return to normal.

Option Number	Key Words	Description
3X	Common Alarm Output	Common output signals that there is an alarm in the unit and clears when all inputs return to normal.
4X	Common Ring-back Pushbutton	Acknowledge pushbutton acknowledges both alarms and ringback alarms.
5X	Common First-out Visual	Flashing rate of first-out alarm and acknowledged states are identical.
6X	Direct Reset Option	Permits resetting without prior acknowledging.
7X	Ringback Silence Interlock	An interlock is added to require operation of the silence pushbutton before the ringback visual can be reset.

Typical method of specifying alarm sequences with options:



SEQUENCE A - AUTOMATIC RESET

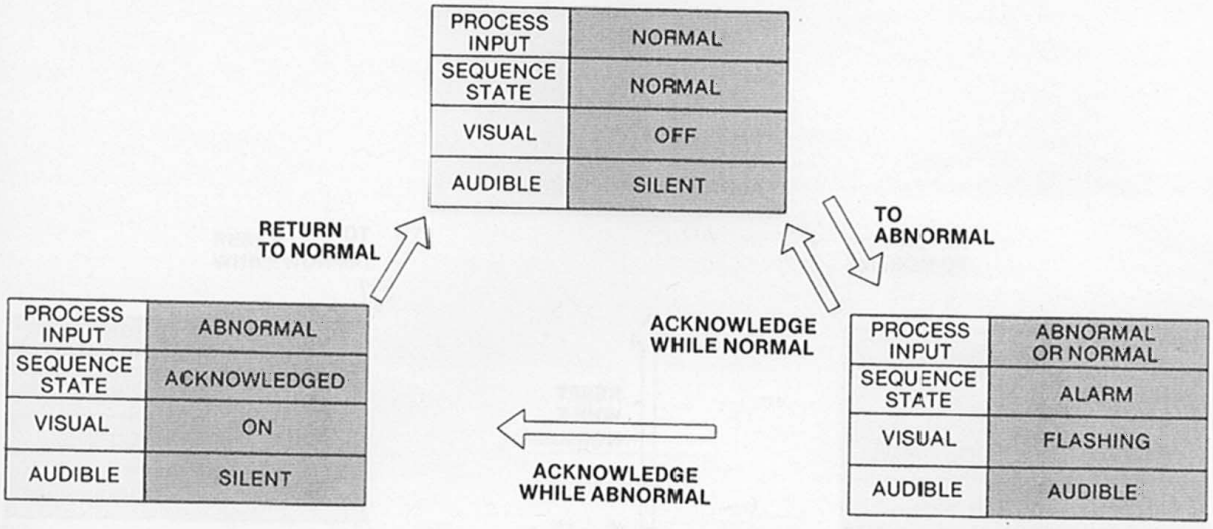


Figure 2-2.

Sequence A

Sequence A is a basic alarm sequence (Horn on with Flashing Visual) with automatic reset that automatically returns acknowledged alarms to normal when the process inputs return to normal. In some applications, Sequence A may have a disadvantage since new momentary alarms return to off if they occur while the acknowledge pushbutton is being operated or they will appear in the steady on condition if still abnormal on release of the acknowledge button. Thus new alarms may be lost or may be confused with previously acknowledged alarms. To avoid this disadvantage, new alarms may be identified and logged when they enter the alarm state before operating Acknowledge. Using Option 1 improves the sequence by adding the Silence Pushbutton to remove the audible signal, leaving the new alarms in the Flashing State while being observed. Option 2 interlocks the Silence and Acknowledge pushbuttons. Operation of the Acknowledge Pushbutton will not change new alarms to the acknowledged state unless and until they are first silenced. Thus, alarms that occur while the Acknowledge Pushbutton is being operated will be presented in the alarm state. Use of this option also prevents accidental operation of the acknowledge function. It also enforces rigorous operator actions by requiring sequential rather than random operation. This sequence is recommended for standard systems where a large number of alarms are not expected to occur simultaneously.

SEQUENCE L - LATCHED RESET

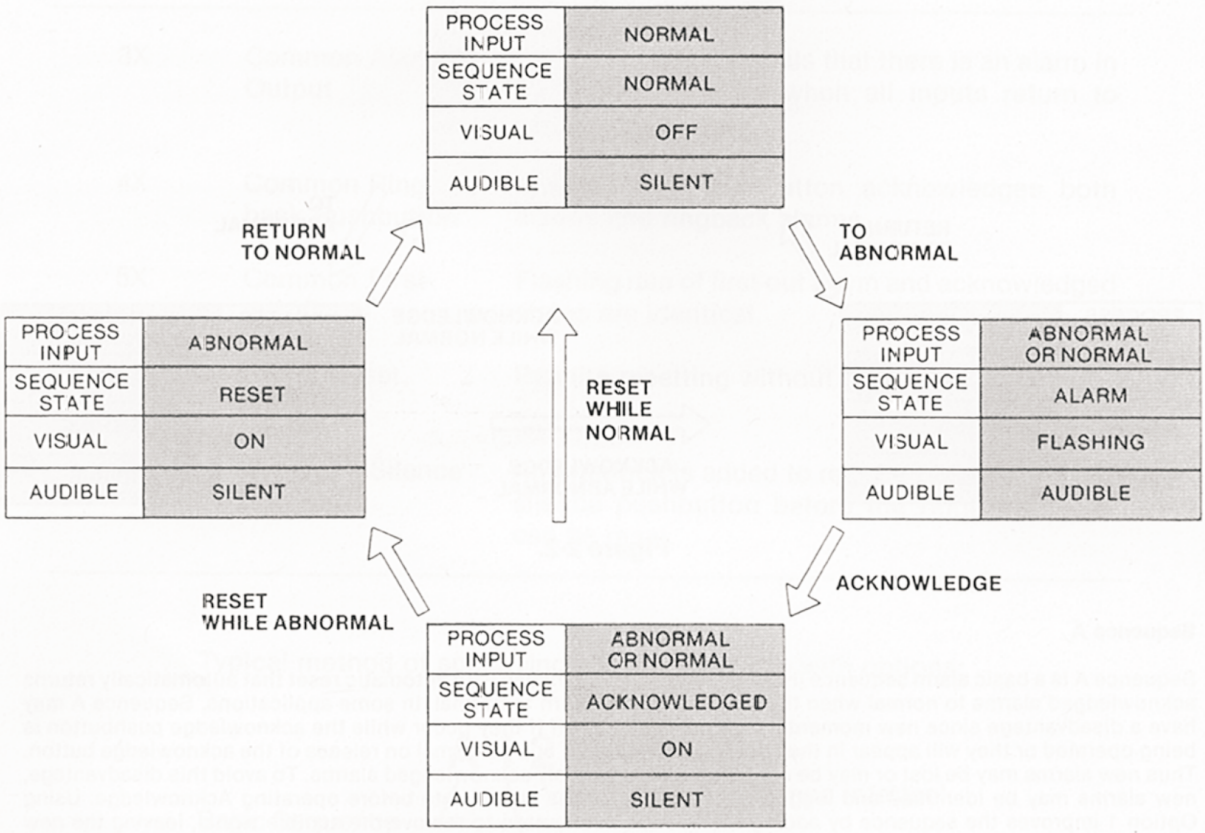


Figure 2-3.

Sequence L

Sequence L is a basic alarm sequence (Horn on with Flashing Visual) with latched reset that retains acknowledged alarms until the Reset Pushbutton is operated. All maintained and momentary alarms are retained in the acknowledged state and only return to normal automatically after the Reset Pushbutton is operated and the process input returns to normal. Addition of Option 1 assists the operator by silencing the Horn and permitting a review of the new flashing alarms. Option 2 requires sequential operation of silence and acknowledge functions as described for Sequence A. This sequence is recommended particularly in large systems where there is a possibility of a large number of alarms occurring simultaneously, so that they may be safely acknowledged while accepting new alarms.

SEQUENCE M - MANUAL RESET

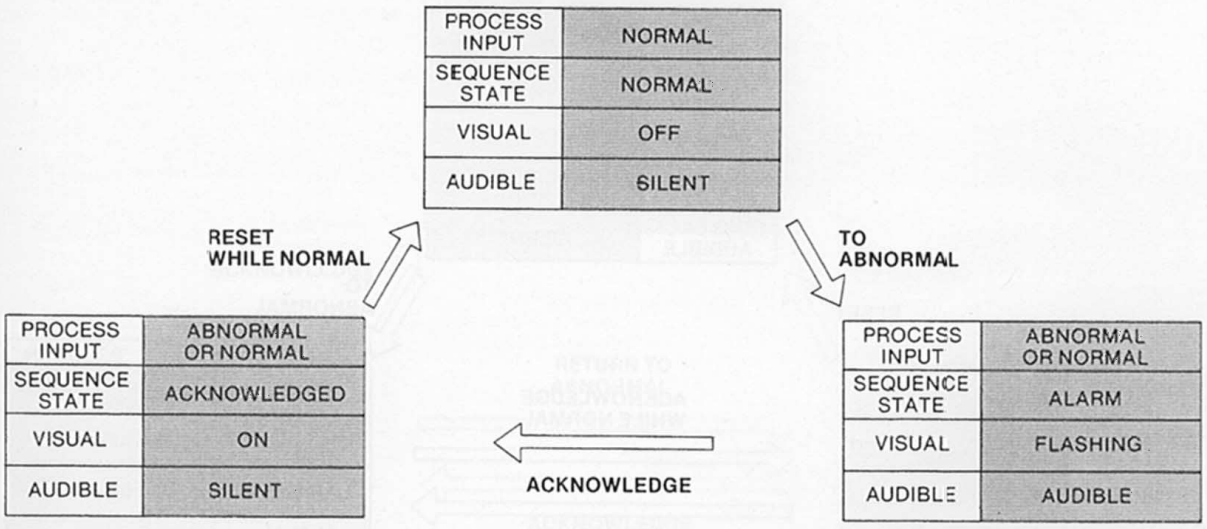


Figure 2-4.

Sequence M

Sequence M is a basic alarm sequence (Horn on with Flashing Visual) with Manual Reset that retains acknowledged alarms until the process input conditions return to normal and the manual Reset Pushbutton is operated. In some applications, Sequence M may have a disadvantage since new alarms that occur while the Acknowledge Pushbutton is being operated appear in the steady on condition. Any alarm occurring during the Acknowledge Pushbutton operation may be confused with existing acknowledged alarms. In order to reset alarms, Sequence M requires that the Reset Pushbutton be operated repeatedly to determine if the process input conditions have returned to normal. With Sequence M it is not evident when the process input returns to normal or returns again to abnormal. Use of Options 1 and 2 improves the sequence for reviewing new incoming alarms.

SEQUENCE R - RINGBACK

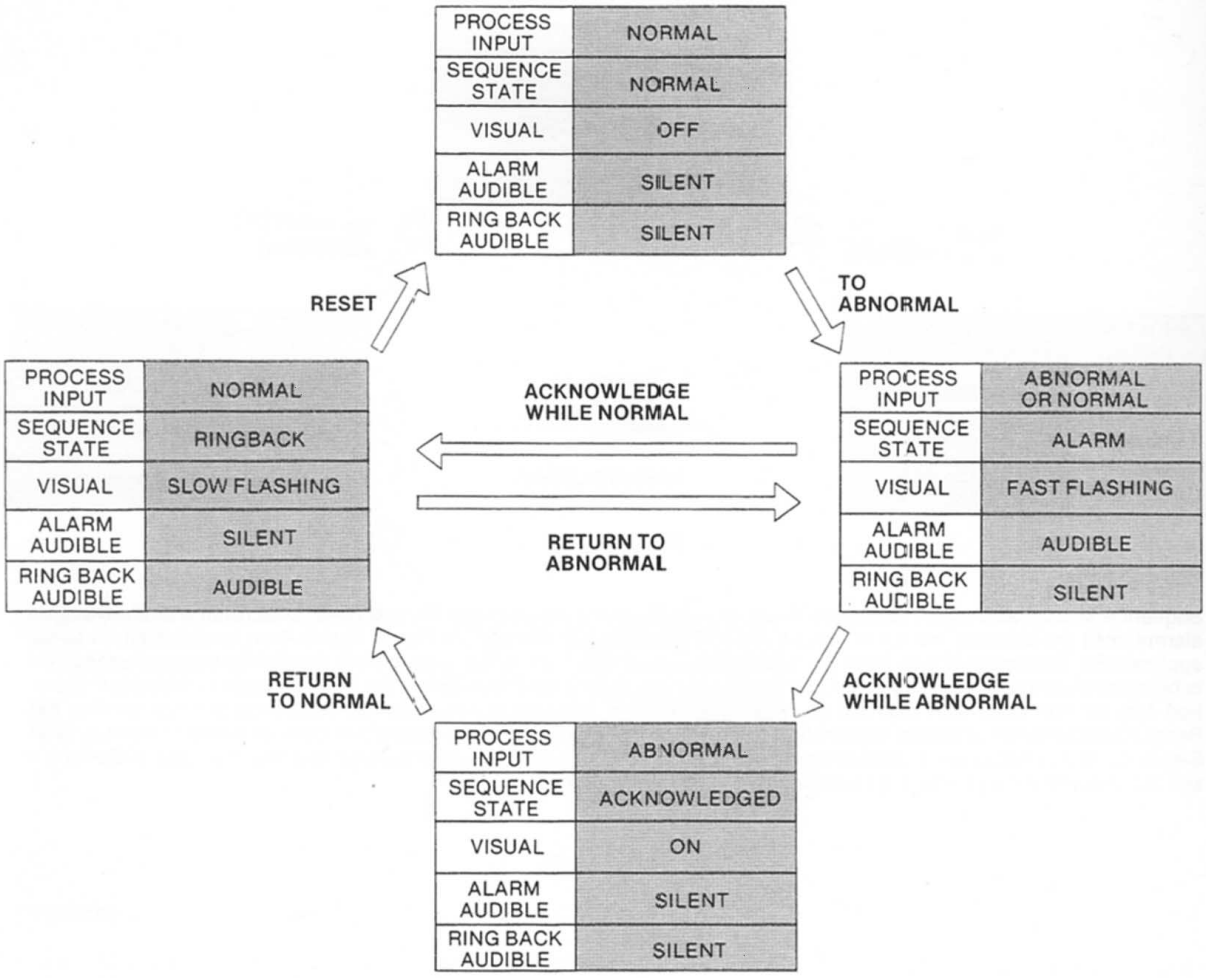


Figure 2-5.

Sequence R

Sequence R is a basic alarm sequence (Horn on with Flashing Visual) with ringback that provides distinct visual and audible indication when the process input conditions return to normal. The ringback indications are displayed when the process condition returns to normal after the alarm has been acknowledged. Activation of reset returns the sequence to a normal state. In some applications, Sequence R may have a disadvantage since momentary and new alarms that occur while the Acknowledge Pushbutton is being operated change to slow flashing and the new maintained alarms change to the steady on condition. The new alarms may be confused with existing alarms. Use of Options 1 and 2 improves the sequence for reviewing new incoming alarms. Option 8 uses a common audible device for both alarm and ringback and relies on the different visual display indications for differentiation. Option 9 uses a time delay device to silence the ringback audible device after a set time. Option 10 deletes the ringback audible and uses only the ringback visual displays. Option 11 uses common type of flashing for both alarm and ringback and relies on the different audible devices for differentiation. Option 12 causes momentary alarms to go to the ringback sequence state as soon as the process condition returns to normal. This sequence is recommended where it is imperative to know when a field input has returned to normal such as an alarm associated with the shutdown of equipment.

SEQUENCE R-4X RINGBACK

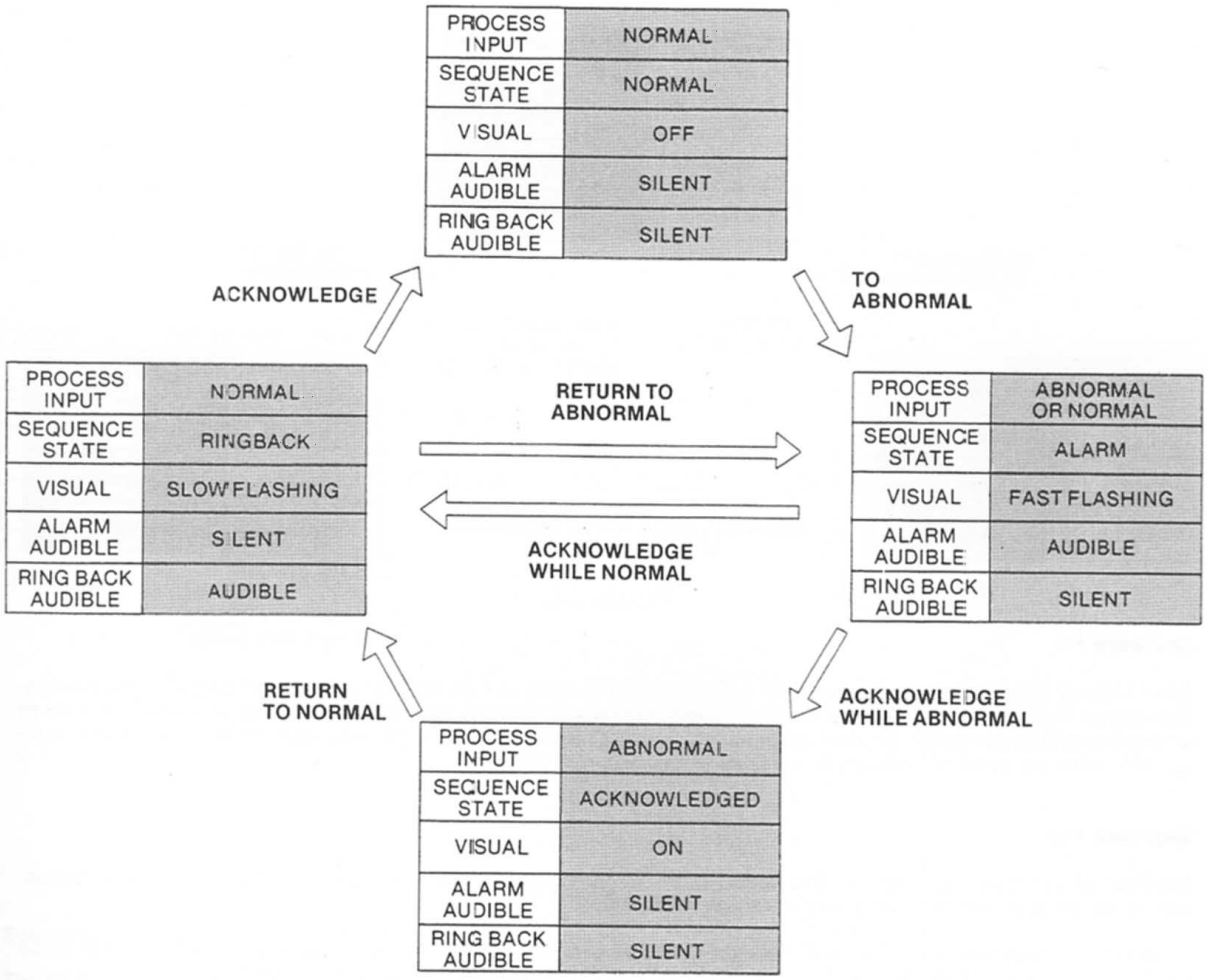


Figure 2-6.

Sequence R-4X

This sequence is the same as the basic "R" sequence except the acknowledge pushbutton is also used to reset the ringback — visual and audible, and returns the logic to a normal state. The reset pushbutton is reserved to reset the numeric display, thus providing the operator with a numeric display indicating the order of events. The alarm display LED's indicate the return to normal and possible return to alarm information required.

This sequence, in conjunction with the numeric display, offers unlimited possibilities when monitoring start-up or shutdown circuits, including special operations requiring monitoring for correct sequence of events.

SEQUENCE FIA - FIRST OUT WITH AUTOMATIC RESET

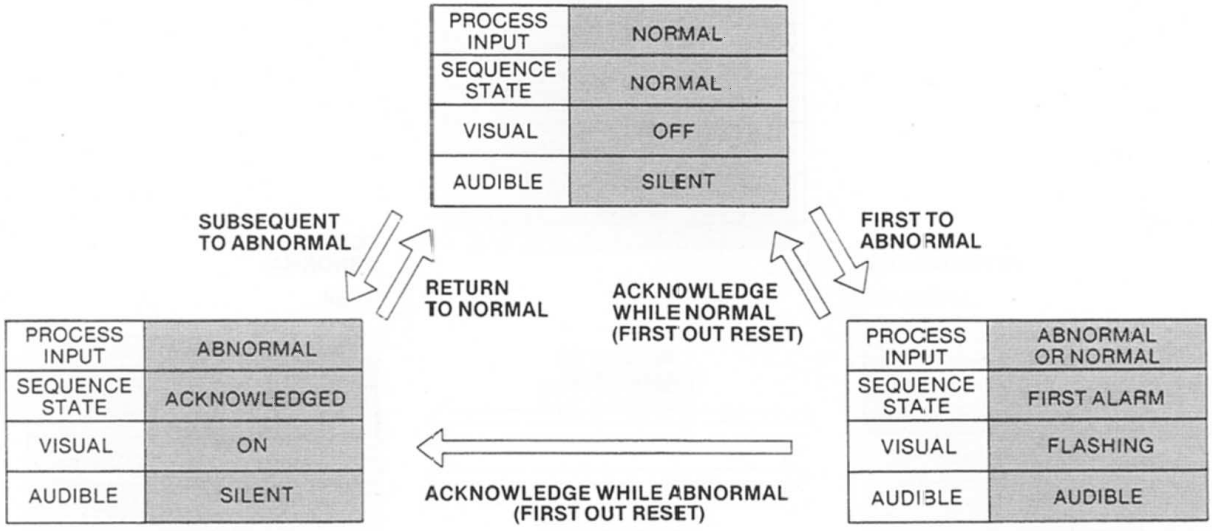


Figure 2-7.

Sequence F1

The F1 family of sequences indicate which one of a group of alarm points occurs first by providing a flashing indication and an audible. Subsequent alarms do not flash nor do they initiate the audible. Clearing of the First out alarm allows the system to accept the next alarm in the group as the First out. The F1 sequence family is available in conjunction with the basic sequences A, L, M and R as described below:

Sequence F1A

The First Alarm operates as a basic Sequence A. Subsequent alarms operate as a status lamp i.e. steady on. Subsequents go off automatically when inputs return to normal.

If Option 1 is specified (Horn Silence) the horn may be silenced without operating the Acknowledge button since acknowledging the system would clear the First Out and the concept of first out would be lost.

Because subsequent alarms for F1 type sequences initially appear in the acknowledged state, F1A subsequent alarms (with their automatic reset feature) return to the normal sequence state automatically, when the inputs return to normal. That is, no acknowledge is required to allow them to return to normal. This sequence is perfect for logging-in the first out and having a constantly updated indication of the status of subsequent alarms. If Option 1 is specified and the horn is silenced, subsequent alarms will not be nuisance alarms by operating the horn or needing operator attention. After operator acknowledgement (resetting First Out function) the First Out point will return to the normal sequence state automatically when the input returns to normal.

Key Applications

1. First out is the only alarm of importance.
2. Current status of subsequents is of interest.
3. Minimum operator action is preferred for subsequent alarms.

If subsequent alarms must lock-in see sequence F1L.

If subsequent alarms must lock-in and be annunciated by audible and visual flashing see sequence F3A.

SEQUENCE FIL - FIRST OUT WITH LATCHED RESET

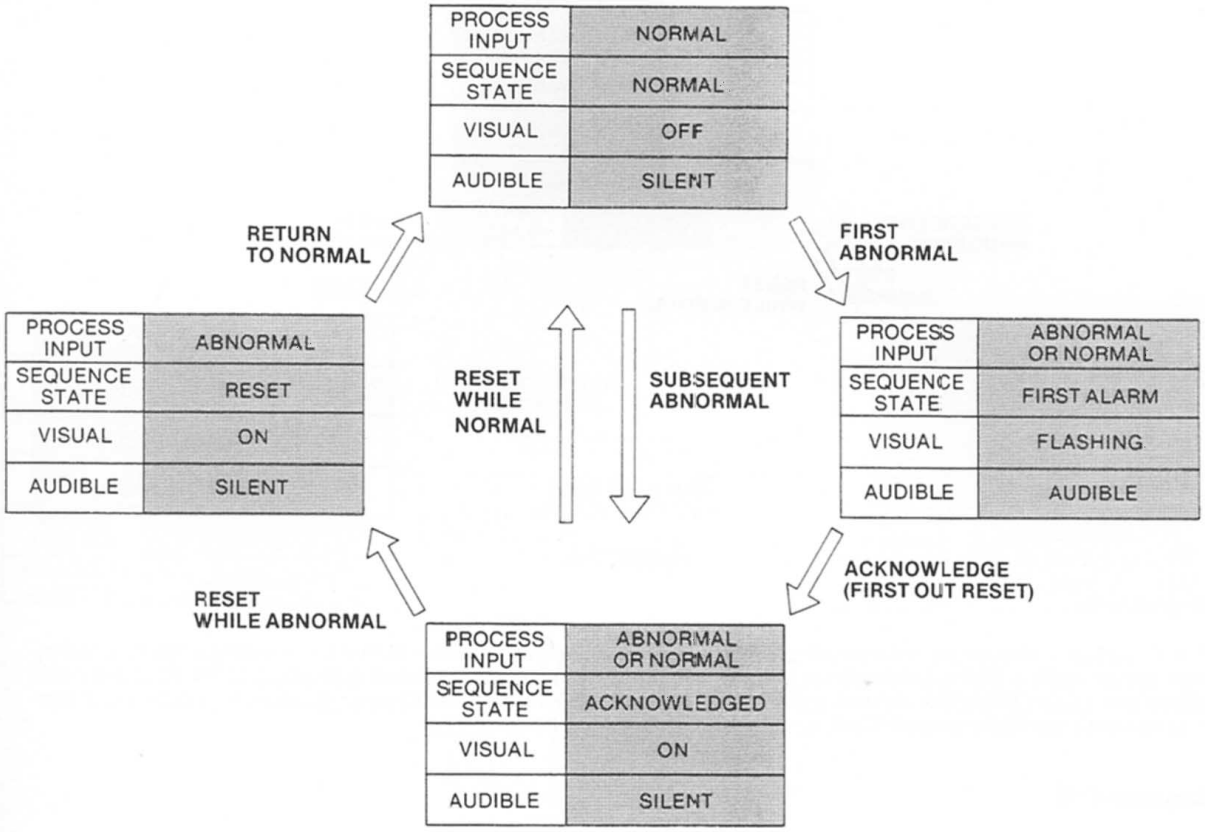


Figure 2-8.

Sequence F1

The F1 family of sequences indicate which one of a group of alarm points occurs first by providing a flashing indication and an audible. Subsequent alarms do not flash nor do they initiate the audible. Clearing of the First out alarm allows the system to accept the next alarm in the group as the First out. The F1 sequence family is available in conjunction with the basic sequences A, L, M and R as described below:

Sequence F1L

The first alarm operates as a basic Sequence L. Subsequent alarms operate as status lamps but lock-in until Reset. Because subsequent alarms for the F1 type sequences initially appear in the acknowledged state (visual on), F1L subsequent alarms are locked in. See Sequence L for explanation. Operation of Reset will permit currently displayed subsequent alarms to return to normal automatically as the inputs return to normal. Further subsequent alarms will be displayed and require resetting before they can automatically return to normal. Operation of the Reset Pushbutton does not affect the First out indication. Only operation of the Acknowledge Pushbutton affects the First out point. To clear a First out point it must be Acknowledged and then Reset before it can automatically return to normal (with input normal).

Key Applications

1. First out is the prime alarm of importance.

2. Subsequent alarms lock-in (to be observed by operator), but can be Reset to permit return to normal automatically (when input returns to normal).
3. Minimum operator action is preferred for subsequent alarms (i.e. lock-in provides complete history of subsequent alarms).

SEQUENCE FIM - FIRST OUT WITH MANUAL RESET

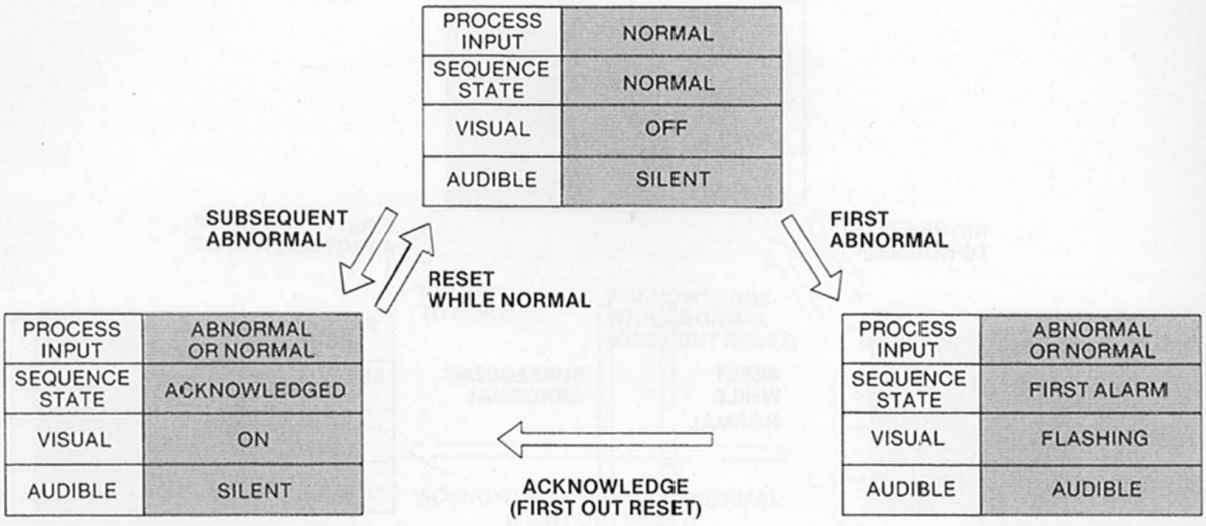


Figure 2-9.

Sequence F1

The F1 family of sequences indicate which one of a group of alarm points occurs first by providing a flashing indication and an audible. Subsequent alarms do not flash nor do they initiate the audible. Clearing of the First out alarm allows the system to accept the next alarm in the group as the First out. The F1 sequence family is available in conjunction with the basic sequences A, L, M and R as described below:

Sequence F1M

The First alarm operates as a basic Sequence M. Subsequent alarms operate as a status lamp that locks in until Reset while normal. This sequence is similar to Sequence F1L except that the Reset will not release the subsequent alarm to return to normal automatically. The subsequent inputs must be normal at the time of reset or the Reset will need to be repeated. The same is true for the First out point after the Acknowledge Pushbutton is operated. For this reason Sequence F1L is a preferred sequence.

Key Applications

1. First Out of prime importance.
2. Subsequent alarms lock-in (to be observed), but require the input to return to normal before it can be reset.

SEQUENCE FIR - FIRST OUT (TYPE 1) RINGBACK

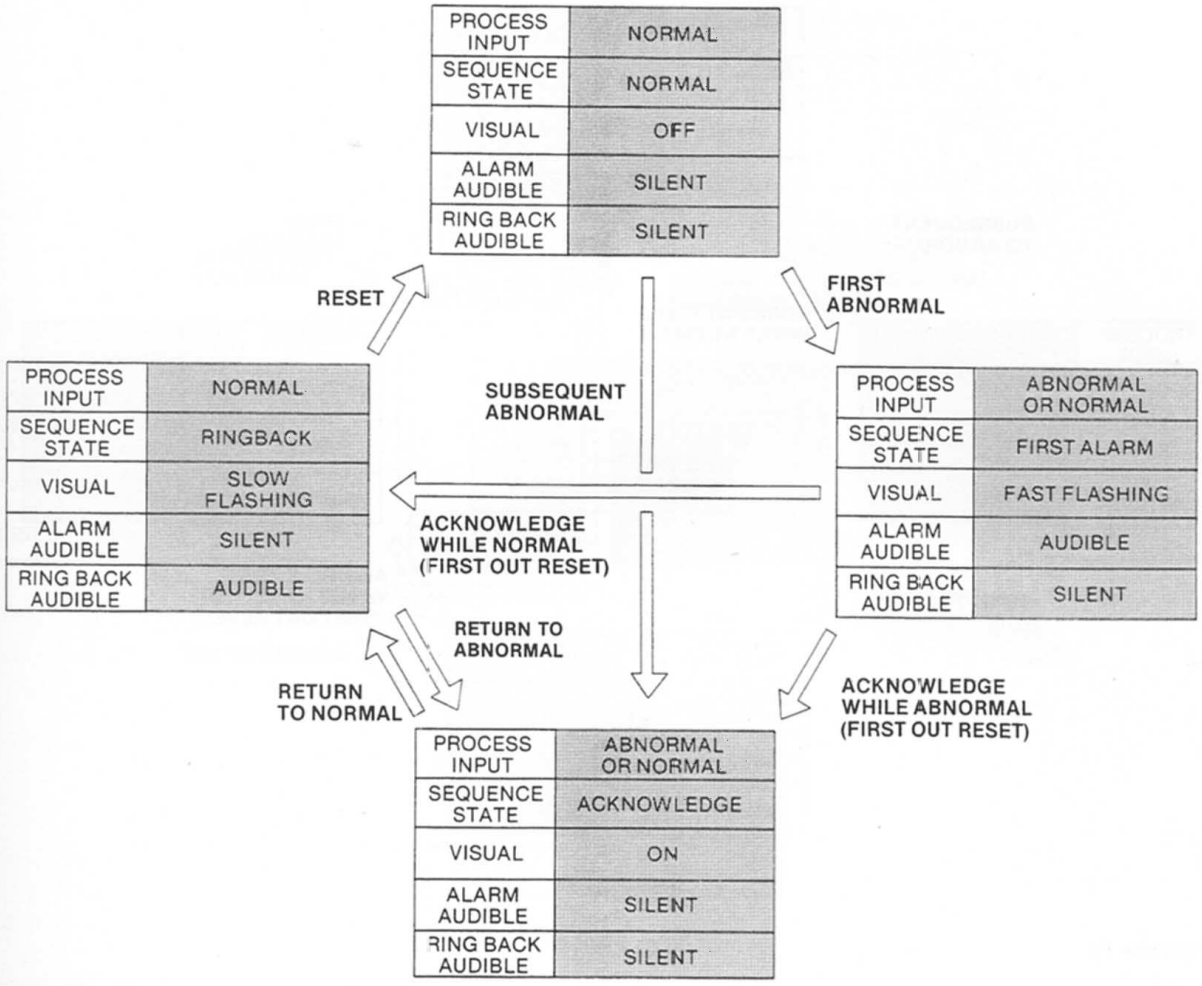


Figure 2-10.

Sequence F1

The F1 family of sequences indicate which one of a group of alarm points occurs first by providing a flashing indication and an audible. Subsequent alarms do not flash nor do they initiate the audible. Clearing of the First out alarm allows the system to accept the next alarm in the group as the First out. The F1 sequence family is available in conjunction with the basic sequences A, L, M and R as described below:

Sequence F1R

The First alarm operates as a basic Sequence R. Subsequent alarms operate as a status lamp that turns steady on for alarm and automatically goes into the ringback state when the input returns to normal. Since subsequent alarms for the F1 type sequence initially appear in the acknowledged state (visual on) F1R subsequent alarms are free to enter the ringback state automatically whenever the associated input returns to normal. If it is desirable to indicate the return to normal of each input, the Ringback audible will draw attention to each subsequent alarm that returns to normal and a slow flashing visual indication will be given. Reset will return these points to the normal state without affecting the First out indication. If subsequent alarms in the ringback state are not reset and the input returns to abnormal, the visual indication will change from slow flashing back to steady on and the ringback audible will turn off. In this way subsequent alarms will alternate automatically between visual on and slow flashing according to the state of the input. After Acknowledging, which resets the First out funtion, the First out alarm will enter the Ringback state automatically when the input returns to normal.

Key Applications

1. First out alarm is of main importance.

2. Subsequent alarms must lock-in (either with visual steady on or slow flashing depending upon status of input).

3. Subsequent alarms which have returned to normal will be announced by;
   a. a ringback audible or;
   b. a ringback audible need not be used, allowing the ringback for subsequent alarms to be observed by slow flashing visual and reset at operators convenience.

SEQUENCE F2A FIRST OUT (TYPE 2) AUTOMATIC RESET

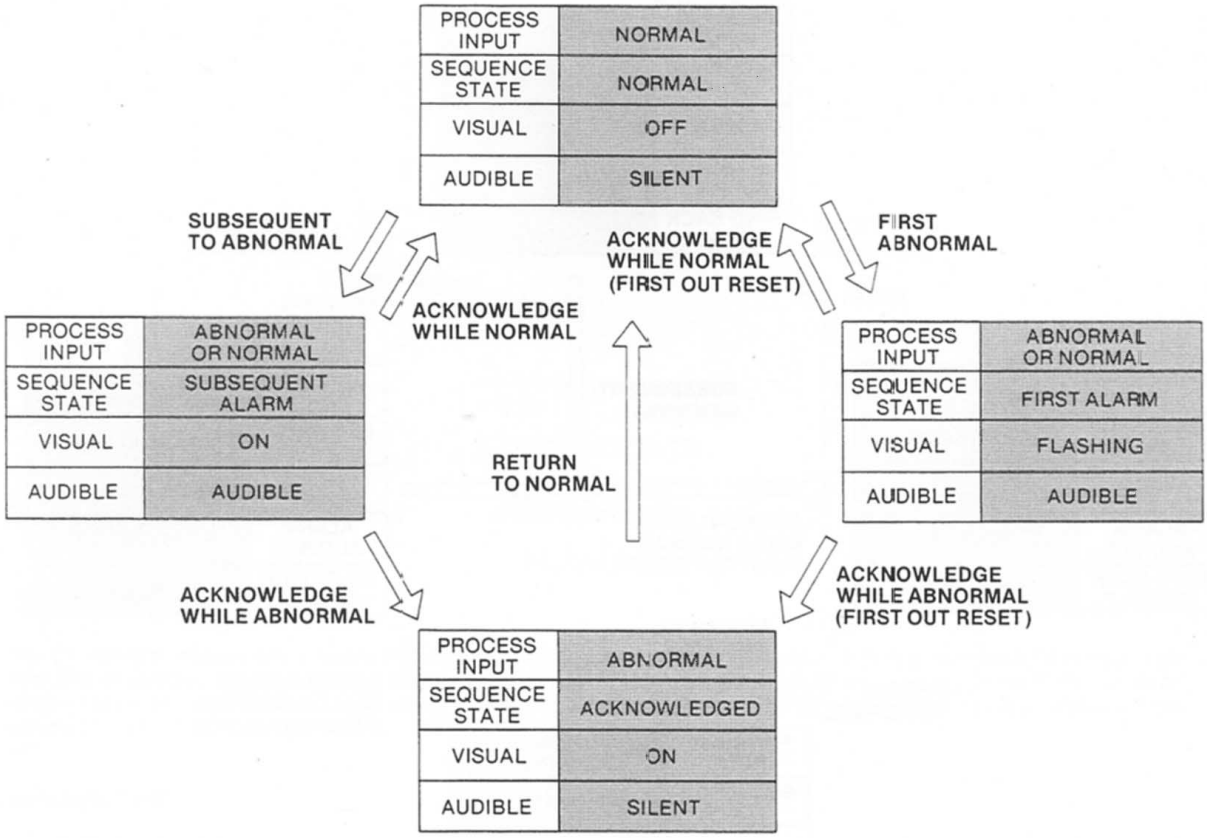


Figure 2-11.

Sequence F2

The F2 family of alarm sequences resets the First out alarm with the operation of the Acknowledge Pushbutton. The first alarm of a group of alarm points operates as described in Family F1. Subsequent alarms do not flash but do initiate the audible. The F2 sequence family is available with basic sequences A, L, and M as described below. Clearing of the First out alarm allows the system to accept the next alarm in the group as a First out.

Sequence F2A

The First Alarm operates as a basic Sequence A. Subsequent alarms operate as a status lamp and also operate the audible. Option 1 must be used to enable the apparent operation of the audible for subsequent alarms. Subsequent alarms are locked-in and cannot return to the normal state until the Acknowledge Pushbutton is operated (resetting the First-out Alarm). After Acknowledgement, all points return to the normal sequence state automatically as the inputs return to normal.

Key Applications

1. First-out Alarm is of prime importance.
2. Subsequent alarms must lock-in and resound the audible if it has been silenced.
3. If Option 1 is used, the number of concurrent alarms expected is small enough that flashing is not required to locate each new subsequent alarm when the audible sounds.

SEQUENCE F2L - FIRSTOUT (TYPE 2) LATCHED RESET

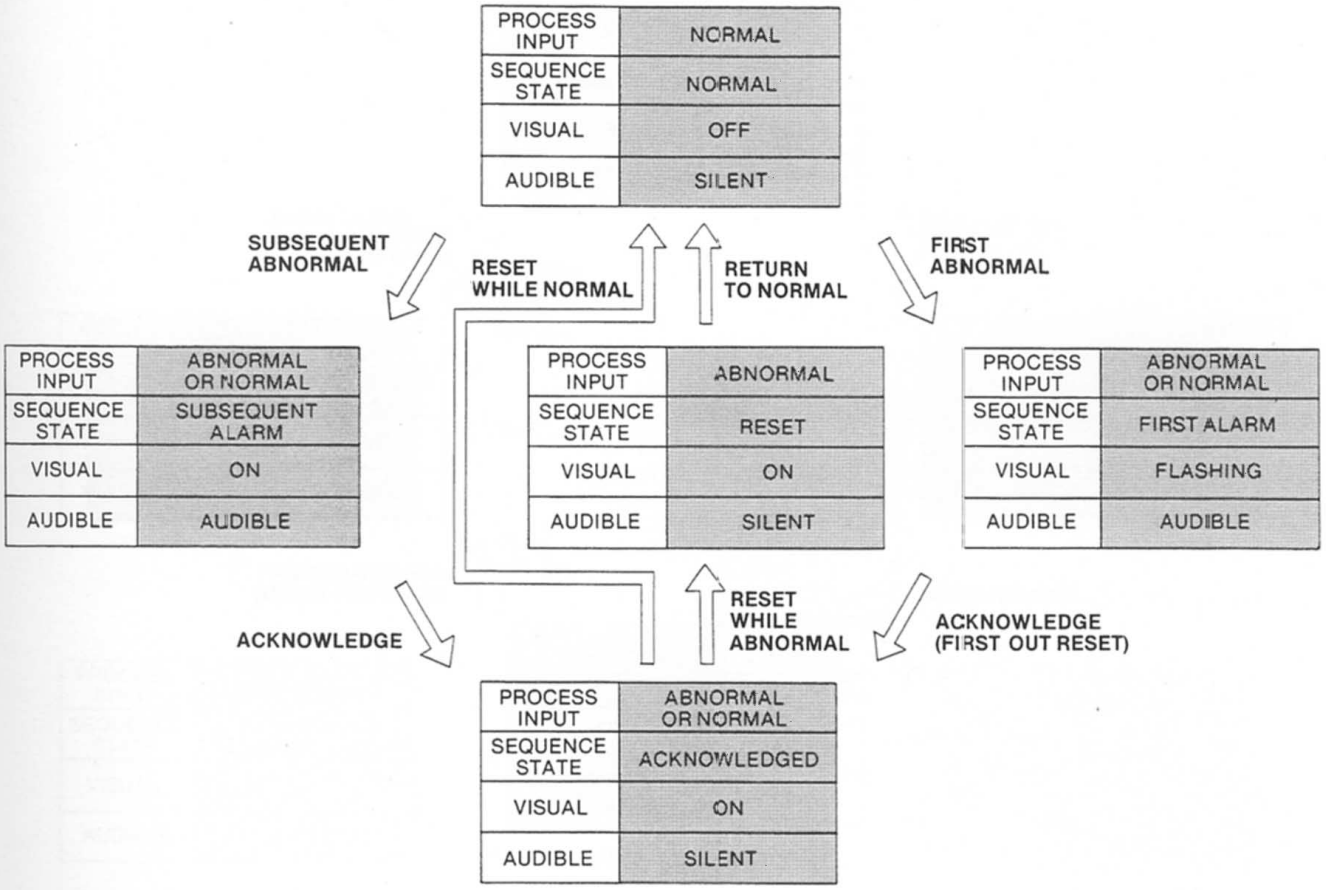


Figure 2-12.

Sequence F2

The F2 family of alarm sequences resets the First out alarm with the operation of the Acknowledge Pushbutton. The first alarm of a group of alarm points operates as described in Family F1. Subsequent alarms do not flash but do initiate the audible. The F2 sequence family is available with basic sequences A, L, and M as described below. Clearing of the First out alarm allows the system to accept the next alarm in the group as a First out.

Sequence F2L

The First Alarm operates as a basic Sequence L. Subsequent alarms operate as a status lamp and also operate the audible. Before Acknowledging the First-out Alarm, Sequence F2L operates the same as Sequence F2A. After Acknowledgment, Sequence F2L differs by requiring a Reset before each point can return to the normal sequence state automatically as inputs return to normal.

Key Applications

1. First-out Alarm is of prime importance.

2. Subsequent alarms must lock-in and resound the audible if it has been silenced. Subsequent alarms return to normal only after Reset.

SEQUENCE F2M - FIRST OUT (TYPE 2) MANUAL RESET

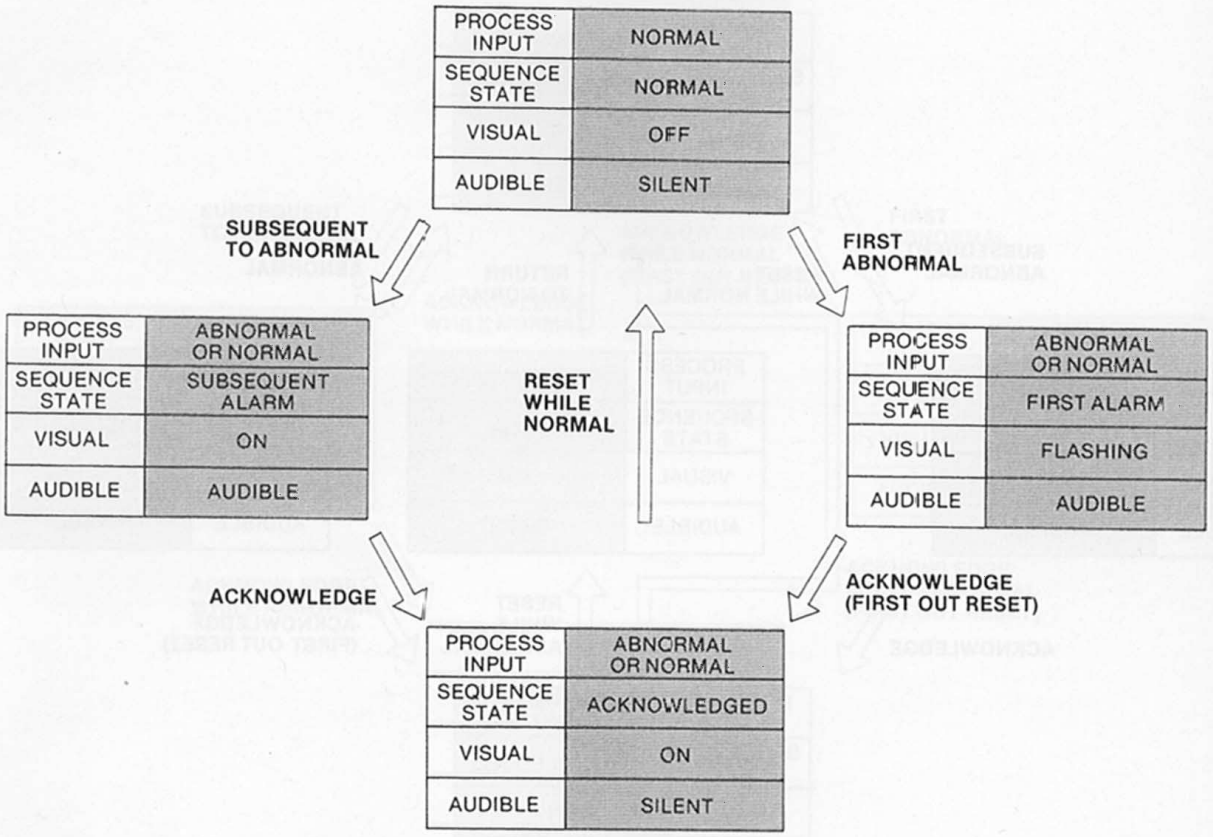


Figure 2-13.

Sequence F2

The F2 family of alarm sequences resets the First out alarm with the operation of the Acknowledge Pushbutton. The first alarm of a group of alarm points operates as described in Family F1. Subsequent alarms do not flash but do initiate the audible. The F2 sequence family is available with basic sequences A, L, and M as described below. Clearing of the First out alarm allows the system to accept the next alarm in the group as a First out.

Sequence F2M

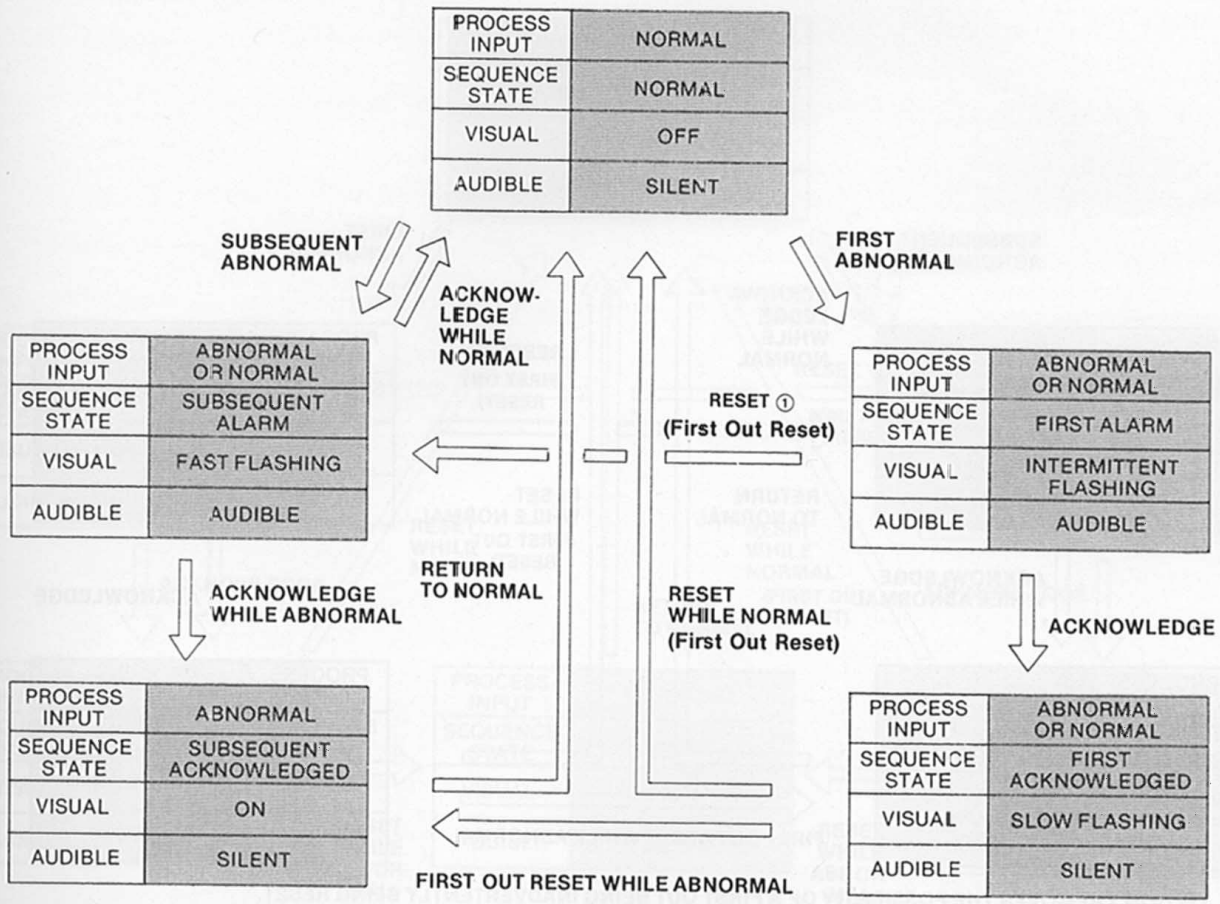
The First-out Alarm operates as a basic Sequence M. Subsequent alarms operate as a status lamp and also operate the audible. Before acknowledging the First-out Alarm, Sequence F2M operates the same as Sequence F2A. After Acknowledgment, Sequence F2M differs by requiring a Reset while the input to each point is normal to return them to the normal state.

Key Applications

1. First-out Alarm is of prime importance.

2. Subsequent alarms must lock-in and require the input to return to normal before it can be reset.

SEQUENCE F3A - FIRSTOUT (TYPE 3)



① OPTION 3 REMOVES THE POSSIBILITY OF A FIRST OUT BEING INADVERTENTLY RESET.

Figure 2-14.

Sequence F3

The F3 Family of Sequences indicates which one of a group of alarms occurs first by providing a special flashing indication and audible. The Acknowledged state of the First-Out Alarm is displayed using a second type of flashing indication while new subsequent alarms use still a third type of visual display and audible. Clearing of the First-out Alarm allows the system to accept the next alarm in the group as a First Out.

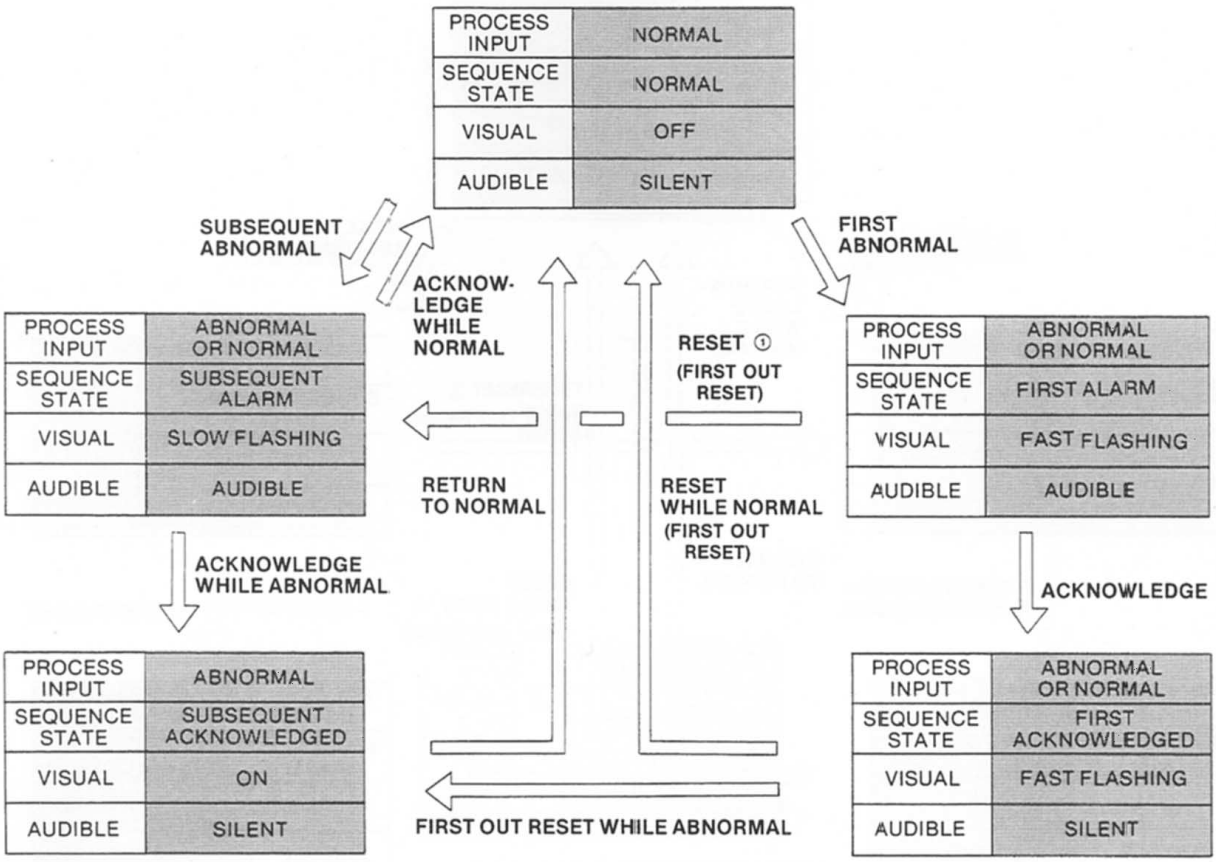
Sequence F3A

The First Alarm is displayed using a special flashing visual. Subsequent alarms follow the basic Sequence A. The First-out Alarm in a group retains unique visual indications until the First-out function is reset. Because the Reset pushbutton is used to reset the First-out function, Acknowledge can be used to sequence subsequent alarms through a standard sequence. In this way, new subsequent alarms can be distinguished from previously Acknowledged subsequent alarms. Also, subsequent alarms lock-in until they are Acknowledged but are then enabled to automatically return to the normal sequence state when the input returns to normal. Sequence F3A distinguishes new First-out points with a distinctive intermittent flashing visual as well as by sounding the audible. Because F3 type sequences do not depend upon Acknowledge to reset the First-out function, a separate acknowledged First-out Alarm state can be provided. A slow flashing visual is used for this state. The adoption of this state makes it easier to identify a new First-out alarm when acknowledged First-out alarms are present in other First-out groups. The Reset operation is used by F3 type sequences to reset the First-out function and remove the unique First-out visual indication. In the Standard F3A Sequence, Reset causes the visual to assume the state that the point would have been in had it not been the First-out. Ordinarily, this is the Acknowledged or normal sequence state. However, if Reset is operated prematurely or if the First-out alarm occurs while Reset is being operated, the First-out function can be defeated. For this reason Option 3 is recommended to require Acknowledge before the First-out function can be reset. A second limitation of F3 sequences is that lock-in of the First-out point until Reset eliminates any way of testing the status of the First-out point without resetting the First-out function. Use of a numeric display with Sequence A or Sequence R is the best solution if this is a problem.

Key Applications

1. First-out Alarm and all subsequent alarms must receive full annunciation.
2. New First-out Alarms must be distinguished from previously Acknowleged First-out Alarms in other groups.
3. Subsequent alarms must return to the normal sequence state automatically after acknowledged as the inputs return to normal.

SEQUENCE F3A - 5X FIRST OUT



① OPTION 3 REMOVES THE POSSIBILITY OF A FIRST OUT BEING INADVERTENTLY BEING RESET.

Figure 2-15.

Sequence F3

The F3 Family of Sequences indicates which one of a group of alarms occurs first by providing a special flashing indication and audible. The Acknowledged state of the First-Out Alarm is displayed using a second type of flashing indication while new subsequent alarms use still a third type of visual display and audible. Clearing of the First-out Alarm allows the system to accept the next alarm in the group as a First Out.

Sequence F3A-5X

The First Alarm is displayed using a special flashing visual. Subsequent alarms follow the basic Sequence A. The First-out alarm in a group retains the unique visual indication until the First-out function is Reset. Because the Reset Pushbutton is used to Reset the First-out function, Acknowledge can be used to sequence subsequent alarms through a standard Sequence A. In this way, new subsequent alarms can be distinguished from previously acknowledged subsequent alarms. Also, subsequent alarms lock-in until they are acknowledged but are then enabled to automatically return to the normal sequence state when the input returns to normal. Sequence F3A-5X distinguishes First-out points with a fast flashing visual display. To simplify the display, the same flashing is used for new and acknowledged First-out Alarms. Subsequent alarms appear with slow flashing visuals so that fast flashing is reserved exclusively for First-out points. This may allow for easier recognition of First-out Alarms when the need to differentiate between new and acknowledged First-out points is not anticipated.

The Reset operation is used by F3 type sequences to reset the First-out function and remove the unique First-out visual indication. In the Standard F3A Sequence, Reset causes the visual to assume the state that the point would have been in had it not been the First-out. Ordinarily, this is the acknowledged or normal sequence state. However, if Reset is operated prematurely or if the First-out alarm occurs while Reset is being operated, the First-out function can be defeated. For this reason, Option 3 is recommended to require Acknowledge before the First-out function can be reset. A second limitation of F3 Sequences is that lock-in of the First-out point until Reset eliminates any way of testing the status of the First-out point without resetting the First-out function. Use of a numeric display with Sequence A or Sequence R is the best solution if this is a problem.

Key Applications

1. First-out Alarm and all subsequent alarms must receive full annunciation.

2. Subsequent alarms must return to the normal sequence state automatically after Acknowledged as the inputs return to normal.

SEQUENCE F3L - FIRST OUT (TYPE3) LATCHED RESET

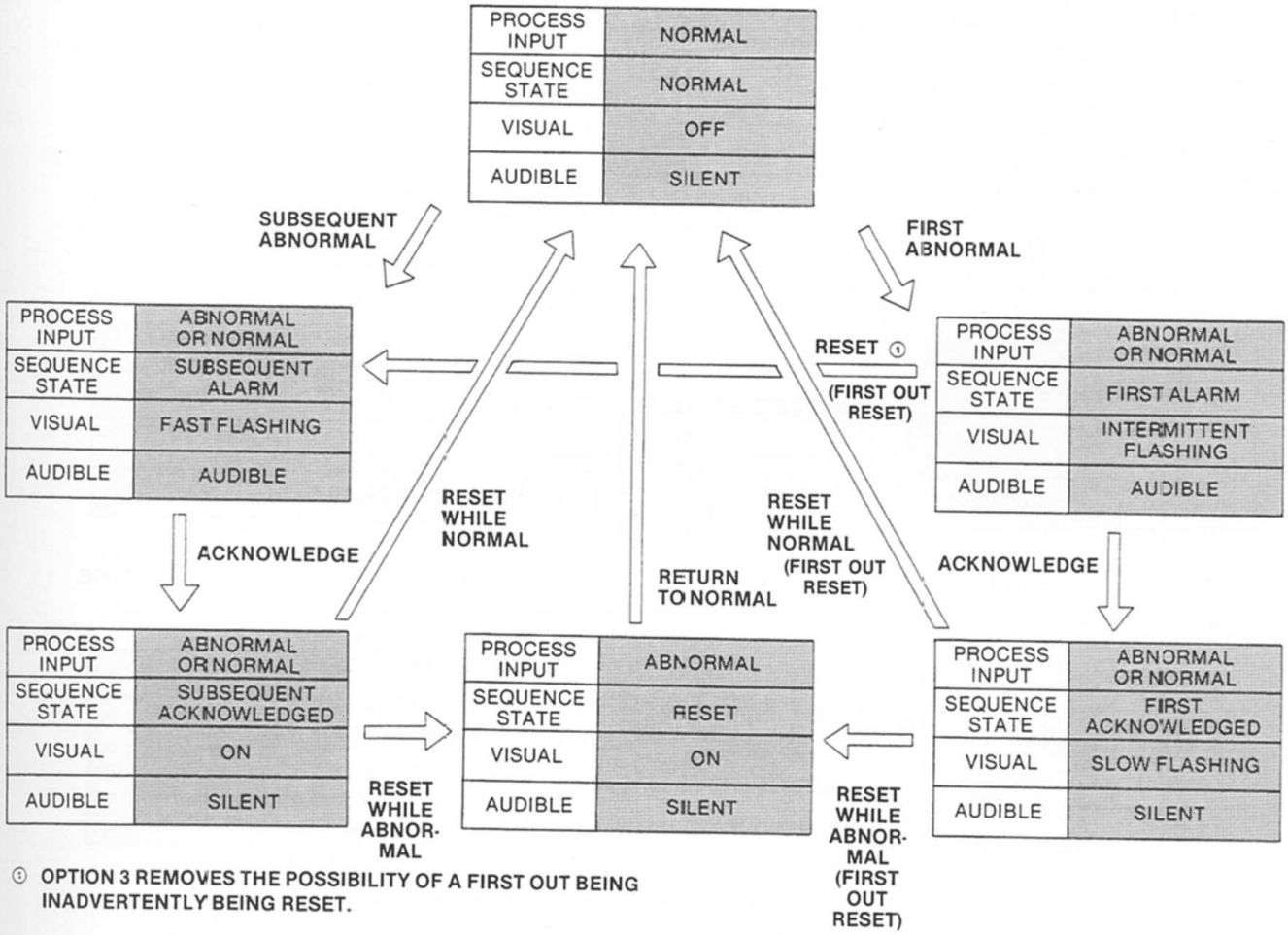


Figure 2-16.

Sequence F3

The F3 Family of Sequences indicates which one of a group of alarms occurs first by providing a special flashing indication and audible. The Acknowledged state of the First-Out Alarm is displayed using a second type of flashing indication while new subsequent alarms use still a third type of visual display and audible. Clearing of the First-out Alarm allows the system to accept the next alarm in the group as a First Out.

Sequence F3L

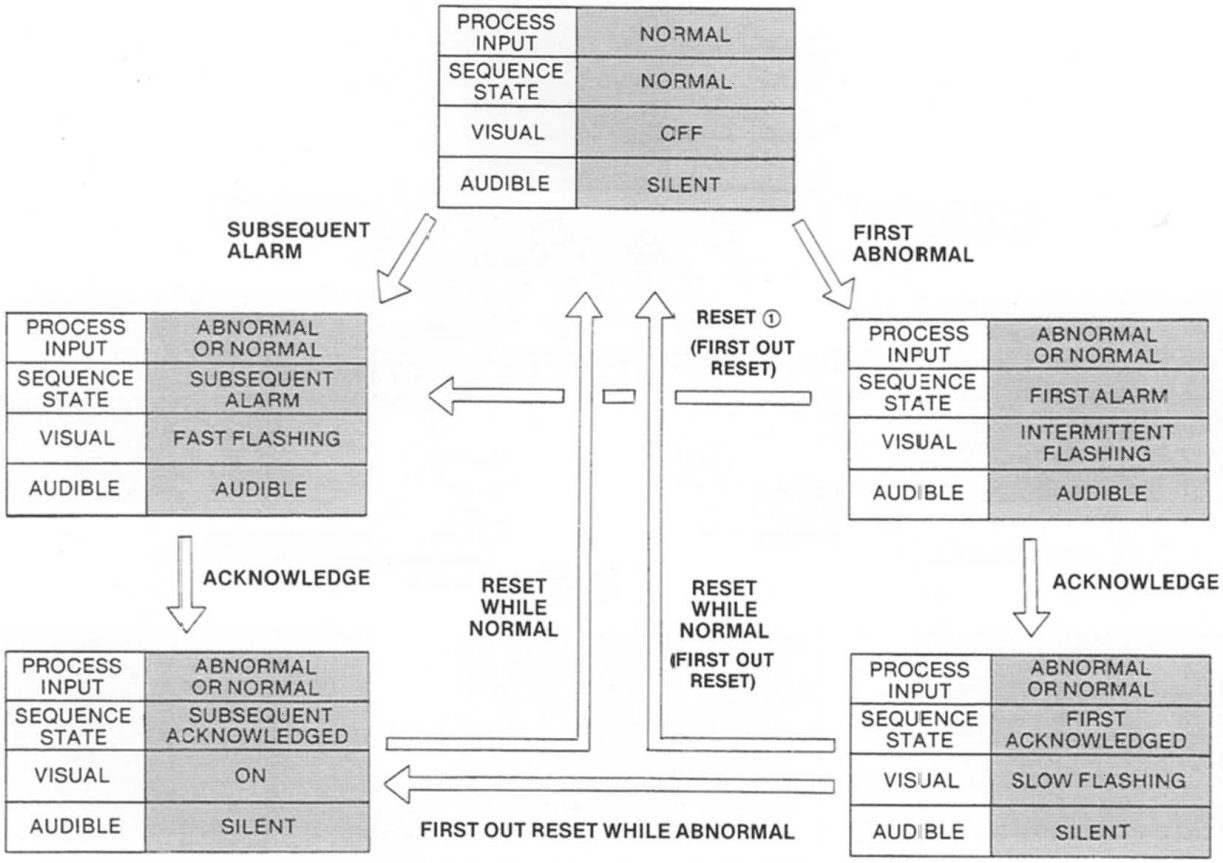
The First-out alarm in a group is distinguished by unique visual indications until the First-out function is Reset. Because Acknowledge is not used to reset the First-out function, new First-out and subsequent alarms can be acknowledged so that new alarms can be distinguished from previously acknowledged alarms. All points will remain in their acknowledged state until Reset is operated. At that time, each point will return to the normal sequence state automatically as the input condition returns to normal. Sequence F3L distinguishes new First-out points with a distinctive intermittent flashing visual as well as by sounding the audible. Because Acknowledge is not used to reset the First-out function, a separate slow flashing acknowledged First Alarm state is provided. The addition of this state makes it easier to identify a new First-out Alarm when acknowledged First-out Alarms are present in other First-out groups.

The reset operation is used by F3 type sequences to reset the First-out function and remove the unique First-out visual indication. In the Standard F3L Sequence, Reset causes the visual to assume the state that the point would have been in had it not been the First-out. Ordinarily, this is the reset or normal sequence state. However, if Reset is operated prematurely or if the First-out Alarm occurs while Reset is being operated, the First-out function can be defeated. For this reason, Option 3 is recommended to require Acknowledge before the First-out function can be Reset. A second limitation of F3 Sequences is that lock-in of the First-out point until Reset eliminates any way of testing the status of the First-out point without resetting the First-out function. Use of a numeric display with Sequence A or Sequence R is the best solution if this is a problem.

Key Applications

1. First-out Alarm and all subsequent alarms must receive full annunciation.
2. New First-out Alarms must be distinguished from previously Acknowledged First-out Alarms in other groups.
3. Subsequent alarms must remain in the acknowledged sequence state until the First-out function is reset.

SEQUENCE F3M - FIRST OUT (TYPE 3) MANUAL RESET



① OPTION 3 REMOVES THE POSSIBILITY OF A FIRST OUT BEING INADVERTENTLY BEING RESET.

Figure 2-17.

Sequence F3

The F3 Family of Sequences indicates which one of a group of alarms occurs first by providing a special flashing indication and audible. The Acknowledged state of the First-Out Alarm is displayed using a second type of flashing indication while new subsequent alarms use still a third type of visual display and audible. Clearing of the First-out Alarm allows the system to accept the next alarm in the group as a First Out.

Sequence F3M

The First-out alarm in a group is distinguished by unique visual indications until the First-out function is Reset. Because Acknowledge is not used to reset the First-out function, new First-out and subsequent alarms can be acknowledged so that new alarms can be distinguished from previously acknowledged alarms. All points will remain in their acknowledged state until Reset is operated. At that time, each point will return to the normal sequence state as if the input condition is normal. Sequence F3M distinguishes new First-out points with a distinctive intermittent flashing visual as well as by sounding the audible. Because Acknowledge is not used to reset the First-out function, a separate slow flashing acknowledged First Alarm state is provided. The addition of this state makes it easier to identify a new First-out Alarm when acknowledged First-out Alarms are present in other First-out groups.

The reset operation is used by F3 type sequences to reset the First-out function and remove the unique First-out visual indication. In the Standard F3M Sequence, Reset causes the visual to assume the state that the point would have been in had it not been the First-out. Ordinarily, this is the reset or normal sequence state. However, if Reset is operated prematurely or if the First-out Alarm occurs while Reset is being operated, the First-out function can be defeated. For this reason, Option 3 is recommended to require Acknowledge before the First-out function can be Reset. A second limitation of F3 Sequences is that lock-in of the First-out point until Reset eliminates any way of testing the status of the First-out point without resetting the First-out function. Use of a numeric display with Sequence A or Sequence R is the best solution if this is a problem.

Key Applications

1. First-out Alarm and all subsequent alarms must receive full annunciation.

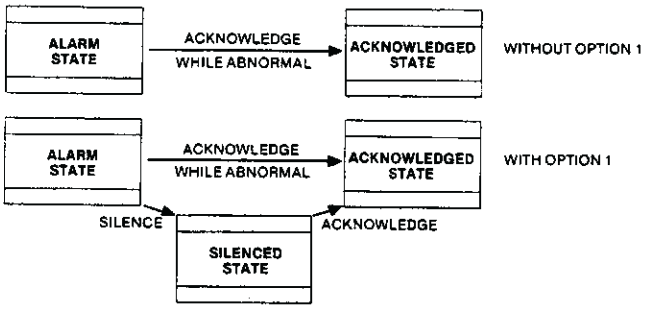
2. New First-out Alarms must be distinguished from previously Acknowledged First-out Alarms in other groups.

3. Subsequent alarms return to the normal sequence state only if they are normal when Reset is operated and the First-out group has been Reset. Sequence F3L is usually preferred.

Option Details

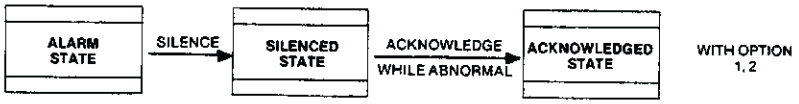
Option 1 — Silence Pushbutton.

Refer to Section 5, Table 5-6, for incorporating this option.



Option 2 — Silence Interlock (Option 1 is a prerequisite).

Refer to Section 5, Table 5-6, for incorporating this option.

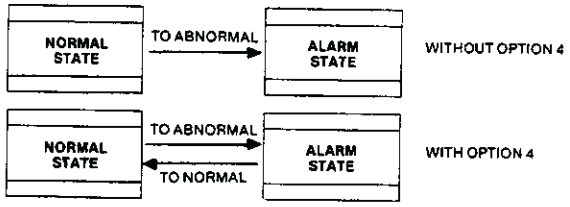


Option 3 — Acknowledge Reset Interlock.

Refer to Section 5, Table 5-6, for incorporating this option. This interlock requires the operation of the Acknowledge pushbutton before the Reset pushbutton is operated. This feature is a standard part of all Basic Alarm Sequences, A, L, M, R and First-out Sequence, F1R. This option applies to the F3 type First-out Sequences only and its use is recommended to avoid inadvertent reset of the First-out alarm.

Option 4 — No Lock-In.

Refer to Section 5, Tables 5-6 and 5-7 for the selection of Lock or Non-Lock for each input.



Option 5 — No Flashing.

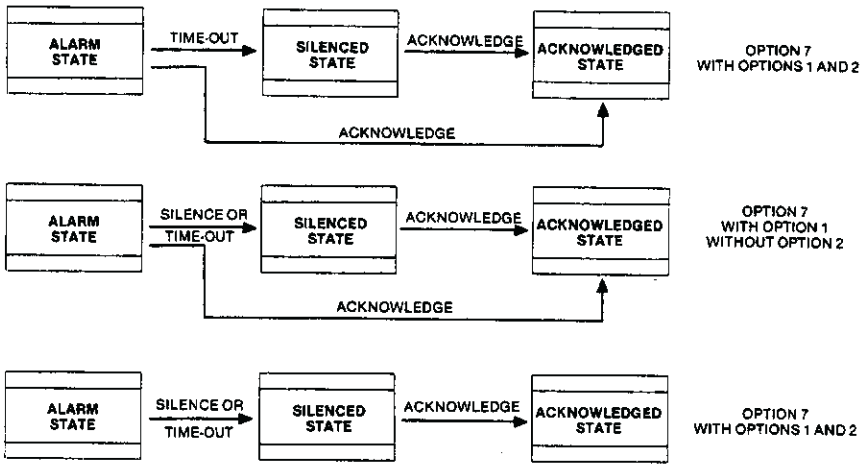
Refer to Section 5, Table 5-2, for Flashing Rate Selection.

Option 6 — No Alarm Audible.

No outputs on Terminals A1 and A2.

Option 7 — Automatic Alarm Silence.

Refer to Section 5, Table 5-5, for Automatic Audible Silence on Audible No. 1 or No. 2 or both.



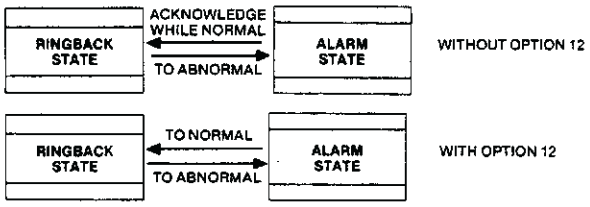
Option 8 — Common Ringback Audible.
This option is achieved by paralleling the outputs of the A1 and A2 Terminals.

Option 9 — Automatic Ringback Silence.
Refer to Section 5, Table 5-5, for Automatic Audible Silence on Audible No. 2. See Option 7 for use of this option with the addition of Options 1 and 2.

Option 10 — No Ringback Audible.
Outputs from the Terminal A2 are not used.

Option 11 — Common Ringback Visual.
Refer to Section 5, Table 5-4, for identically setting the Alarm and Ringback Flashing Rates.

Option 12 — Automatic Momentary Ringback.
Refer to Section 5, Table 5-6, to incorporate this option.



Option 13 — Dim Lamp Monitor.
Not applicable for X100.

Option 14 — Lamp Test.
Not applicable for X100.

Option 1X — Priority Horn.
Refer to Section 5, Tables 5-6 and 5-7, for using with selectable horn outputs.

Option 2X — Reflash Output.
Refer to Section 5, Table 5-6, for selecting this option.
Option 3X — Common Alarm Output.
Refer to Section 5, Table 5-6, for selecting this option.

Option 4X — Common Ringback Pushbutton.
This option of using the same pushbutton for acknowledging new and ringback alarms is recommended when using the numeric display X100 Units.

Option 5X — Common First-Out Visual.
This option uses the same Visual Flashing Rate for first-out alarm and acknowledged states. Refer to Section 5, Table 5-4, for flashing rate selection.

Option 6X — Direct Reset Options.
This option defeats the normal interlock that allows only acknowledged alarm to be reset. Not applicable for the X100.

Option 7X — Ringback Silence Interlock.
This option requires the operation of the silence pushbutton before the ringback visual can be reset.

2-6. Reflash/Common Alarm

The X100 has a retransmission capability supplied in the form of a reflash or common alarm output. A reflash or common alarm output provides a signal to indicate to a distant annunciator (in this case the Central Control Room) that one or more field input contacts in the reflash or common alarm group (all points in the X100) is in the abnormal state. In addition, reflash provides a mechanism for indicating that new alarms have occurred while other points are also in alarm. This is a form of input multiplexing commonly referred to as Multiple Inputs. Reflash takes advantage of the fact that a sequence "A" or "R" module in the Central Control Room will return to the flashing alarm state (reflash) if it is in the acknowledged state when the abnormal input is briefly returned to normal (and then returned to abnormal). Typically, the Control Room operator will request the status of the X100 whenever its assigned alarm window reflashes. The assigned window will clear when all inputs to the X100 are normal.

Configuration:

- All 8 or 16 points are in a single reflash/common alarm group.
- An option switch is provided to select reflash or common alarm (See Section 5).
- The relay contacts or transistor outputs are provided on RF terminals for wiring inputs to another annunciator (See Section 3 and 5).

General:

- The test function on the X100 will operate the reflash/common alarm output. Releasing the X100 test pushbutton returns the output to normal.

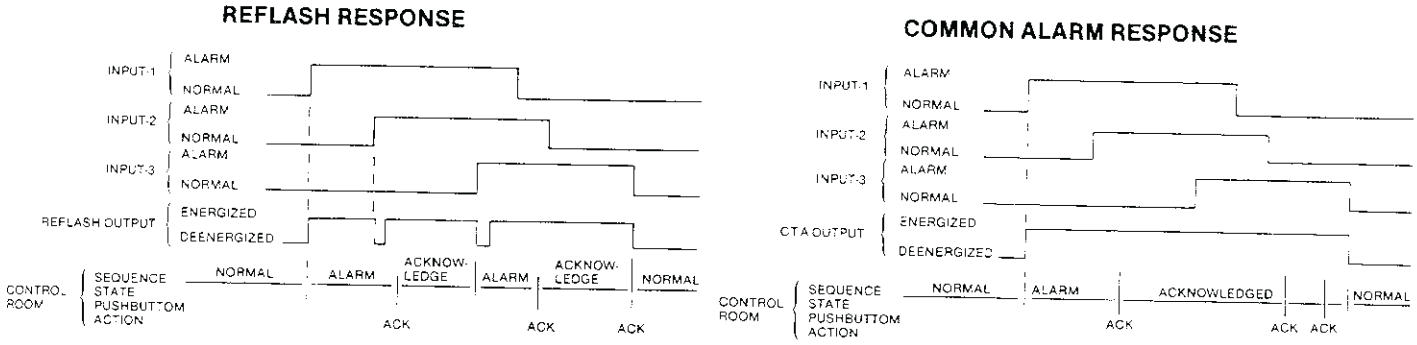


FIGURE 2-18

2-7. Application of X100 As A Fault-Finder/Annunciator

A typical application for the X100 System is illustrated in Figure 2-19. In this application, 8 series live contacts are powered by 115V AC with a power contactor coil as the load. These series contacts could be from any combination of flow switches, temperature switches, pressure switches, or other process variable detectors used to provide interlock protection by de-energizing the contactor under any abnormal condition. The X100 in this application will detect which switch contact opens first as the primary cause of shutdown. Indication of the first out point is retained until the reset pushbutton is depressed.

In the example shown, up to eight contacts in series can be monitored. If the number of points is less than eight, the remaining channels may be placed in a second alarm group for monitoring a separate set of contacts. These additional points may be isolated field contact closures, in which case they could be powered either from the V+ output of the Model X100 or from any other suitable power source. Alternately, these contacts could be from a second series interlock circuit. In the latter case, the Model X100 could indicate the first out point in both groups.

Partial Schematics

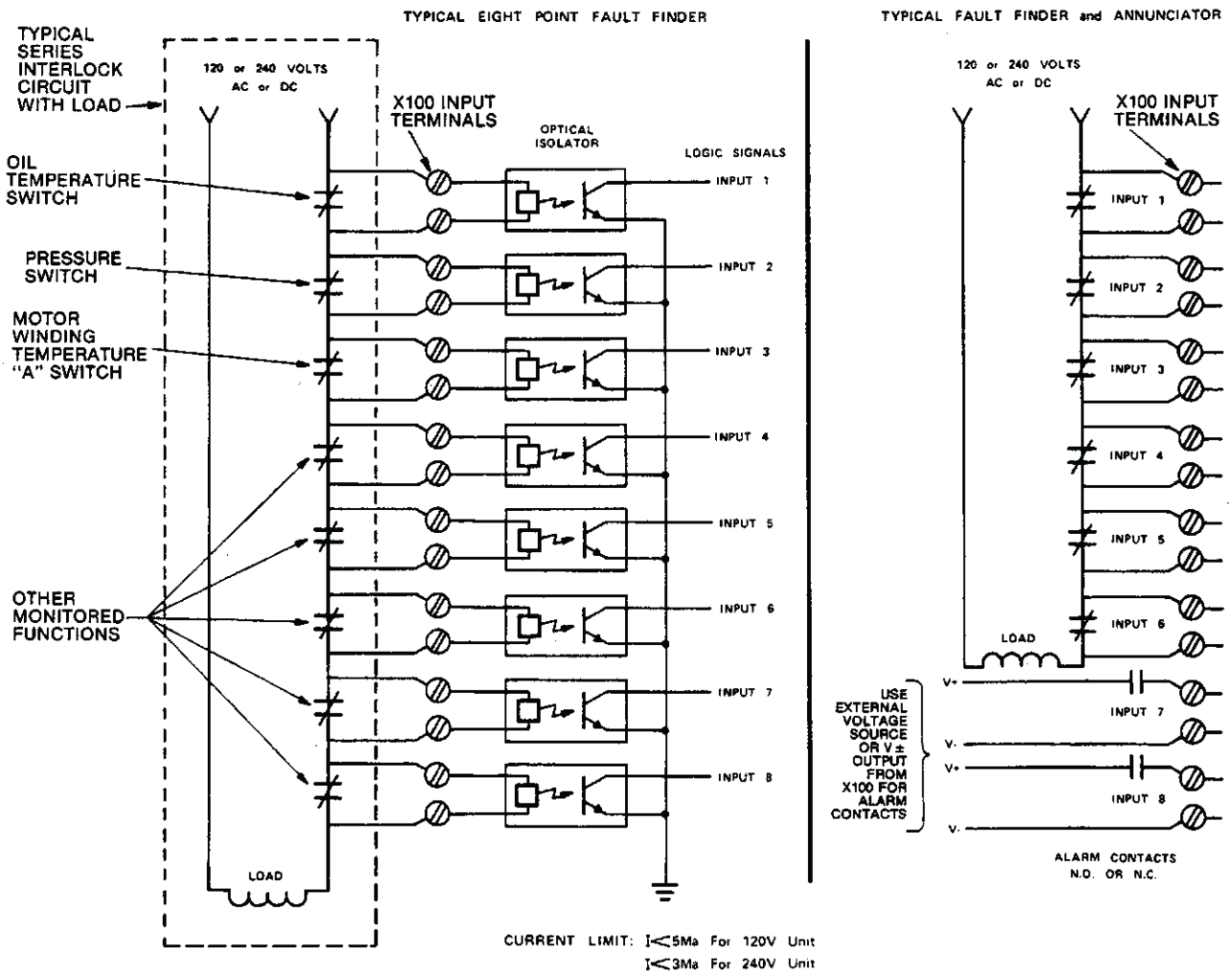


Figure 2-19. Typical Fault Finder/Annunciator Applications

2-8. Input Filter Response

Input filter response time is the minimum time duration of an input signal change necessary for it to be accepted by the alarm sequence logic as a change in input state. Referring to Section 5, Table 5-3, four settings of input filter response time are available: 15 msec, 30 msec, 60 msec, and 120 msec. Selection of any of the above settings affects all inputs to the Model X100 equally. These settings do not affect the resolution between event recognition of input changes. Any input received that is shorter than the input filter response chosen will not cause a change in the sequence state. These filter response times are generated in the microcomputer software.

SECTION 3

SYSTEM FUNCTIONAL DESCRIPTION

3-1. Introduction

This section contains a functional description of the Series X100 Ultralarm Systems. Included in this section is an overall system description, a brief description of each plug-in module and its overall function in the system along with a description of the internal bus system.

3-2. Series X100 Functional Description

The Series X100 Ultralarm System is a compact, general-purpose fault-finder/annunciator system that is controlled by a microcomputer with 2048 bytes of program memory. As shown in Figure 3-1, the X100 plug-in modules are functionally interfaced on a bi-directional bus system which is common to all plug-in modules. In addition to their internal interface on the bus system, each module has a unique external interface to its primary function in the system. The internal bus consists of 9 lines for low voltage DC power distribution, control of the output relays, and data input from the input module(s) to the controller. Internal chassis wiring interconnects the field wiring terminals and the plug-in modules.

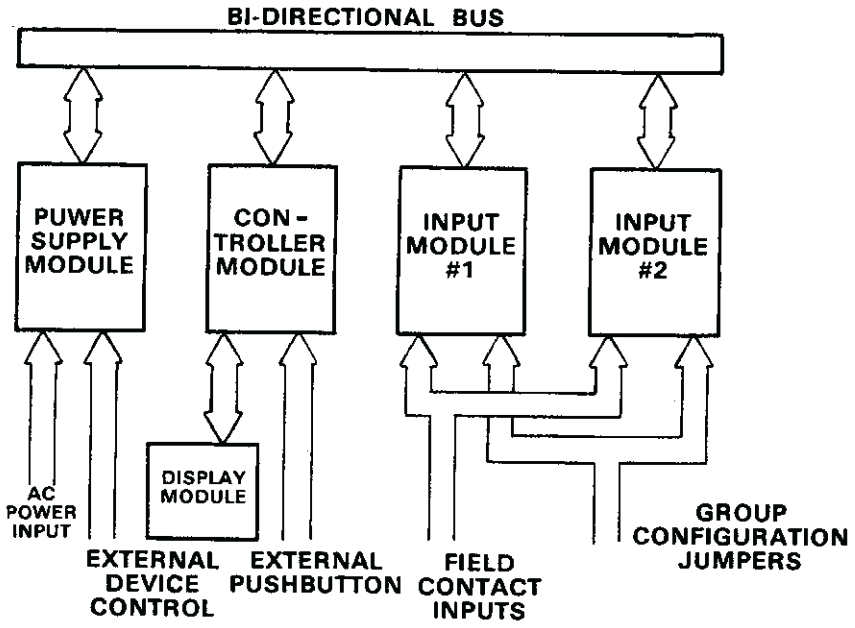


Figure 3-1. X100 System Functional Block Diagram

3-3. Input Modules

The input modules have eight identical circuits that perform two basic functions in the X100 System (Figure 3-2):

1. Provide signal conditioning and, when selected, electrical isolation for each input. (See Section 4 for Module Selection).

2. Provide an electrical interface between the ME terminals (contact grouping) and the controller module to identify which inputs have been grouped with jumper wires.

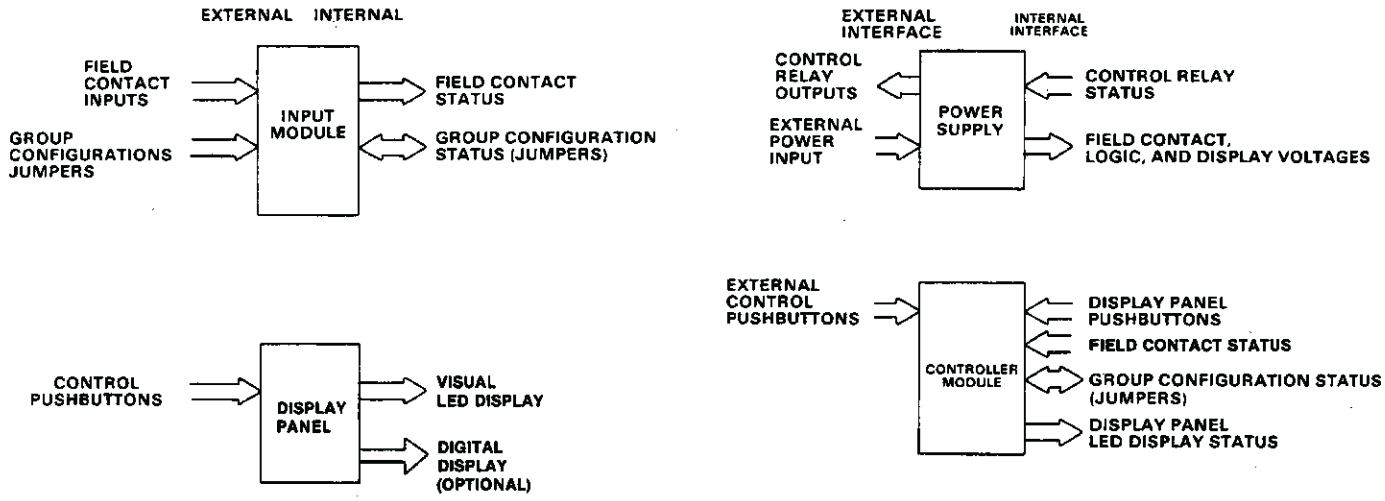


Figure 3-2. Plug-in Modules, Simplified Block Diagrams

3-4. Controller Module

The controller is the system functional configurator module and has the user-selectable option switches for selecting annunciator sequences, output functions, and input types. (See Section 4 for Module Selection). In operation, the controller performs four basic functions in the X100 System (Figure 3-2):

1. Constantly scans and samples the status of the input lines from the Input Modules.
2. Initiates and executes a sequence action (a change of sequence state) in response to each input status change.
3. Initiates and executes sequence actions in response to pressing the front panel or remote Silence, Acknowledge, or Reset pushbuttons.
4. Constantly updates the status of the displays and audibles in response to any change of status in the contact lines.

3-5. Power Supply Modules

The power supply module performs two basic functions in the X100 System:

1. Interfaces with the primary power source of 120/230V, AC, 50/60 Hz, and converts the primary power input to DC internal voltages and 24V DC which is output at the +V and −V field wiring terminals.
2. Physically houses and provides DC operating power for the optional output relays or output transistors.

3-6. Display Panels

The Display panel is the system interface with the operator and performs three basic functions in the X100 System.

1. Indicates the presence of primary AC power with a Power-On lamp.
2. Provides visual alarms in accordance with the selected Annunciator Sequences.
3. Physically houses the Test, Silence, Acknowledge, and Reset pushbuttons used by the operator to respond to an alarm.

3-7. Field Wiring Terminals

The field wiring terminals can be divided into five categories:

H and FC Terminals: These are the terminals that are wired to the external inputs to be monitored.

ME Terminals: These are contact grouping terminals used to group two or more external inputs for first-out or numerical alarm indications.

V+ and V– Terminals: These are the 24V DC output terminals. They provide the source voltage required for monitoring dry contacts and powering external pushbuttons.

Test, Sil, Ack, Reset Terminals: These are the input terminals used for connecting a set of remote pushbuttons.

A1, A2, RF Terminals: These are the output terminals used to connect external and remote audio alarms and the Reflash/Common Alarm. Optional relays must be installed on the power supply module to drive the external alarms, see Figure 3-3.

- All relays are normally deenergized.
- When power is applied to the X100, all relays are energized until automatically cleared by the microcomputer. This verifies the successful start-up of the X100 computer program.
- Reflash output contact, either Normally Open (N.O.) or Normally Closed (N.C.), will activate by momentarily changing its state to transmit a signal every time a new alarm input is received on the X100. After all alarm inputs return to normal, the output contact returns to the normal state.
- Common alarm output contact, either Normally Open (N.O.) or Normally Closed (N.C.) selectable. Will change and remain in the alarm state until all inputs return to the normal state.
- Transistor outputs are available in place of the relay outputs described above. Transistors conduct to provide a current path from an external power source and perform functionally as the relays.

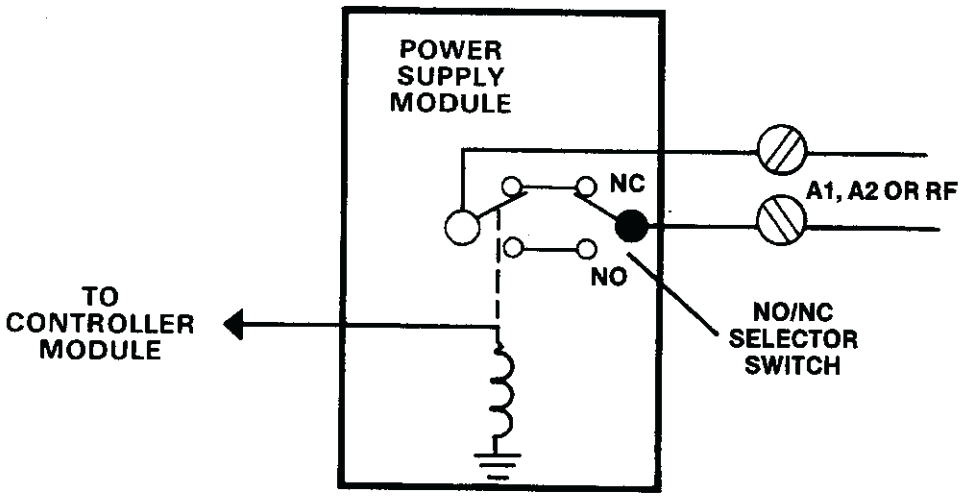


Figure 3-3. Optional External Alarm Relays and Associated Field Wiring Terminals

SECTION 4

MODULE SELECTION AND SPECIFICATIONS

4-1. Introduction

The X100 is a general-purpose annunciator/fault-finder and may be custom ordered for use in numerous applications. The data in this section is designed to assist the user in selecting the most cost-effective set of X100 plug-in modules for his application.

The type of inputs that the X100 will be employed to monitor will dictate the type (model) of input module(s), controller, power supply and display panel that the user should order to do the job. This section defines the detailed characteristics of each plug-in module and contains other data necessary to determine which complement of plug-in modules is both cost-effective and best suited to perform the annunciator/fault-finder functions required at the intended installation.

General Notes:

1. *System Resolution* — The resolution between inputs is based upon three factors: scan time, analog skew, and AC zero-crossing. The scan time is defined as the interval of time between samples of input status by the microcomputer; analog skew is the difference between input time delays due to tolerances of electronic parts; and, AC zero-crossing represents the dead time of an AC waveform. The standard unit scans 16 inputs in less than 1 millisecond and has a maximum analog skew of 300 microseconds giving a total maximum skew for DC inputs of 1.3 milliseconds. AC inputs, when used, may create an additional error if an input change occurs during the time the AC line is near zero volts since no current flows at this time. This maximum dead time is 1.7 milliseconds providing a worst case resolution of 3 milliseconds for AC inputs. The high resolution units feature a faster scan time of 500 microseconds and selected input boards with less than 150 microseconds analog skew resulting in a 650 microsecond DC resolution. Additionally, the effects of zero-crossing error is reduced to 1.2 milliseconds giving a worst case AC resolution of 2.0 milliseconds.

2. *Maximizing Resolutions*

   A. Select the highest AC voltage possible.

   B. Use minimum number of series live contacts.

   C. Use DC input voltage.

   D. Use high resolution type input and controller modules.

   For calculation of series live contact shutdown loads, refer to Section 5 of this manual.

4-2. Input Modules

There are seven types of Input Modules to choose from in configuring the X100 for a specific application or applications. The seven models are listed below and the description of each is indicative of the application for which it was designed. All Input Modules are identical except for signal conditioning.

Model X100-401 Standard, Dry Contact Input

Model X100-402 Live/Dry Contact Input, 10 to 140 Volts AC or DC

Model X100-403 Live/Dry Contact Input, 20 to 280 Volts AC or DC

Model X100-404 Live/Dry Contact Input, 5 to 140 Volts AC or DC (HIGH SENSITIVITY)

Model X100-405 Live/Dry Contact Input, 5 to 280 Volts AC or DC (HIGH SENSITIVITY)

Model X100-406 Logic Level Input, 4.5V to 16.5V (Transistor, TTL, LSTTL, STLL Inputs)

Model X100-407 Logic Level Input, 4.5V to 30.0V (Transistor, CMOS Inputs)

Each module interfaces eight inputs (switch contacts or logic-level voltages) and eight group configuration terminals to the Controller Module. These configuration terminals allow the user to create separate groups of inputs so that the first-out alarm or the numeric sequence of alarms within each group is determined independently.

The Input Modules may be intermixed or replaced with other types as requirements change. Addition of a second Input Module increases the capacity of a 16-point Chassis from 8 to 16 points.

4-3. Model X100-401 Standard (Dry Contact) Input Module

The Model X100-401 Input Module uses standard annunciator circuits to monitor up to 8 dry (isolated) contacts. The X100 internal 24V DC power supply is used to provide the source voltage for each of the contacts. Opto-couplers may be used in place of contact inputs. Field contact wiring should be less than 2000 Ohms maximum loop resistance. Removal of the Input Module removes power to the field contacts.

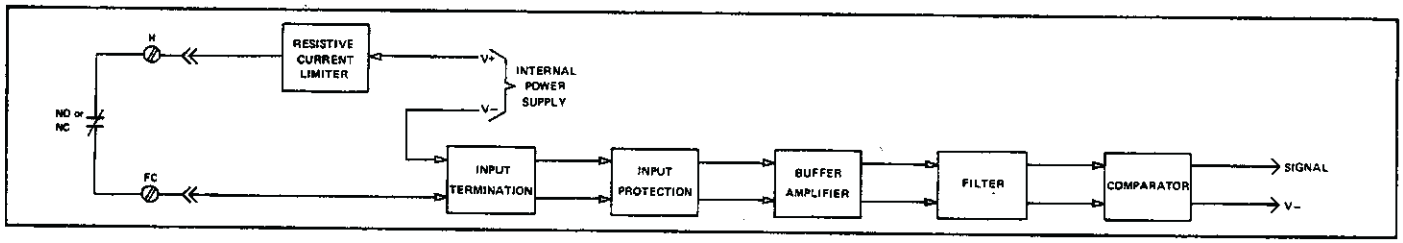


Figure 4-1. Model X100-401 Standard (Dry Contact) Input Module, Block Diagram

4-4. Model X100-402/403 Live/Dry Contact Input Module

The Model X100-402 and -403 Input Modules are designed primarily for monitoring live switch contacts at voltages ranging from 10 volts to 280 volts, AC or DC. A live contact has an external voltage applied to it and does not draw power from the X100. Model X100-402 has an input voltage range of 10 volts to 140 volts and the Model X100-403 has an input range of 20 volts to 280 volts. These modules are designed to monitor individual contacts or grouped up to 8 series-connected live contacts. Whenever a single group of more than 8 series-wired live contacts are to be monitored in an 8-point or 16-point Model X100, refer to Models X100-404 or X100-405. The bridge rectifier in the input circuit allows AC inputs to be monitored and allows DC inputs to be connected without regard to polarity. The filter limits input changes to a rate that can be scanned by the Controller Module. If AC inputs are used, the filter minimizes the effects of zero voltage crossings.

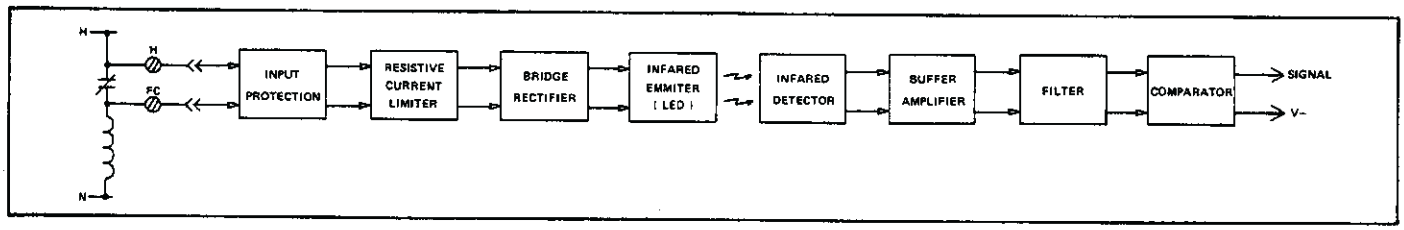


Figure 4-2. Model X100-402/403 Live/Dry Contact Input Modules, Block Diagram

4-5. Model X100-404/405 Live/Dry Contact Input Module (High Sensitivity)

The Model X100-404 and -405 Input Modules are similar to the X100-403/403 modules but incorporate constant current limiting to maintain an input current of approximately 3 milliamperes over the input voltage range. This allows two Model X100-404/405 modules to monitor up to 16 series-wired live contacts in a single group. The Model X100-404 has an input range of 5 volts to 140 volts AC or DC. Model X100-405 has an input range of 5 volts to 280 volts AC or DC.

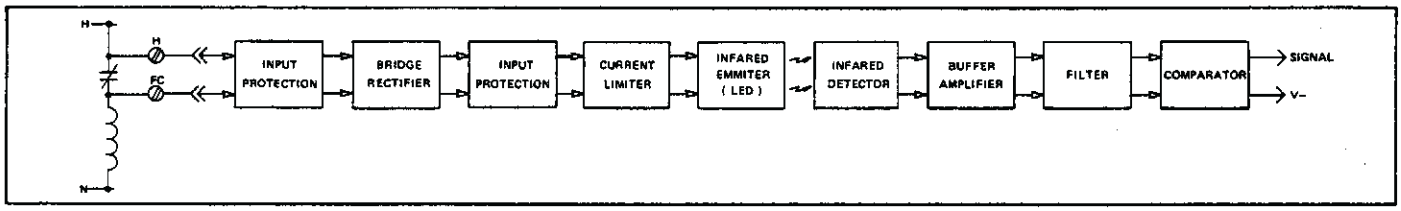


Figure 4-3. Model X100-404/405 High Sensitivity Live/Dry Contact Input Module, Block Diagram

4-6. Model X100-406/407 Logic Level Input Module

The Model X100-406 and -407 Input Modules utilize isolated inputs which can be connected to separately powered sources. Typical monitoring sources include:

- Signals from laboratory or test instruments without creating grounding problems.
- Signals within larger systems when using the X100 as an OEM product.
- Signals from control room electronic instruments when using the X100 as a self-contained annunciator.

The Model X100-406 is designed to monitor logic level inputs of 4.5V to 16.5V from transistor, TTL, LSTTL or STTL sources. The Model X100-407 is designed to monitor logic level inputs of 4.5V to 30.0V allowing it to be used with CMOS logic in addition to sources used by the Model X100-406.

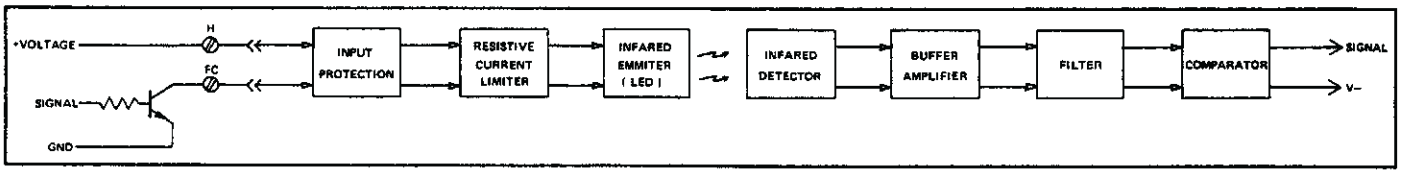


Figure 4-4. Model X100-406/407 Logic Level Input Module, Block Diagram

4-7. Input Module Selection Guide

Model No.	Type of Input Accepted	Max. No. of Series Contacts	Response Curve 2 to 8 Series Contacts	Response Curve 8 to 16 Contacts	Response Curve Logic Level Inputs
X100-401	Dry Contact (Isolated)	N/A	N/A	N/A	1.7 Milliseconds Standard Resolution .65 Milliseconds High Resolution
X100-402	Dry or Live Contact, 12 to 125 Vac or Vdc	8	Consult factory for special application curves	N/A	
X100-403	Dry or Live Contact, 24 to 250 Vac or Vdc	8		N/A	
X100-404	Dry or Live Contact, 5 to 125 Vac or Vdc	16		Consult factory for special application curves	
X100-405	Dry or Live Contact, 5 to 250 Vac or Vdc	16			
X100-406	4.5 to 16.5 Vdc Logic Levels, TTL, LSTL, STTL	N/A	N/A	N/A	
X100-407	4.5 to 30 Vdc CMOS Logic Levels	N/A	N/A	N/A	

TABLE 4-1

4-8. Controller Module

The Controller Module is the heart of the X100 System. A high-speed microcomputer and interface logic on this module scan the input circuitry, comparing current input status to previous input status, and updating the annunciator displays and audibles according to the features and functions selected by the option switches.

Option switches on this Module are used to select:

- Annunciator sequences.
- Type of input to be monitored - N.O., N.C., or Series Live.
- Input response time (avoids erroneous alarms without degrading resolution).
- Reflash or Common Alarm output to a control room annunciator when the X100 is used in remote locations.
- Annunciator sequence variations such as:

  Interlocked operating controls (sequenced pushbuttons), non-lock-in of momentary alarms, automatic delayed silence of one or two audible devices, priority horn grouping, flashing rate of the visual displays.

The ease and versatility afforded by the option switches allow the user to determine, at the time of installation, which features are best suited to his applications. Detailed illustrations showing switch locations and procedures for setting the switches to implement the options are provided in Section 5.

Included in the microcomputer program memory is the main operating program that controls the system, a unique system self-test is automatically activated each time power is applied to the X100 System, and the user selectable annunciator sequences.

Standard and high resolution Controller Modules are available for the X100. Standard resolution is 1.3 to 3.0 milliseconds. High resolution is 0.65 to 2.0 milliseconds. Controller Modules are available for either 8 or 16 inputs. All Controller Modules operate with either standard or numeric displays.

4-9. Power Supply Modules

Two types of plug-in Power Supply Modules are available for the X100 System:

- Model X100-651 - Power Supply with Standard Relay Outputs (Relays rated at 3 amps at 115V AC or 30V DC).

- Model X-100-651 - Power Supply with Transistor Outputs (Transistors rated at 0.5 amp at 1.5V DC ON, 30V DC OFF).

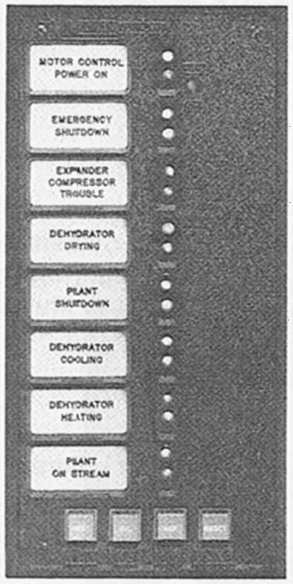
The models of power supplies can be ordered for operation from 115V AC or 230V AC ± 10%, 50/60 Hz input power. Model X100-651 may be ordered with General Purpose Relays or with Hermetically Sealed Relay for Class 1, Division 2 installation. An SPST selector switch is supplied with each relay to select N.O. or N.C. output contacts. Transistor outputs can be substituted for relays for powering external audible alarms in applications that do not require relay outputs. Model X100-653 Power Supply has transistor outputs in place of relays for powering external devices. Both power supplies provide sufficient current at 24V DC to power external operating pushbuttons and field contacts when required.

4-10. Display Panels

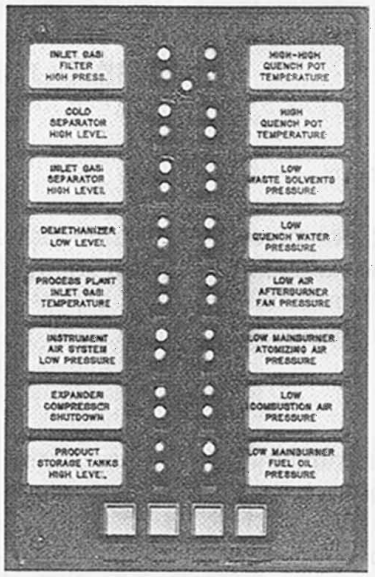
Two types of Displays are available for the 8-input and 16-input model X100s. Both types have individually removable windows as in Figure 4-6 above and interface to the control electronics via a quick-disconnect cable. The Standard Display Panels have two high-intensity LED lamps located adjacent to each window. The dual-lamp display provides five types of visual alarm status: fast flashing, slow flashing, intermittent flashing, steady on, and off.

For more complex applications, where the order in which certain alarms occur is important, Numeric Display Panels are available. These panels have, in addition to the standard LED lamps, a large one or two digit display adjacent to each window. The numeric readouts capture the exact sequence in which alarms occur within each group and retain this information until the display is reset. The dual-lamp displays, not necessary for the display of First-Out status, can follow a simple sequence (A, L, M or R for example) to annunciate new and acknowledged alarms, or even return-to-normal conditions for all points including the first alarm.

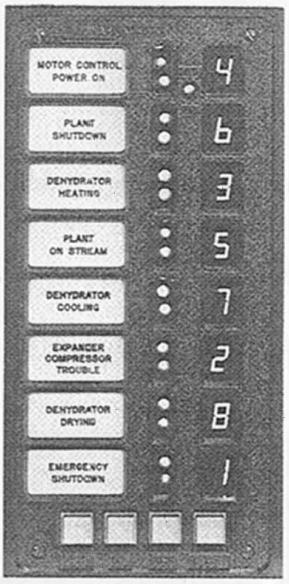
A Power-On indicator is located at the top of the panel and system operating controls are located at the bottom of the panel. Switches include TEST, SILENCE, ACKNOWLEDGE, and RESET. Provisions to connect a set of remote switches are provided on the field wiring terminals.



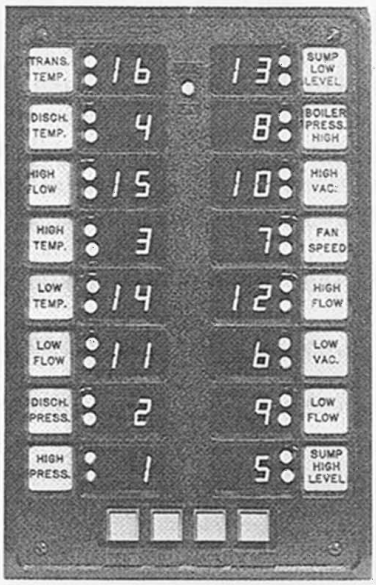
8-Point Unit with Alarm Display
Model X100-208



16-Point Unit with Alarm Display
Model X100-216



8-Point Unit with Alarm and
Numerical Display
Model X100-308



16-Point Unit with Alarm and
Numerical Display
Model X100-316

Figure 4-5. X100 Display Control Panels

SECTION 5

INSTALLATION DATA

5-1. Introduction

This section contains installation data for the Series X100 Ultralarm Systems. Included are mechanical and electrical specifications, data for terminal wiring, how to wire for N.O./N.C. contacts (External alarms), how to set option switches and illustrations of typical installations.

NOTE

Service and installation personnel should read this entire section before attempting to install the X100 System.

5-2. Location of Plug-In Modules in Eight-Point X100 Models

There are three models of the eight-point X100 Ultralarm Systems.

- Model X100-08SM Surface Mounting Chassis
- Model X100-08PM Panel Mounting Chassis
- Model X100-08PC Portable Case

Model X100-08SM is shown in Figure 5-1. NOTE: Model X100-08PC is similar to Model X100-08PM for front access and rear terminal arrangement. The plug-in modules in all three models are located in the same card slots.

5-3. Location of Plug-In Modules in Sixteen-Point X100 Models

There are three models of the sixteen-point X100 Ultralarm Systems.

- Model X100-16SM Surface Mounting Chassis
- Model X100-16PM Panel Mounting Chassis
- Model X100-16PC Portable Case

Model X100-16SM is shown in Figure 5-2. NOTE: Model X100-16PC is similar to Model X100-16PM for front access and rear terminal arrangement. The plug-in modules in all three models are located in the same card slots.

As shown in Figure 5-2, the Input Module in card slot J2 is dedicated to Field Wiring Terminals 1 thru 8 and the Input Module in card slot J1 is dedicated to Field Wiring Terminals 9 thru 16.

NOTE

If only one Input Module is used in a Model X100-16 chassis (a case where a customer purchases a sixteen-point unit and only activates eight points with the original order), it must be located in card slot J2 The unit will not function if it has only one Input Module plugged into slot J1.

8 POINT SURFACE MOUNTING MODEL X100-08SM

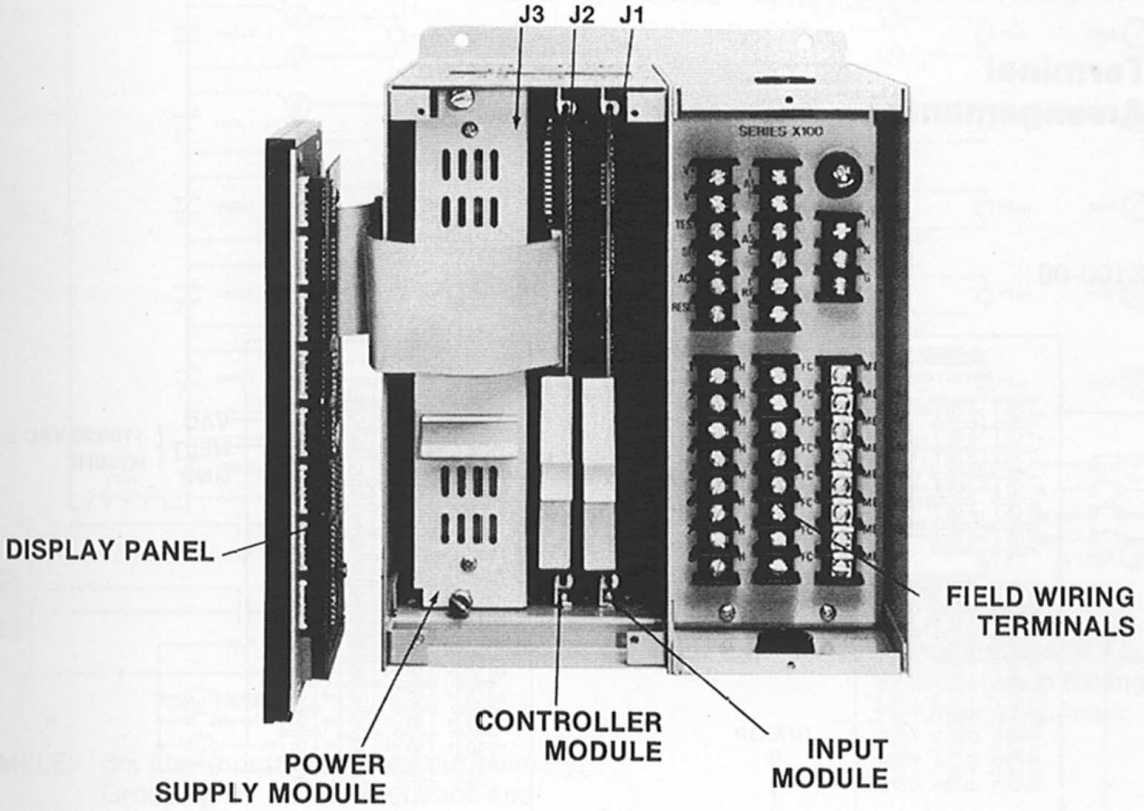


Figure 5-1

16 POINT SURFACE MOUNTING MODEL X100-16SM

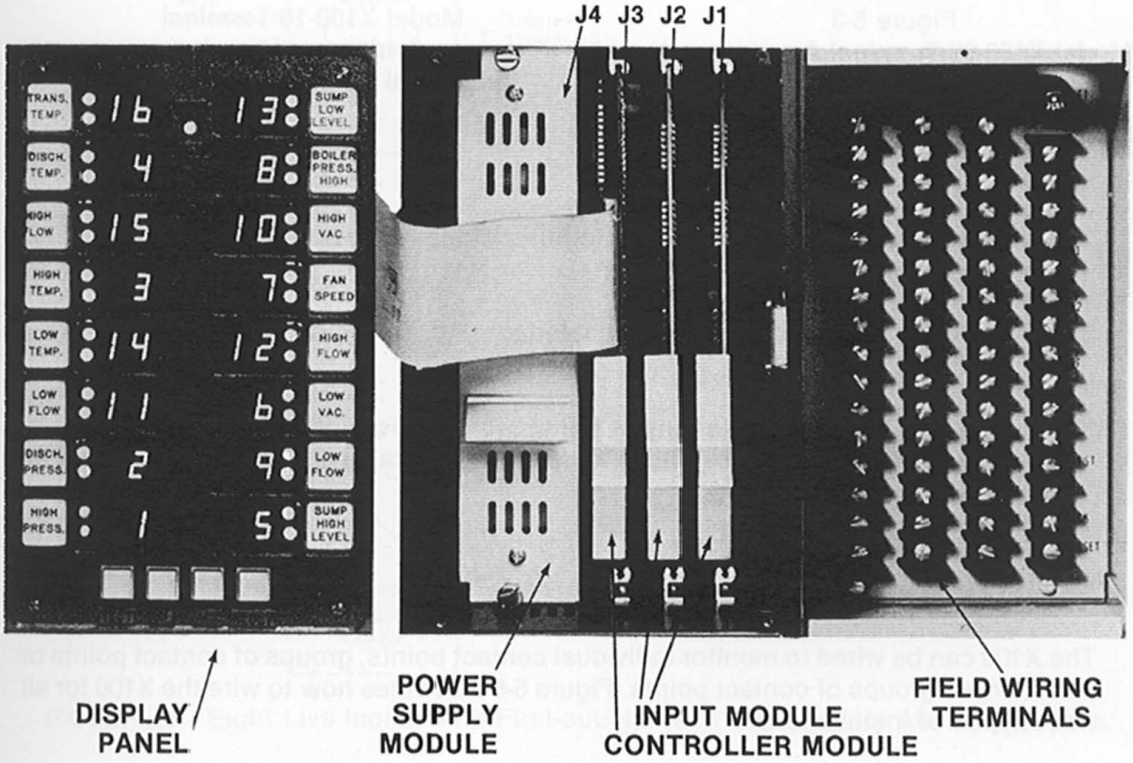


Figure 5-2

5-4. Terminal Arrangement and External Pushbutton Wiring

The terminal arrangement and external pushbutton wiring for all eight-point models is shown in Figure 5-3. Terminal arrangement and external pushbutton wiring for all sixteen-point models is shown in Figure 5-4.

Terminal Arrangements

X100-08

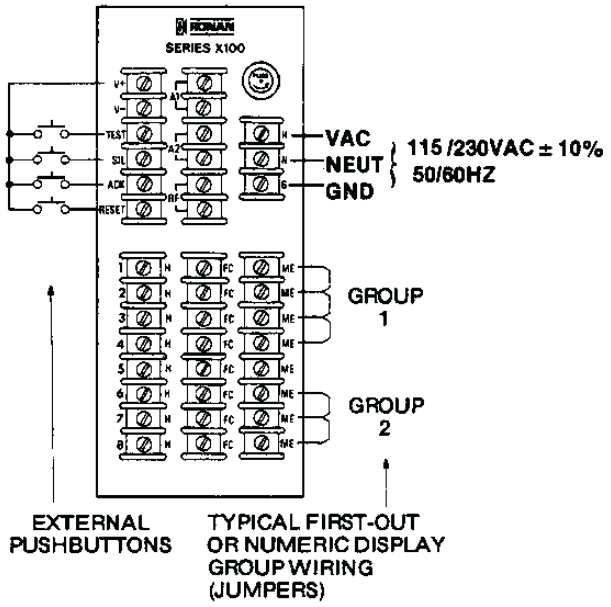


Figure 5-3
Model X100-08 Terminal Arrangement and External Pushbutton Wiring

X100-16

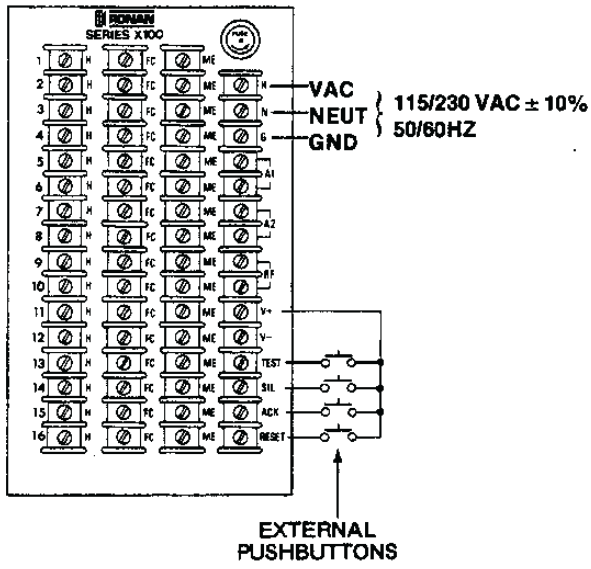


Figure 5-4
Model X100-16 Terminal Arrangement and External Pushbutton Wiring

NOTES:

1. Terminals A1, A2, and RF are output terminals for audible horns No. 1 and No. 2 plus Reflash or Common Alarm Outputs.

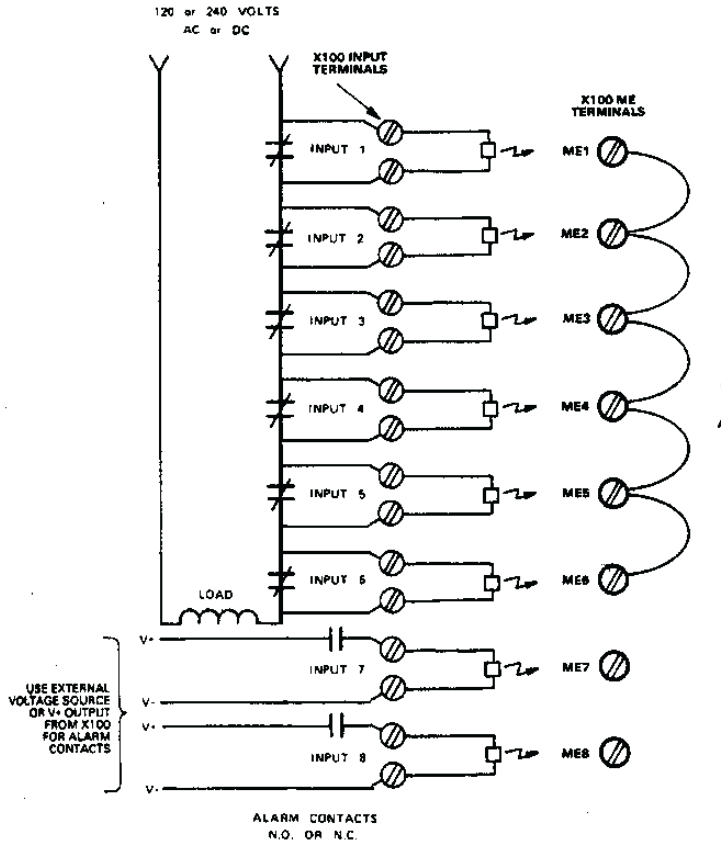
2. Relays or transistor outputs are located on the power supply module.

3. When relays are selected for any of the above options, Normally Open or Normally Closed (NO/NC) contacts can be selected for each via an SPST switch mounted on the power supply module.

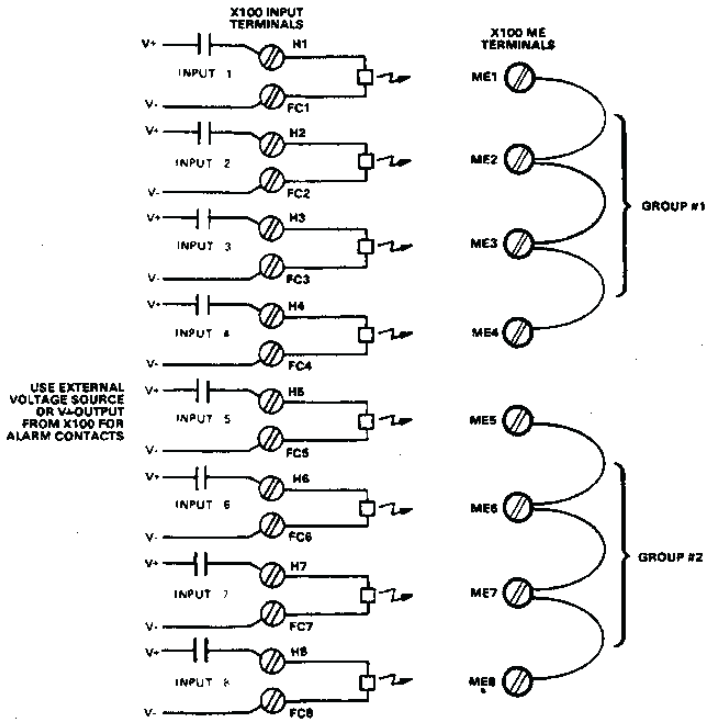
5-5. How To Connect Field Wiring Terminals

The X100 can be wired to monitor individual contact points, groups of contact points or series wired groups of contact points. Figure 5-5 illustrates how to wire the X100 for all three types of installations.

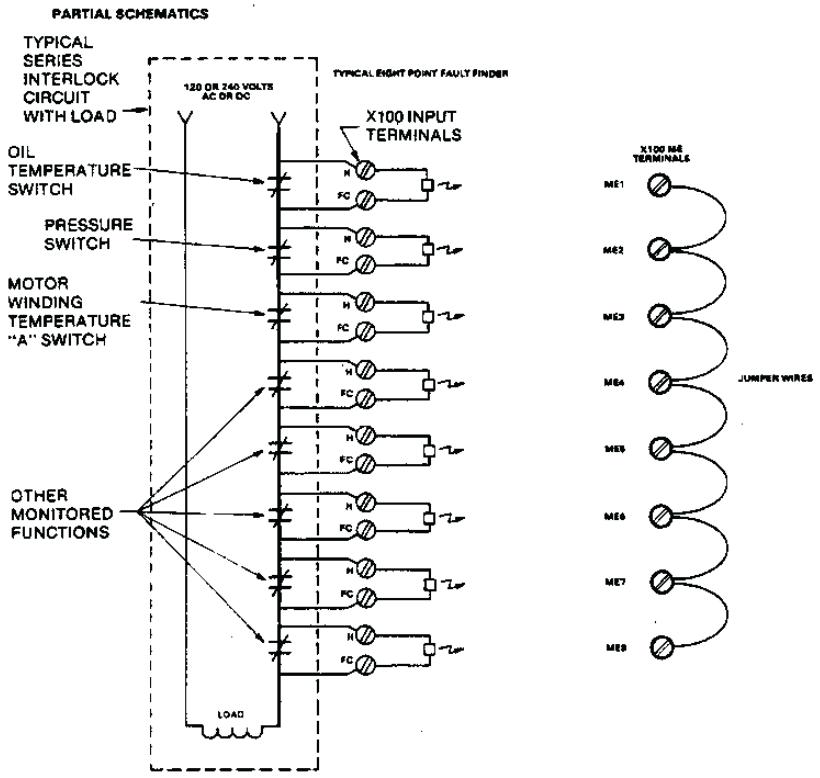
TYPICAL FAULT FINDER and ANNUNCIATOR



EXAMPLE: Six Live Inputs with First-out/Numeric Grouping for Alarm Sequence and Two Inputs Used for Independent Alarms.



EXAMPLE: Two Groups of Four Inputs with each Group having Independent First-out/Numeric Indication.



EXAMPLE: Eight Live Inputs with First-out/Numeric Grouping for Alarm Sequence.

Figure 5-5. Wiring Diagram of Typical X100 Annunciator and Fault-Finder Installation

5-6. Optional Audible Alarm and Reflash/Common Alarm Relays on Power Supply Module

The standard X100 Power Supply Modules, Figure 5-6, may be ordered with 1, 2, or 3 relays. Each relay is provided with an SPST switch to permit normally open (N.O.) or normally closed (N.C.) output contacts to operate the customer's device.

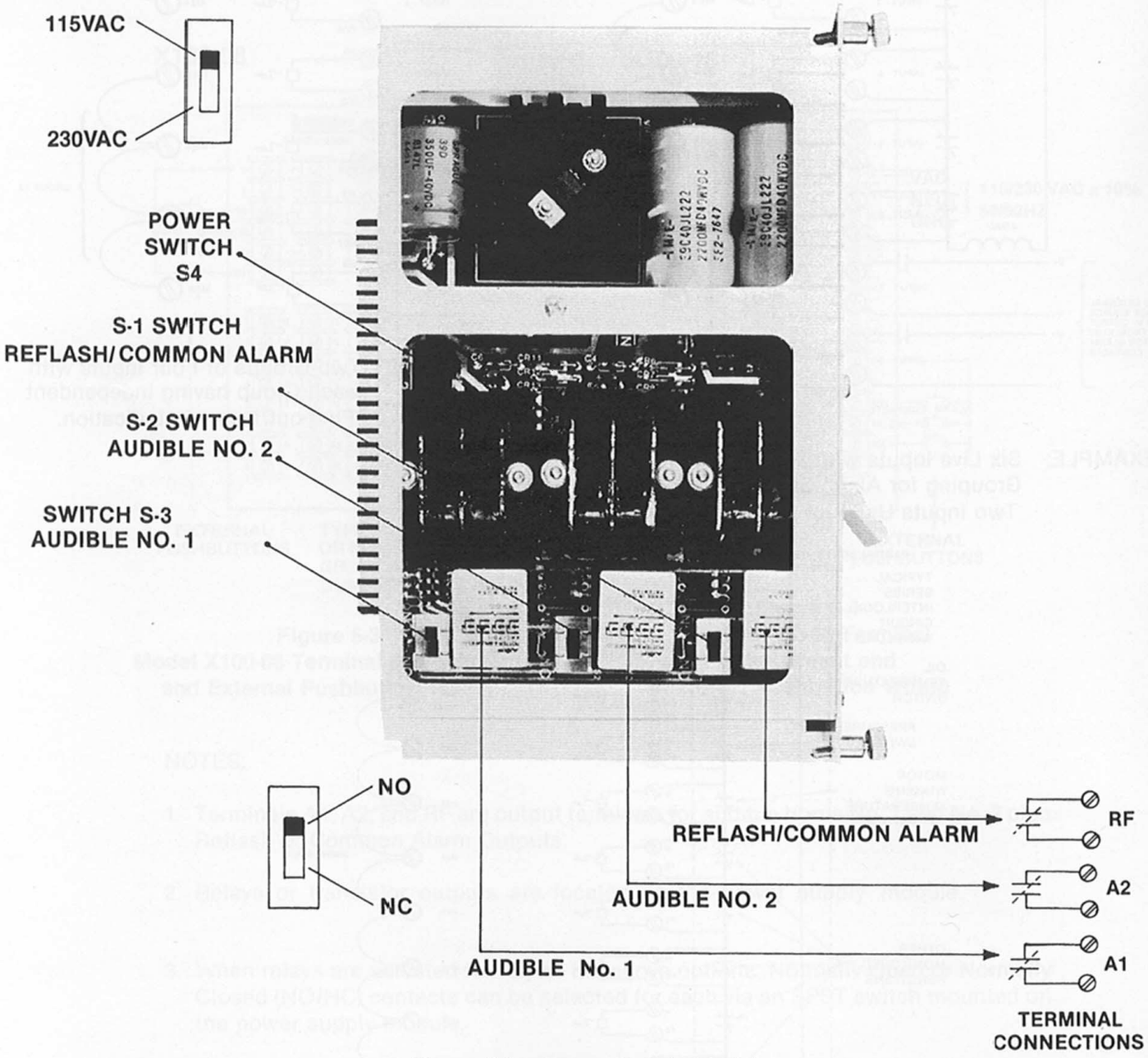


Figure 5-6. Power Supply Module

5-7. How To Set Option Select Switches

The Controller Module, Figure 5-7, has a maximum of eight DIP switch packages (8 switches on each) and two ten-position rotary switches which allow the user to manually program the X100 for his applications. Switch selectable features of the X100 are listed in the following tables:

Table 5-1. Annunciator Sequence Selection.

Table 5-2. Field Contact Polarity.

Table 5-3. Input Filter Response.

Table 5-4. Fast and Slow Flashing Rates for Display Panel Indicators.

Table 5-5. Automatic Silence for Audible Outputs.

Table 5-6. Reflash or Common Alarm Select.
Silence Pushbutton Interlock.
Acknowledge Pushbutton Interlock.
Ringback Silence Interlock.
Automatic Momentary Ringback.
Momentary Alarms Return to Normal.
Second Audible on A2 Outputs.

Table 5-7. Individual Selection of Alarm Sequence Select, Lock/Non-Lock Select, and Priority Horn Selection for each Alarm Input.

Figure 5-7 depicts the relationship of all the select switches on the Controller Module. Flashing Rates, Resolution, Sequence Modification Options, and Reflash/Common Alarm are functions that are common to all (8 or 16) inputs that the X100 is monitoring and, after the switches are set, the rates and features selected will apply to all inputs.

Annunciator Sequence Select switches are used in conjunction with S1-1 thru S1-8 and S4-1 thru S4-8, Field Contact Polarity Select Switches, to pair-up an Annunciator Sequence with the contacts being monitored. Switches S1-1 thru S1-8 and S4-1 thru S4-8 must be set to ON if the contacts that will be monitored are Normally Closed (N.C.) or OFF if the contacts are Normally Open (N.O.). Figure 5-7 illustrates the location on the Controller Module of all of the option select switches. Tables 5-1 thru 5-7 list the switch setting for implementing all of the options.

Prior to installing of the X100, it is recommended that the user sketch an installation diagram similar to Figure 5-5, then refer to Tables 5-1 thru 5-7 and set up the option switches for the desired operation. Sketch out wiring for ME, H, FC, A1, A2 and RF terminals and primary power input wiring. Last, but not least, refer to Paragraph 3-7 where output relay contacts for N.O. or N.C. operation is discussed.

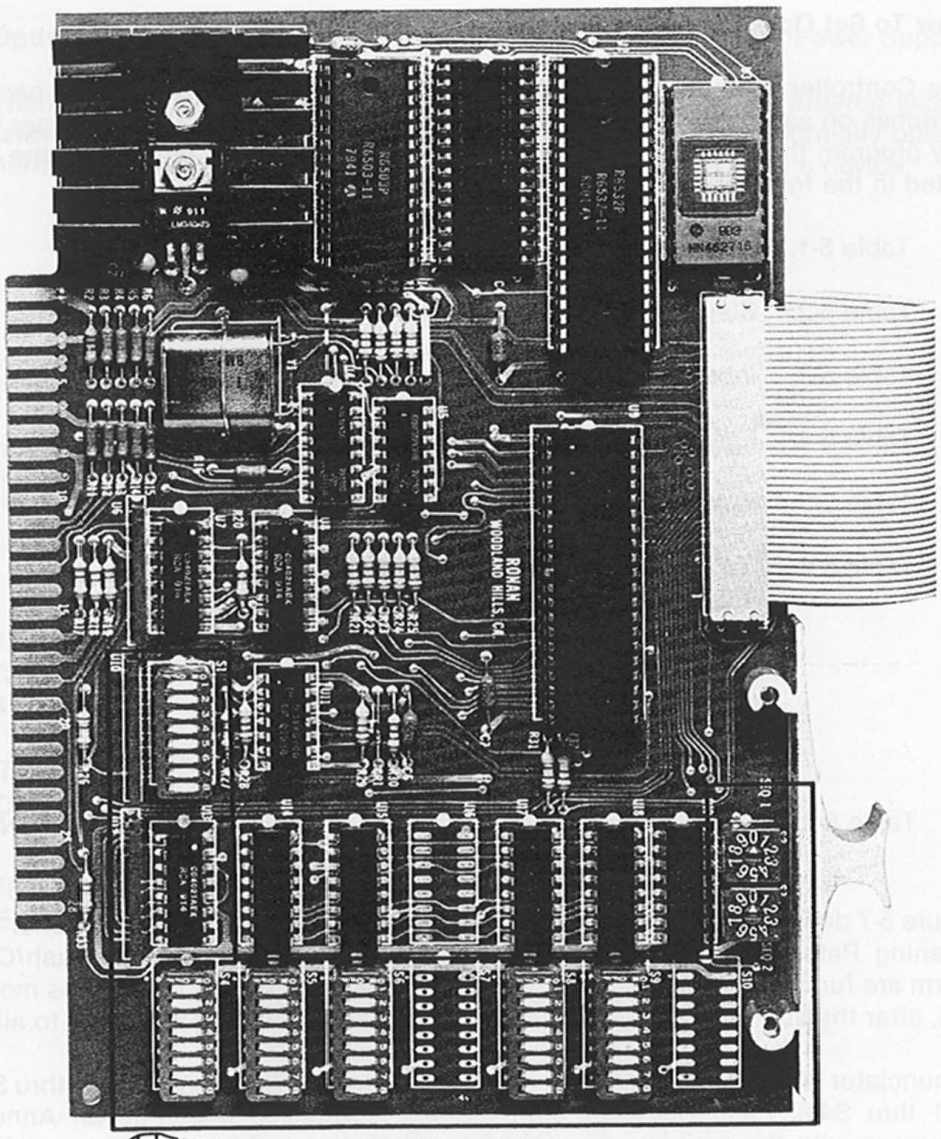
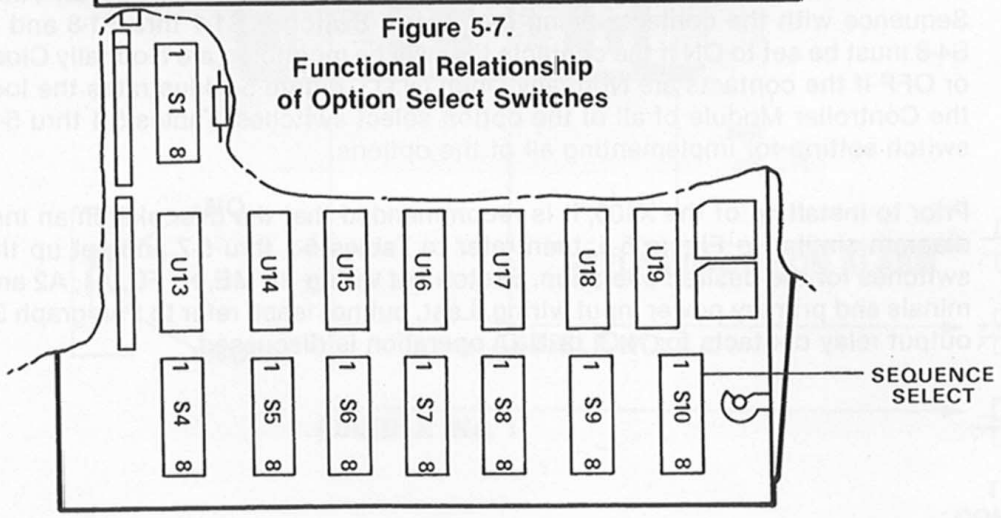
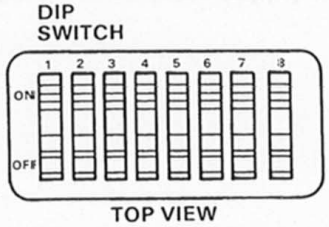


Figure 5-7.
Functional Relationship of Option Select Switches



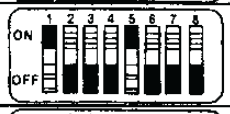
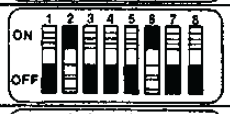
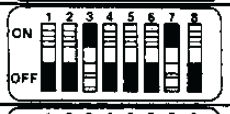
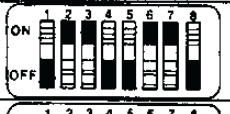
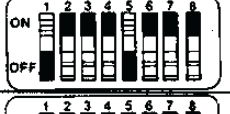


ALARM SEQUENCE SELECT SEQ. 1 or 2

– 16 Module Option

S10

SEQ 1 | SEQ 2

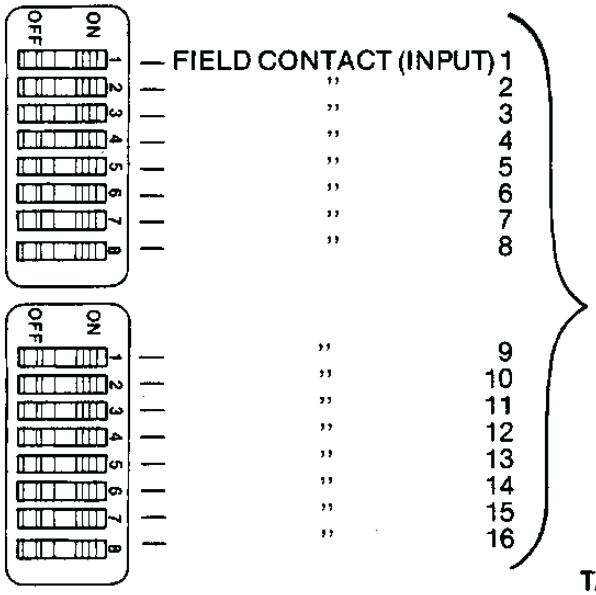
No.		Alarm Sequence	
0		**A**	Automatic Reset
1		**L**	Latched Reset
2		**M**	Manual Reset
3		**R**	Ringback
4		**R-4X**	Ringback
5		**F1A**	First Out Automatic Reset
6		**F1L**	First Out Latched Reset
7		**F1M**	First Out Manual Reset
8		**F3A**	First Out Automatic Reset
9		**F3A-5X**	First Out Automatic Reset
10		**F2A**	First Out Automatic Reset
11		**F2L**	First Out Latched Reset
12		**F2M**	First Out Manual Reset
13		**F3L**	First Out Latched Reset
14		**F3M**	First Out Manual Reset
15		**F1R**	First Out Ringback

Note: Black Indicates Depressed Position

USED ON SIXTEEN SEQUENCE ALARM UNITS

TABLE 5-1

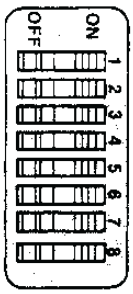
FIELD CONTACT POLARITY



CONTACT TYPE	SETTING
NORMALLY CLOSED	ON
NORMALLY OPEN	OFF
SERIES LIVE CONTACTS FOR SHUTDOWN CIRCUITS	OFF

TABLE 5-2

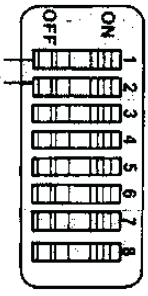
INPUT FILTER RESPONSE



15MSEC	30MSEC	60MSEC	120MSEC
←OFF	ON	OFF	ON
←OFF	OFF	ON	ON

TABLE 5-3

FLASHING RATES (Hz)

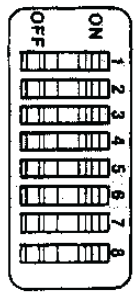


16	8	4	1	1	1	1	16	8	4	.5	.5	.5	4	.25	0
1	1	1	1	4	8	16	.5	.5	.5	4	8	16	.25	4	0
Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On
Off	Off	On	On	Off	Off	On	On	Off	Off	On	On	Off	Off	On	On
Off	Off	Off	Off	On	On	On	On	Off	Off	Off	Off	On	On	On	On
Off	Off	Off	Off	Off	Off	Off	Off	On	On	On	On	On	On	On	On

FF = Fast Flash
SF = Slow Flash

TABLE 5-4

AUTOMATIC AUDIBLE SILENCE

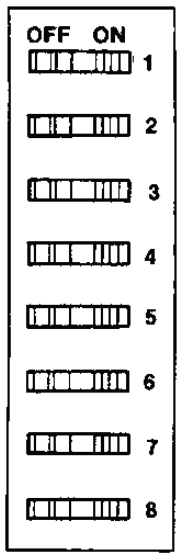


ON = ENABLE

— Auto Silence Audible 1 After Nominal 30 Sec Delay
— Auto Silence Audible 2 After Nominal 30 Sec Delay

TABLE 5-5

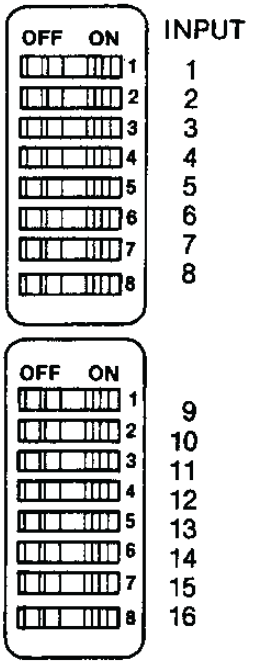
OPTION SELECTION



SWITCH POSITION	
OFF	**ON**
Reflash function on RF outputs	Common alarm function on RF outputs (SIL before ACK)
Silence pushbutton optional	Silence pushbutton interlock (option 2) P.B. or Auto SIL
Acknowledge pushbutton optional	Acknowledge pushbutton interlock (option 3)(F3)(ACK before RST)
Silence pushbutton operation is optional before Reset	Ringback Silence interlock (option 7X)
Sequence R alarms Lock-in	Automatic Momentary Ringback (option 12)
Momentary Alarms Lock-in	Momentary Alarms Return to normal non-lock (option 4)
Single Alarm Audible A1 Alarm	Second Alarm Audible on A2 outputs A2 Alarm Horn (option 1X)
8 Point Test on Power-Up	16 Point Test on Power-Up—two input modules must be installed

TABLE 5-6

ALARM SEQUENCE/NON-LOCK/HORN SELECTION



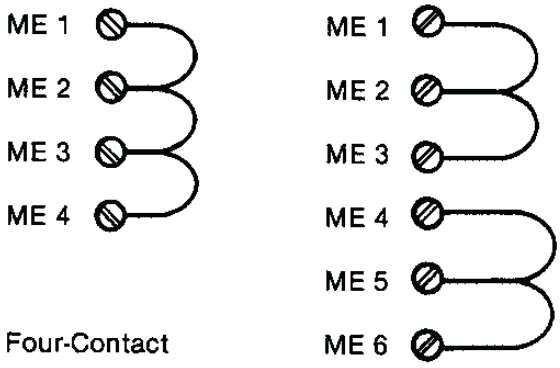
SWITCH S6-6	SWITCH S6-7	OPTION[2]	SWITCHES S8 and S9 OFF	SWITCHES S8 and S9 ON
OFF	OFF	Alarm sequence selection	Sequence 1	Sequence 2
ON	OFF	Non-lock selection	SEQ 1 + LOCK-IN	SEQ 2 + NON-LOCK
OFF	ON	Audible A1 and A2 selection	SEQ 1 + AUDIBLE 1	SEQ 2 + AUDIBLE 2
ON	ON		SEQ 1 & Lock in & A1	SEQ 2 & Non-Lock & A2

TABLE 5-7

5-8. First-Out/Numeric Grouping and How to Connect ME Terminals

The ME terminals on the terminal strip are group configuration terminals which are used to form contact sub-groups for both Fault-Finder applications of the X100. Any number from two to sixteen contacts can be grouped together for First-Out/Numeric annunciation. Examples of ME terminal groupings are shown in Figure 5-8.

There are three distinct purposes for ME wiring. The first case is where the grouping of ME terminals is associated with First Alert Alarm Sequences. The second case is where the grouping of ME terminals is used to present Sequence of Events occurring within a selected group on the Numeric Display. In this case, the Model X100 would be used with any of the Basic Alarm Sequences selected for these groups. A third case is in use of these groups with First Alert Alarm Sequences and Numeric Display. In this case the reset function is not independent since it will reset both the numerics and the alarm sequences. Case 2 is recommended for first-out applications. This is particularly important where more than one first-out group is used in the Model X100.



Four-Contact Groupings-Contacts	Two Three-Contact Groupings, 1, 2, 3, and 4, 5, 6
1 thru 4	

Figure 5-8. Examples of ME Terminal Groupings

5-9. How To Calculate R/L/C Factor of Relay Coils for Series Wired Contacts (For Model X100-404 and X100-405 Input Modules).

It is necessary to know the resistive load of the relay coil and the intended source voltage in applications where series contacts will be monitored. These factors affect both relay performance and the response time of the selected Input Modules in the X100 System. The detector circuits on the input modules are designed for optimum performance at input voltages ranging from 5V to 280V.

The performance of the detector circuit starts at ±5 volts and detection resolution improves as the input voltage (voltage across each contact) increases. Figure 5-9 illustrates a typical first-out fault-finder installation and some helpful equations for converting relay coil data commonly supplied by relay manufacturers into ohms.

When a relay contact opens, Figure 5-9, the associated sensing circuit on the input module shunts the open contact allowing 3 milliamps of current to pass through the relay coil. It is important to determine that the selected relay will de-energize at the reduced voltage level (3 milliamps of current flow) and allow the normal shutdown sequence to occur. Relay manufacturers generally specify that AC relays will drop out at a voltage reduction of 10% to 25% from the nominally specified operating voltage. To ensure that this criteria is met, it is recommended that the following calculations be performed prior to installation of the X100.

1. Determine resistive load of the relay coil from the manufacturer's supplied data.

NOTE:

If necessary, convert relay manufacturer's data into ohms using equations shown in figure 5-9.

2. Using the following formula, determine the voltage drop across the relay coil.

$$\text{Voltage Drop} = 0.003 \times \text{Coil Resistance (ohms)}$$

3. Check manufacturer's relay specifications to ensure that the relay will de-energize at a voltage level greater than the one calculated in Step 2 above.

4. To ensure that the source voltage is adequate to supply a minimum of 5 volts for each contact monitored, use the following formula:

$$\frac{\text{Source Voltage} - \text{Coil Voltage Drop}}{\text{Maximum Number of Contacts to be Monitored}} > 5 \text{ Volts}$$

EXAMPLE

$$\frac{100\text{V} - 12.0\text{V}}{8} = 11.0\text{V}$$

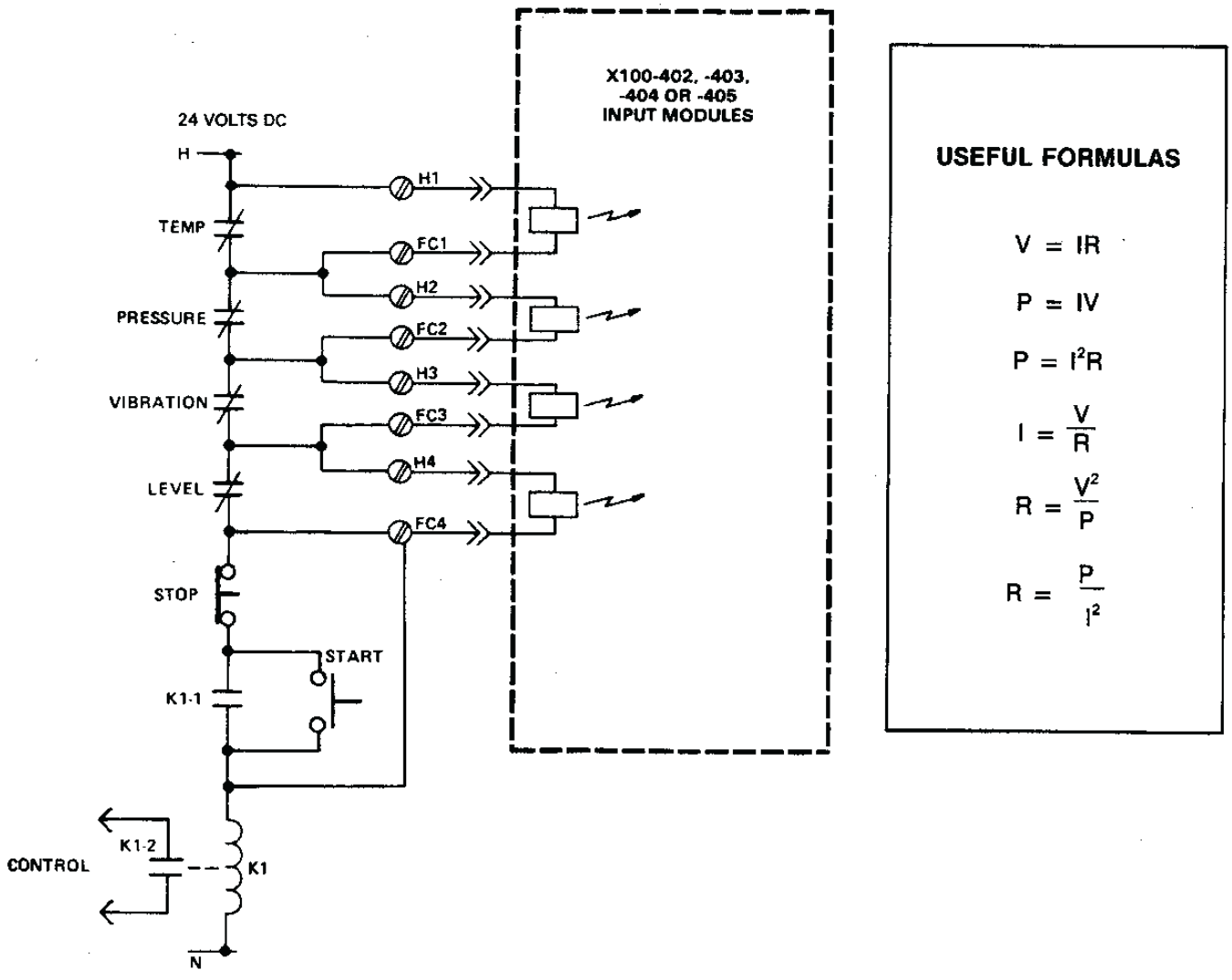


Figure 5-9. Typical Series Interlocked Relay Contacts

5-10. Window Removal, Replacement and Fabrication

Each X100 annunciator window, Figure 5-10, is inserted in front panel grooves and automatically retained by the chassis sides. The use of individual acrylic windows, available in white, red, green, amber and blue, permit easy relocation of legends without requiring any new engraving. In portable diagnostic applications, paper inserts can be quickly created and used in place of the acrylic windows.

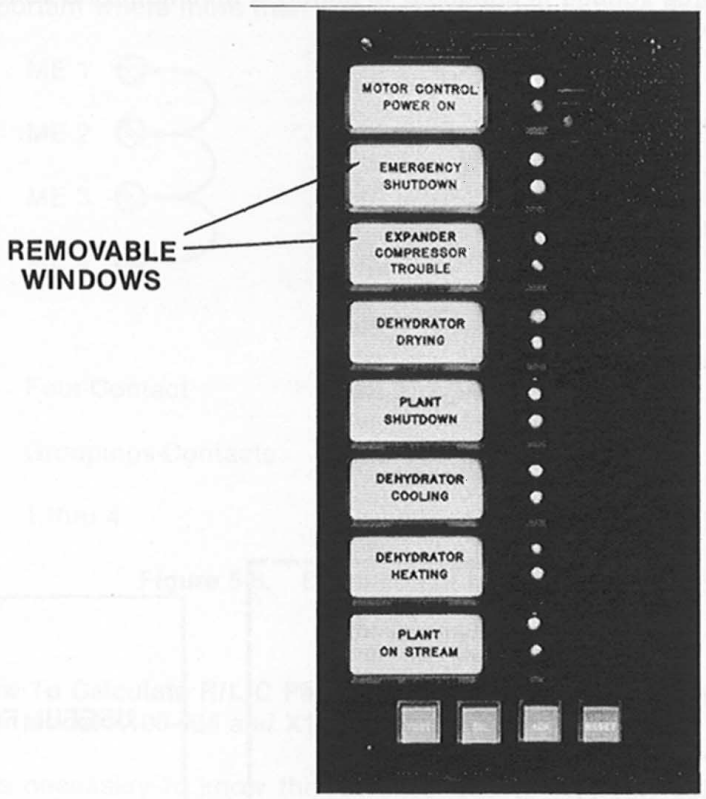


Figure 5-10. Display Window Removal and Replacement

5-11. Actual Size Windows - Engraving Details

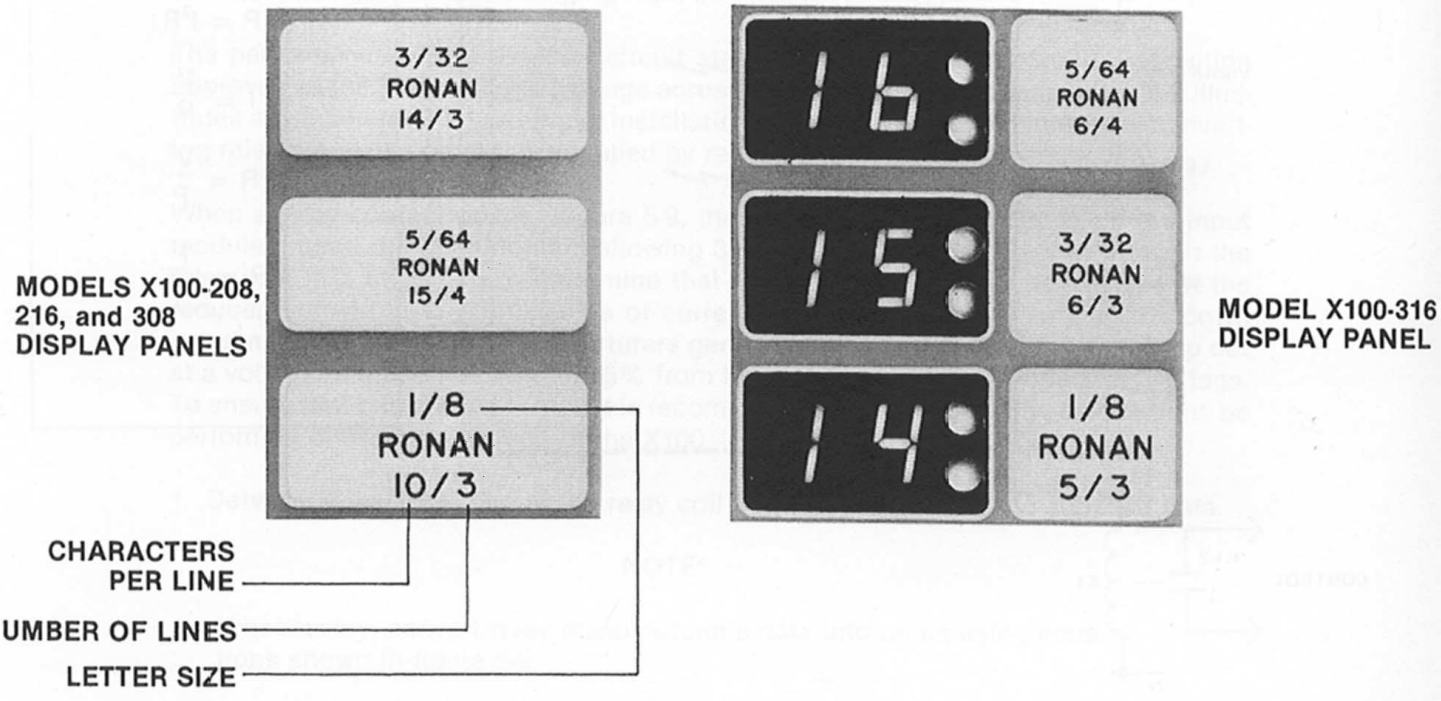
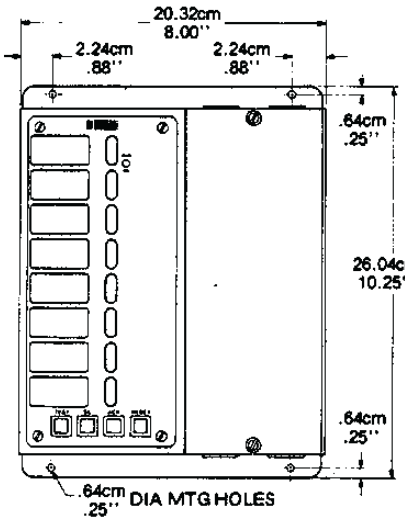


Figure 5-11. Actual Size Windows

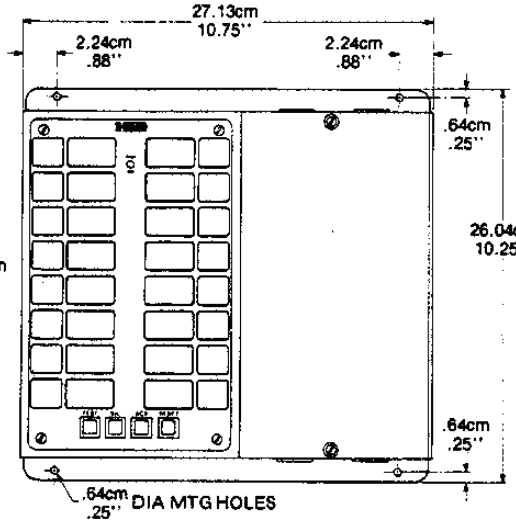
5-12. Mechanical Specifications

Surface Mounting Chassis

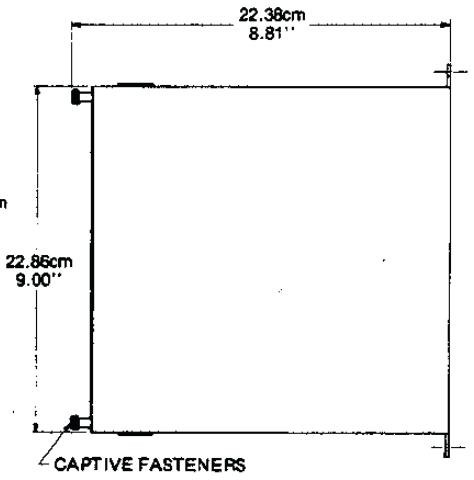
Model X100-08SM Front View
(with X100-208 Display)



Model X100-16SM Front View
(with X100-316 Display)

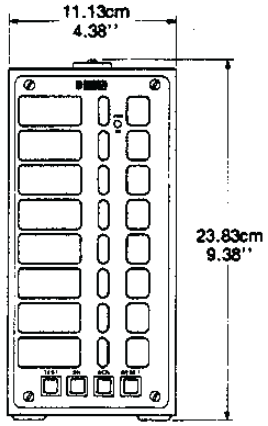


Side View

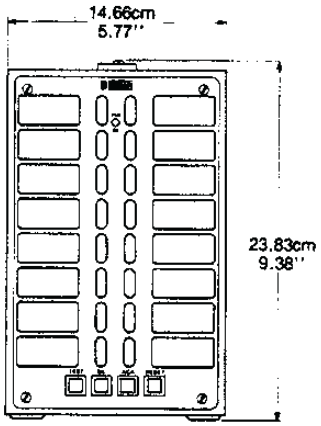


Portable Cases

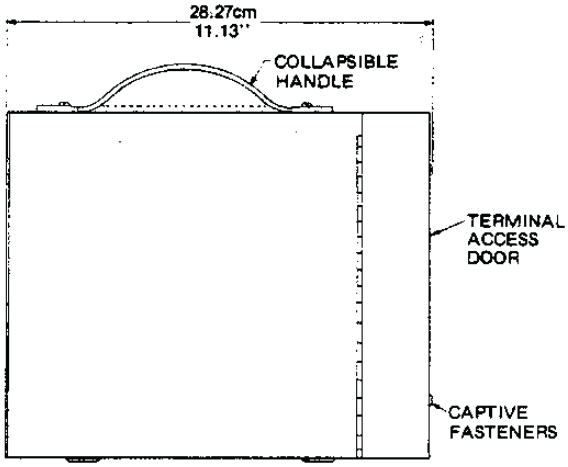
Model X100-08PC Front View
(with X100-308 Display)



Model X100-16PC Front View
(with X100-216 Display)

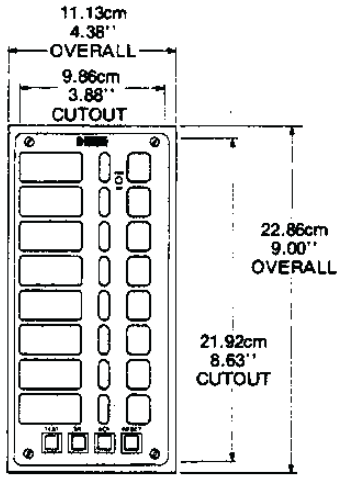


Side View

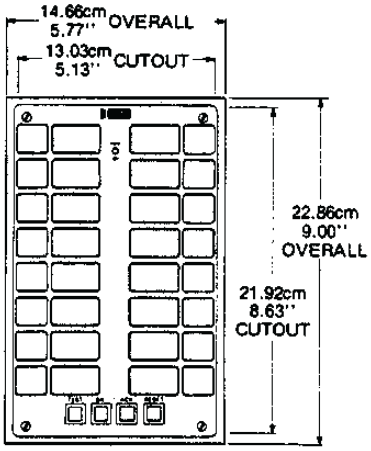


Panel Mounting Chassis

Model X100-08PM Front View
(with X100-308 Display)



Model X100-16PM Front View
(with X100-316 Display)



Side View

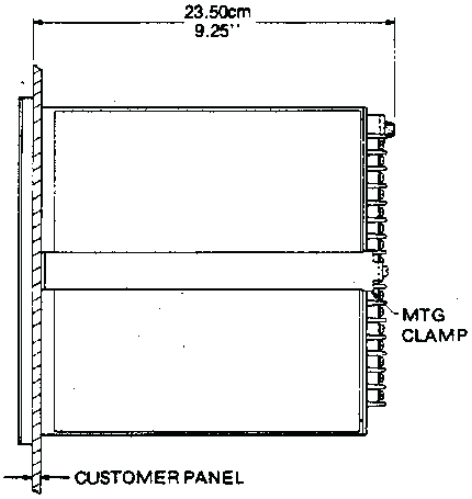
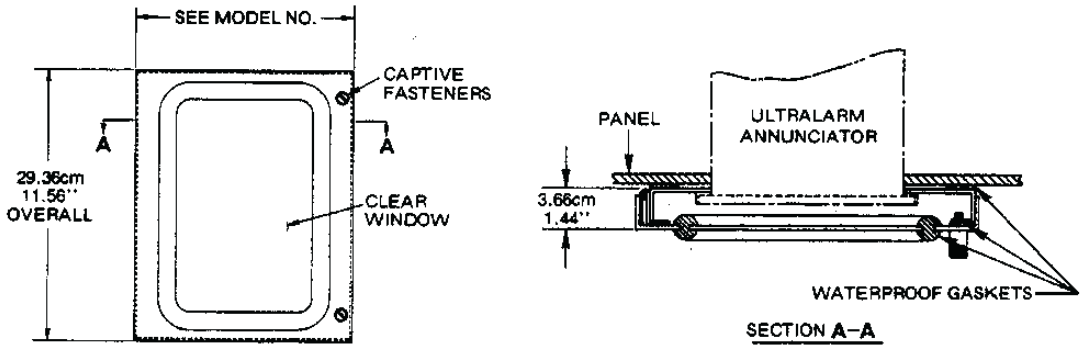


Figure 5-12. X100 Mechanical Specifications

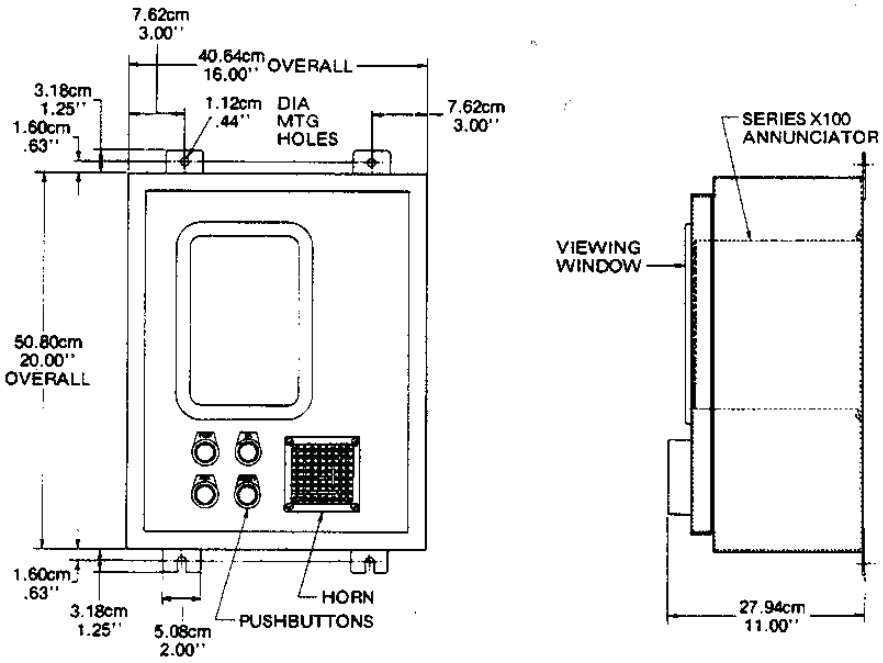
Nema 12 Door

Model X100-708
20.32cm/8.00''

Model X100-716
23.83cm/9.38''



WE1 Enclosures (Model X100-16WE1 shown)



WE3 Enclosures (Model X100-16WE3 shown)

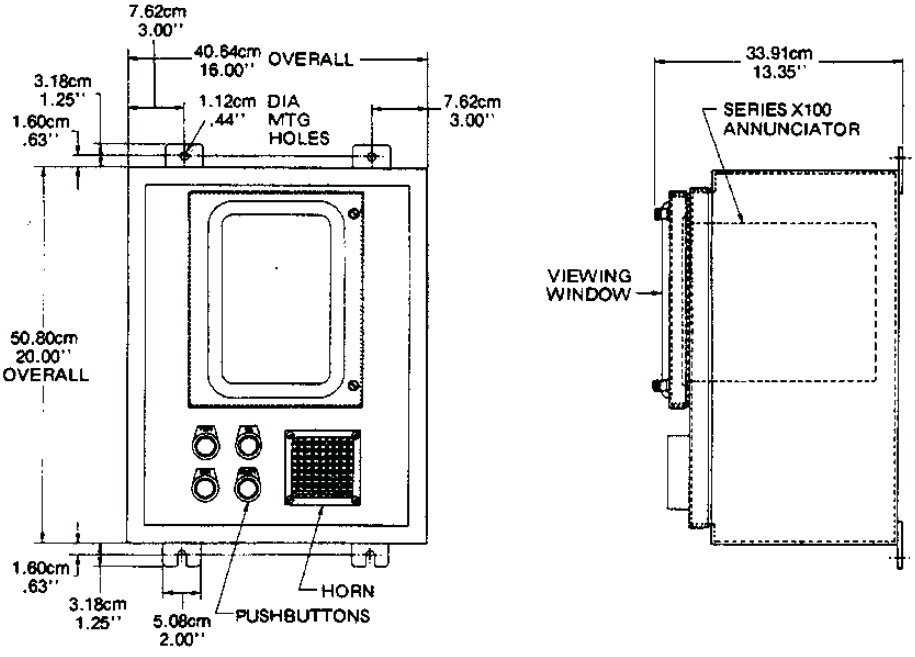
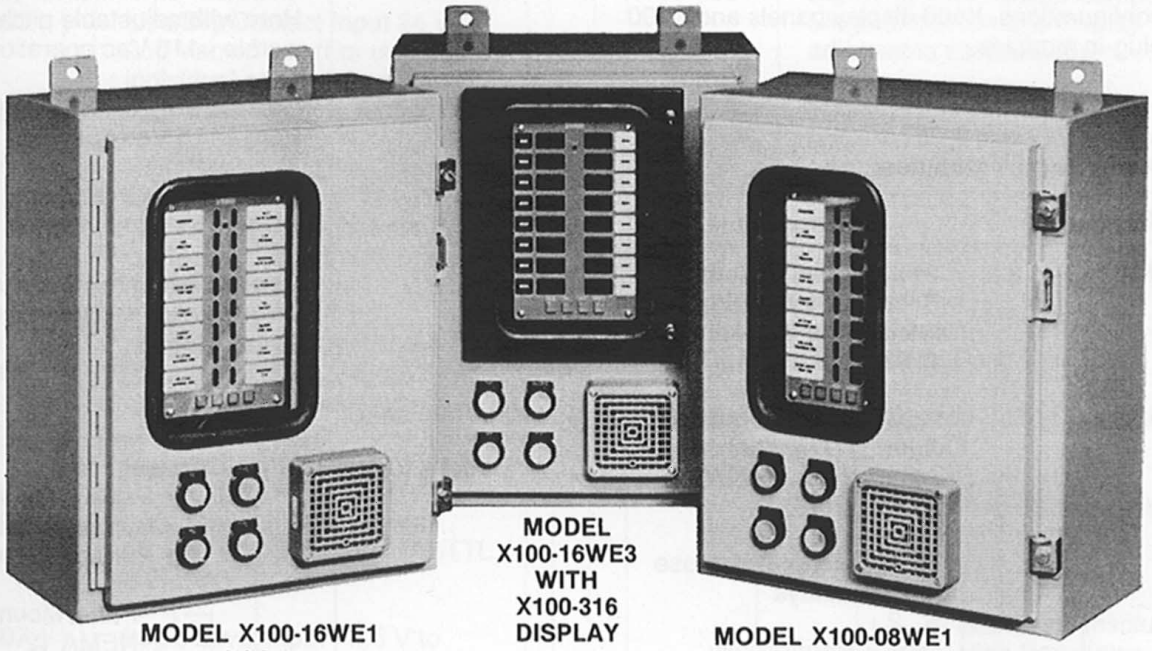


Figure 5-13. X100 Enclosure Specifications

5-13. NEMA 12 Enclosures and Doors

Various small mounting and panel mounting NEMA 12 Enclosures allow the X100 Ultralarm systems to be field located. See Figure 5-14.

The Model X100-708 and X100-716 NEMA 12 Doors, Figure 5-15, completely seal the front of the annunciator in panel mounting (PM) installations where the front of the unit is subjected to moisture or a corrosive atmosphere. The door assembly is supplied with a clear window and sealed with neoprene gaskets.

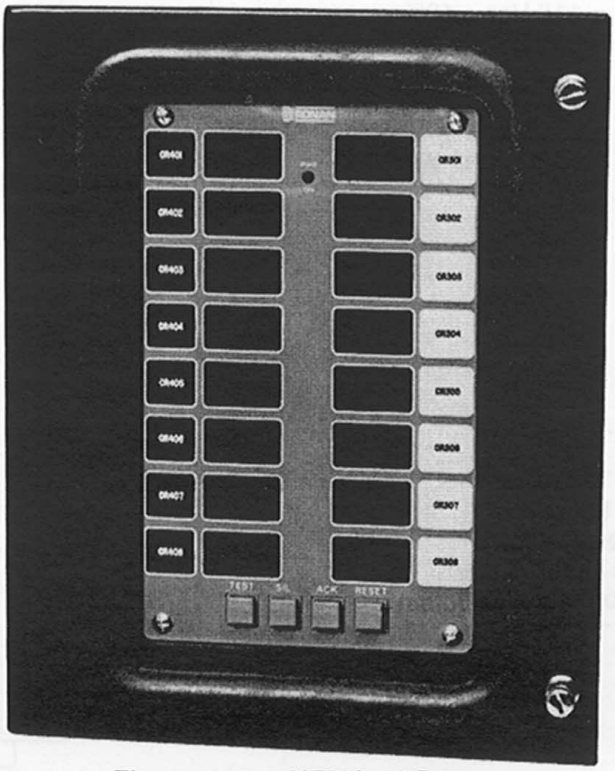


MODEL X100-16WE1 WITH X100-216 DISPLAY

MODEL X100-16WE3 WITH X100-316 DISPLAY

MODEL X100-08WE1 WITH X100-308 DISPLAY

Figure 5-14. NEMA 12 Enclosures



MODEL X100-716 (SHOWN WITH X100-16PM CHASSIS AND X100-316 DISPLAY)

Figure 5-15. NEMA 12 Doors

SECTION 6

ORDERING INFORMATION AND PARTS LISTS

6-1. Introduction

This section contains ordering information and detailed parts lists for all X100 chassis configurations, X100 display panels and X100 plug-in modules.

X100 Power Supply Modules

Model	Description
X100-651 - ( ) - ( )	Power Supply, Standard Replay Outputs (Relays rated 3 A amps resistive at 115 Vac or 30 Vdc)
X100-653 - ( )	Power Supply, Transistor Outputs (Transistors rated 1/2 amp at 1.5 Vdc ON, 30.0 Vdc OFF)
( ) = GP	General Purpose Relays
( ) = HS	Hermetically Sealed Relays (For Class I, Division 2 Installations)
( ) = A	115 Vac ± 10% 50/60 Hz Input Power
( ) = B	230 Vac ± 10% 50/60 Hz Input Power
( ) = C	12 Vdc
( ) = D	24 Vdc
( ) = E	48 Vdc
( ) = F	125 Vdc
NOTE Output Functions: 2 Audible Device Drivers and Reflash/ Common Alarm Output	

X100 Accessories

Model	Description
X100-708	NEMA 12 Door for use with Model X100-08PM
X100-716	NEMA 12 Door for use with Model X100-16PM
X36-115	General Purpose Electronic Horn with adjustable pitch and warble - 115 Vac operation
350N	General Purpose Vibrating Horn - 115 Vac operation
350W	Weatherproof Vibrating Horn - 115 Vac operation
202B	General Purpose Push Button for remotely mounted operating controls

X100 Chassis

Model X100 - ( ) - ( ) Chassis

- PM = Panel Mounting
- SM = Surface Mount
- PC = Portable Case
  - P = Panel Mounting NEMA 12 Enclosure
  - W = Wall Mounting NEMA 12 Enclosure
- ( ) E1 = Surface Mounting Unit, installed inside a NEMA 12 Enclosure with a weatherproof horn and four push buttons
- ( ) E2 = Panel Mounting Unit, installed through the door of a NEMA 12 Enclosure with a general purpose horn
- ( ) E3 = Panel Mounting Unit, covered by a NEMA 12 door, installed through the door of a NEMA 12 Enclosure with a weatherproof horn and four push buttons

- 08 = Eight Point Unit
- 16 = Sixteen Point Unit

X100 Eight-Point Input Modules

Model	Description
X100-401 ( )	Standard (Dry Contact) Input
X100-402 ( )	Live/Dry Contact Input 12 V to 125 Vac or Vdc (For use with individual contacts or series connections of 2 to 8 contacts)
X100-403 ( )	Live/Dry Contact Input 24 V to 250 Vac or Vdc (For use with individual contacts or series connections of 2 to 8 contacts)
X100-404 ( )	High Sensitivity Live/Dry Contact Input - 5 V to 125 Vac or Vdc (For use with individual contacts or series connections of 2 to 16 contacts)
X100-405 ( )	High Sensitivity Live/Dry Contact Input - 5 V to 250 Vac or Vdc (For use with individual contacts or series connections of 2 to 16 contacts)
X100-406 ( )	Logic Level Input - 4.5 V to 16.5 V (Transistor, TTL, LSTTL, STTL inputs)
X100-407 ( )	Logic Level Input - 4.5 V to 30.0 V (Transistor, CMOS inputs) S = Standard Resolution H = High Resolution

NOTE: D.C. standard resolution is 1.3 milliseconds maximum. D.C. high resolution is .65 milliseconds maximum.

X100 Display Panels

Model	Description
X100-208	Eight Point with 2 LED Lamps adjacent to each window
X100-216	Sixteen Point with 2 LED Lamps adjacent to each window
X100-308	Eight Point with 2 LED Lamps and Single Digit Numeric Display adjacent to each window
X100-316	Sixteen Point with 2 LED Lamps and Two Digit Numeric Display adjacent to each window

X100 Controller Modules

Model	Description
X100-508 ( ) - 16	Eight Point Controller
X100-516 ( ) - 16	Sixteen Point Controller 16 = 16 Annunciator Sequences selected by 8 discrete switches S = Standard Resolution H = High Resolution

NOTE: D.C. standard resolution is 1.3 milliseconds maximum. D.C. high resolution is .65 milliseconds maximum.

SECTION 7

SCHEMATIC DIAGRAMS

7-1. Introduction

This section contains schematic diagrams for the complete series of X100 Ultralarm Systems. All schematic diagrams are identified by model number. The chassis wiring diagram is applicable to all models of the X100 Systems.

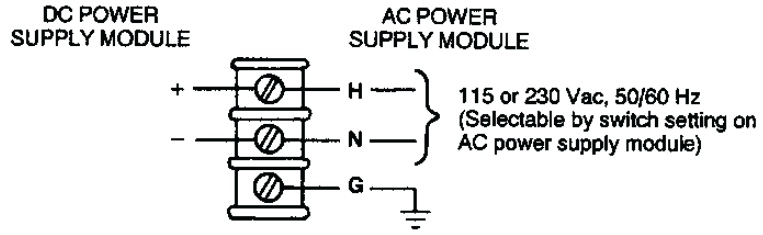
Field Wiring Summary

Typical field wiring input details shown on Pages 65, 66, and 67.

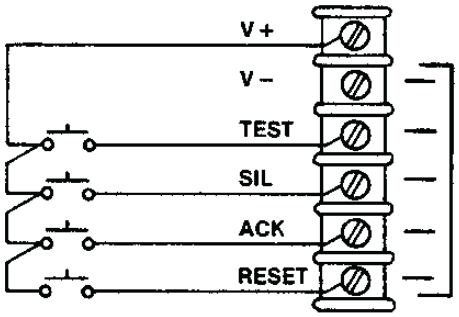
Diagrams included in this section are:

Drawing Number	Title
X100B60 - Rev. 1	Eight Point Chassis Wiring Details
X100B61 - Rev. 0	Sixteen Point Chassis Wiring Details
X100B62 - Rev. 0	Standard Dry Contact Input Module X100-401 Live/Dry Contact Inputs
X100B63 - Rev. 0	Non-sensitive or Logic Input Modules X100-402, X100-403, X100-406 and X100-407
X100B64 - Rev. 0	High Sensitivity Live/Dry Contact Inputs or Logic Input Modules X100-404 and X100-405
X100B65 - Rev. 1	Power Supply Module
X100B66 - Rev. 0	Controller Module X100-508 - (S or H) - 16 Controller Module X100-516 - (S or H) - 16
X100B67 - Rev. 0	8 Point Non-numeric Display Module X100-208
X100B68 - Rev. 0	16 Point Non-numeric Display Module X100-216
X100B69 - Rev. 0	8 Point Numeric Display Module X100-308
X100B70 - Rev. 0	16 Point Numeric Display Module X100-316
X100-1000 - Rev. 2	DC Power Supply Module

POWER INPUT



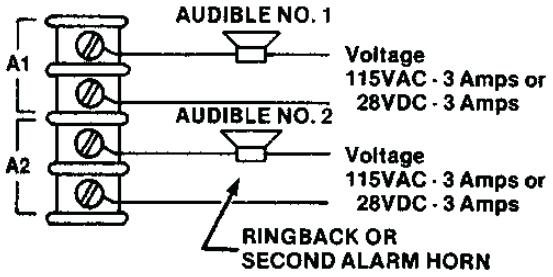
EXTERNAL PUSHBUTTONS



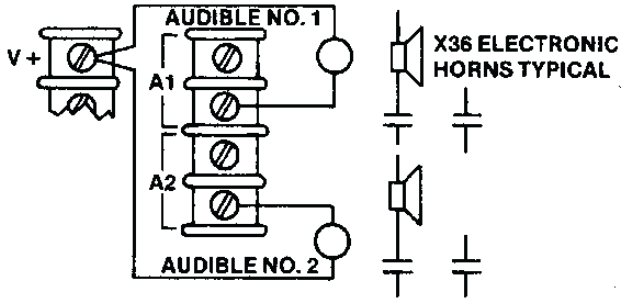
On Multiple X100 systems using one set of external pushbuttons buss Test, Silence, Acknowledge, Reset and V –.

All external pushbuttons must be wired with Normally Open (N.O.) contacts.

AUDIBLE OUTPUTS



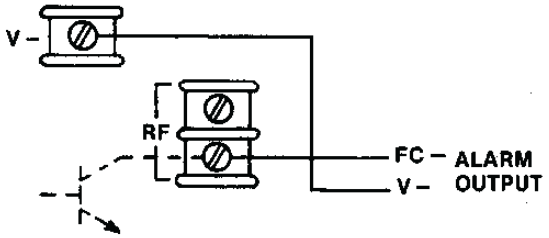
CONTACT OUTPUT



TRANSISTOR OUTPUT
Use relays with 24VDC coils not to exceed 1.25 watts.

REFLASH OR COMMON ALARMS

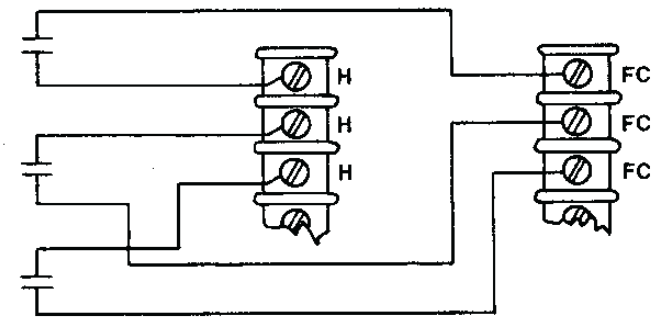
RELAY OUTPUT



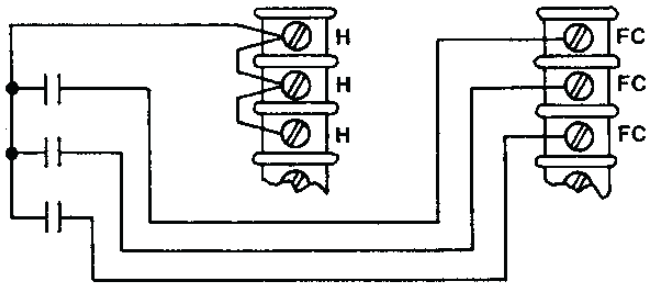
TRANSISTOR OUTPUT
Typical Hookup to Remote Annunciator

FIELD CONTACT WIRING — DRY CONTACT

INPUT MODULES X100-401-(S or H)

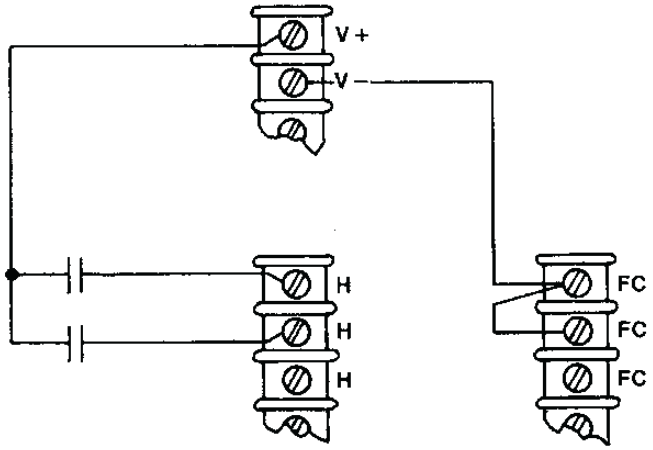


INDIVIDUAL TWO WIRES PER INPUT



COMMON POWER LEAD TO CONTACTS
Each H terminal can power only one field contact. Jumper H terminals when using common power lead to contacts.

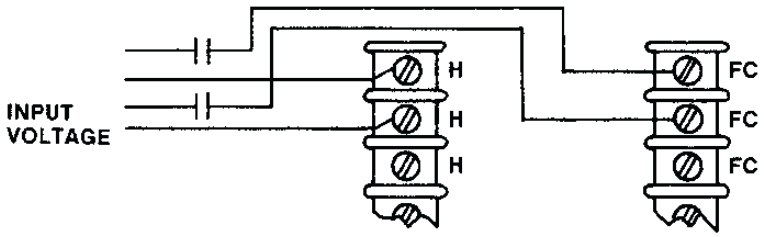
INPUT MODULES X100-402-(S or H)
X100-403-(S or H)
X100-404-(S or H)
X100-405-(S or H)
X100-407-(S or H)

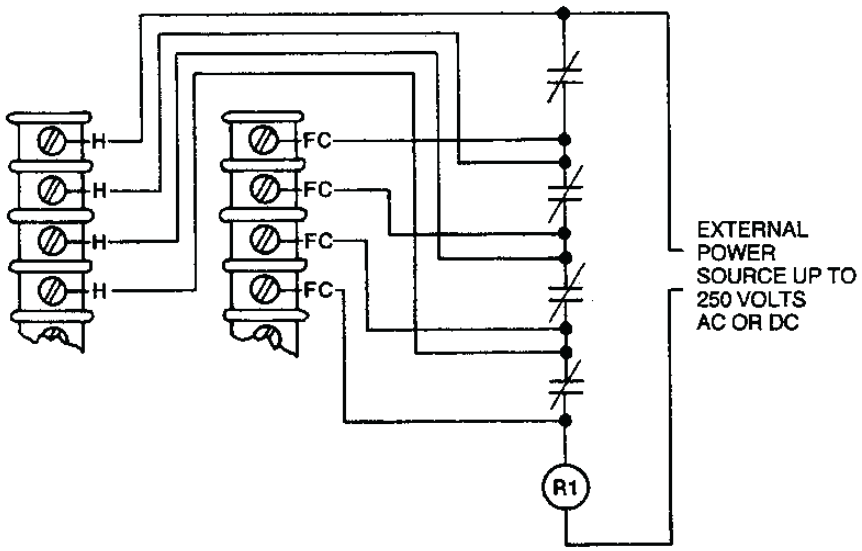


FIELD CONTACT WIRING — LIVE CONTACTS

INPUT VOLTAGES	
INPUT MODULE MODEL	VOLTAGE AC OR DC
X100-402-(S or H)	12 to 125
X100-403-(S or H)	24 to 250
X100-404-(S or H)	5 to 125
X100-405-(S or H)	5 to 250

Live inputs on contacts using external voltage source. Each input may be from different voltage sources AC or DC. Polarity of DC inputs not important.

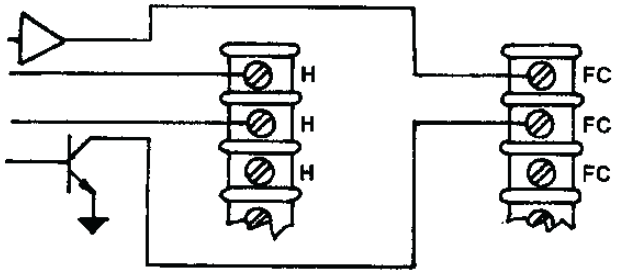




TYPICAL SHUTDOWN CIRCUIT
For low voltage refer to section 5 for maximum number of contacts that can be wired in series.

MAXIMUM NUMBER OF CONTACTS IN SERIES		
INPUT MODULE	EXTERNAL VOLTAGE AC OR DC	NUMBER OF CONTACTS
X100-402-(S or H)	100-125	8
X100-403-(S or H)	200-250	8
X100-404-(S or H)	90-125	16
X100-405-(S or H)	180-250	16

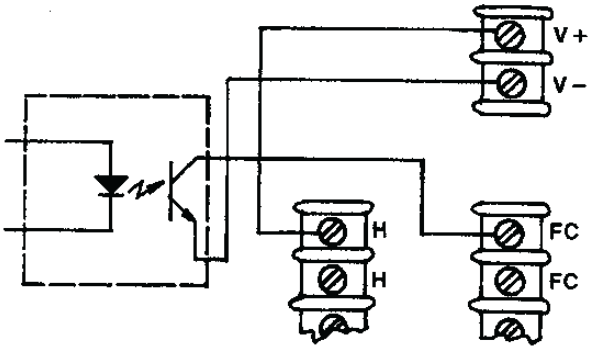
INPUT WIRING — LOGIC LEVELS



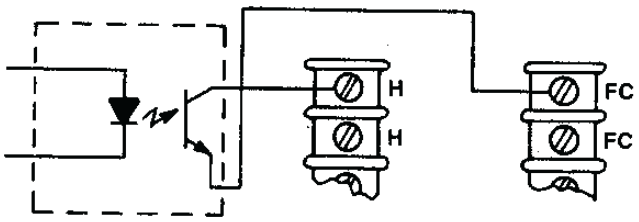
TYPE OF INPUT	INPUT MODULE
TRANSISTOR	X100-406-(S or H) X100-407-(S or H)
TTL	X100-406-(S or H)
CMOS	X100-407-(S or H)

INPUT WIRING — OPTO-COUPLERS

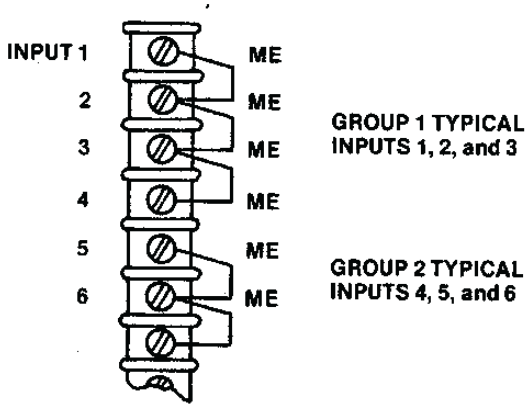
INPUT MODULE X100-402-(S or H)
X100-403-(S or H)
X100-404-(S or H)
X100-405-(S or H)
X100-406-(S or H)
X100-407-(S or H)

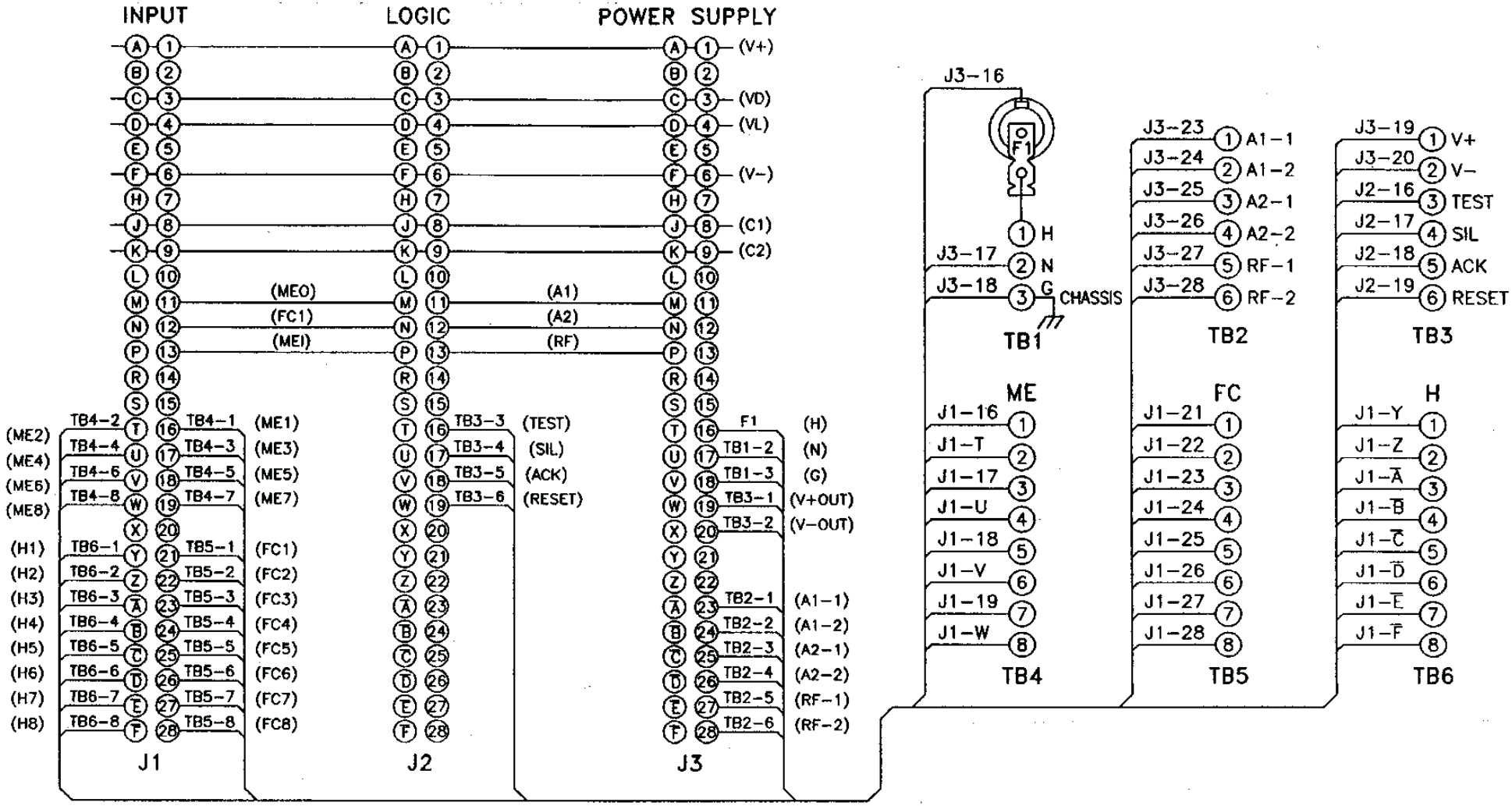


INPUT MODULES X100-401-(S or H)



FIRST OUT GROUPING WIRING





DO NOT REVISE WITHOUT APPROVAL BY FACTORY MUTUAL

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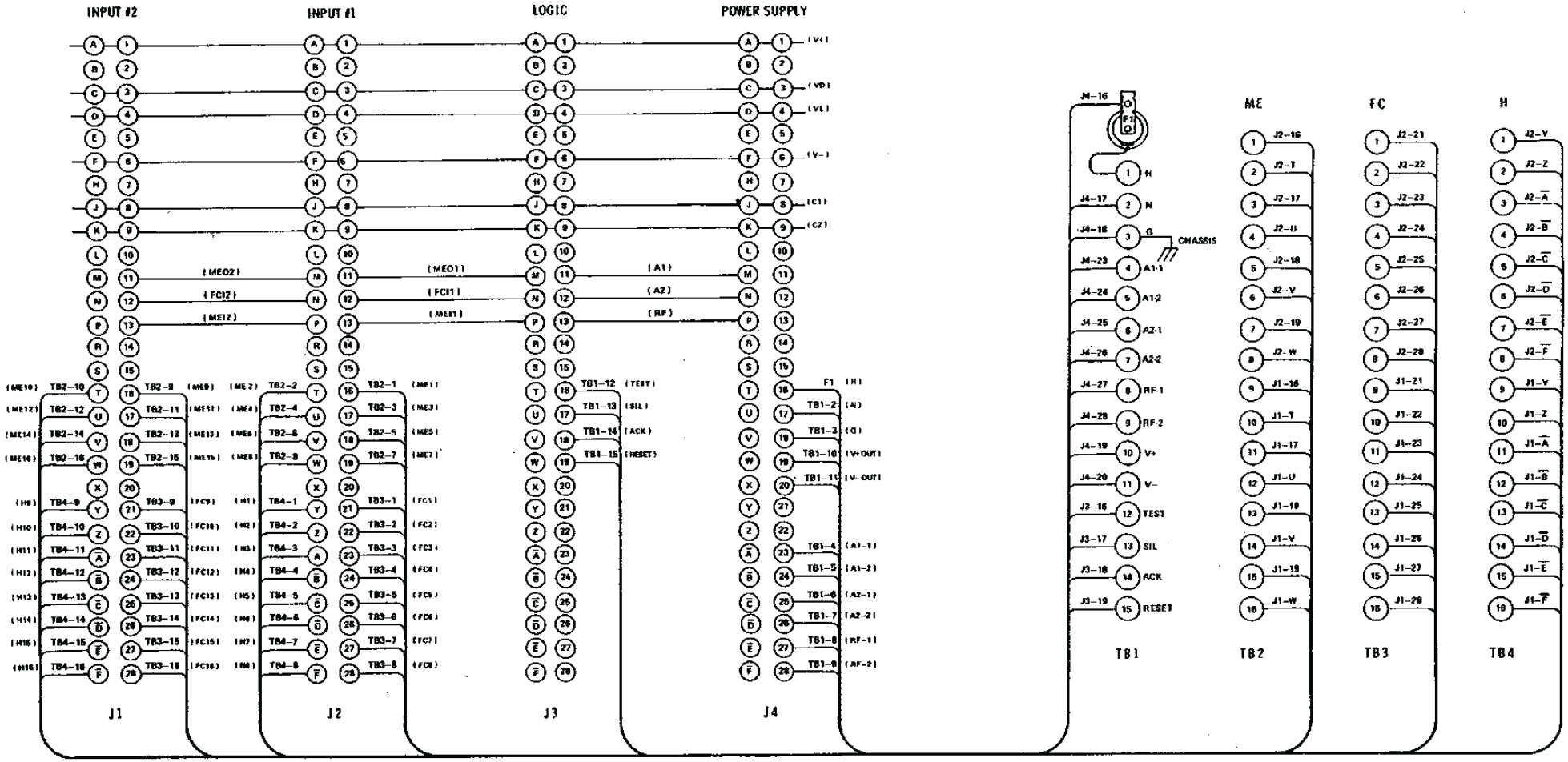
WOODLAND HILLS, CALIF.

SERIES X100 ULTRALARM SYSTEMS
EIGHT POINT CHASSIS WIRING DETAILS

DWG. NO. X100B60-Rev. 1



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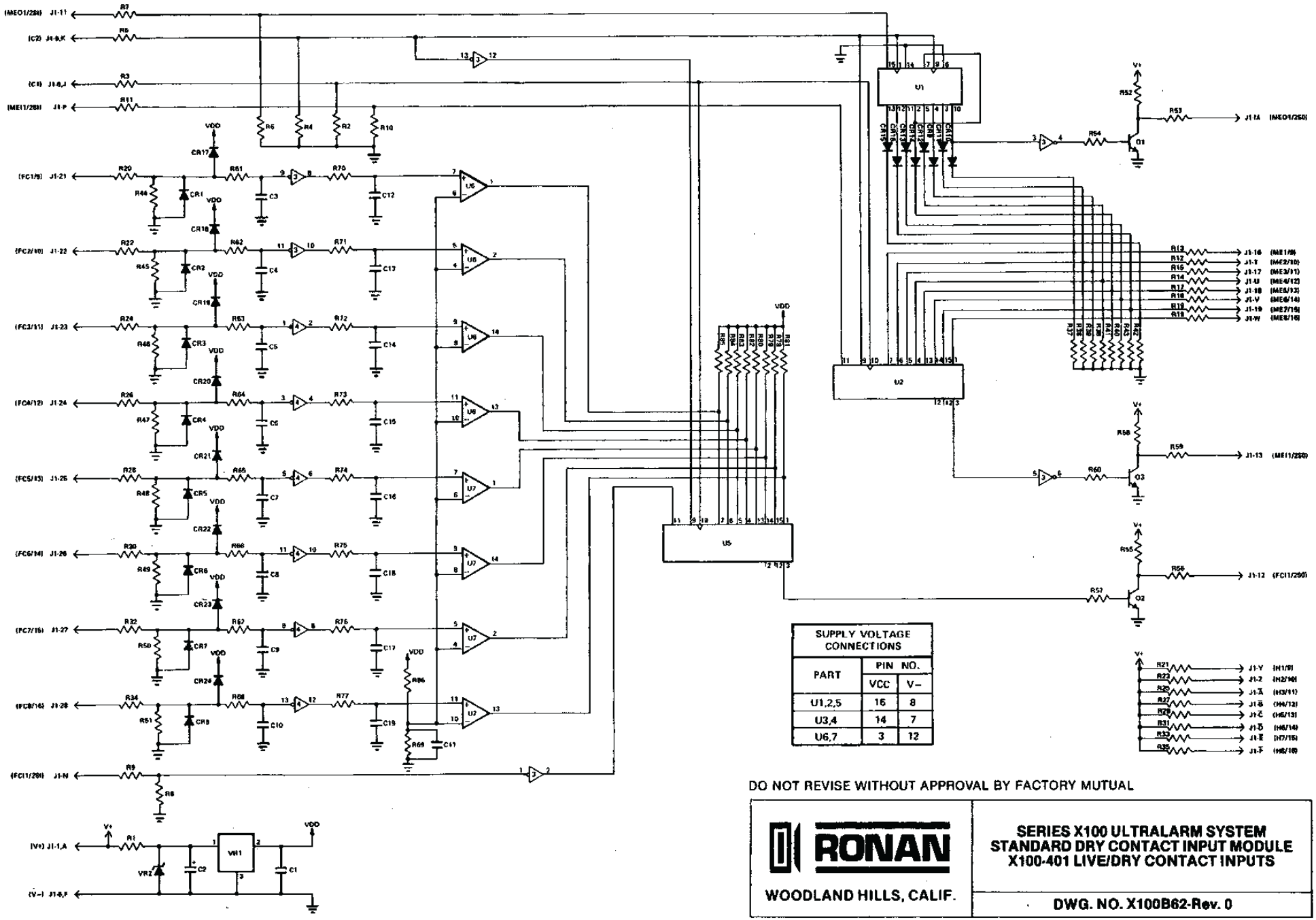
SERIES X100 ULTRALARM SYSTEM
SIXTEEN POINT CHASSIS WIRING DETAILS

DWG. No. X100B61-Rev. 0



SUPPLY VOLTAGE CONNECTIONS		
PART	PIN NO.	
	VCC	V–
U1,2,5	16	8
U3,4	14	7
U6,7	3	12

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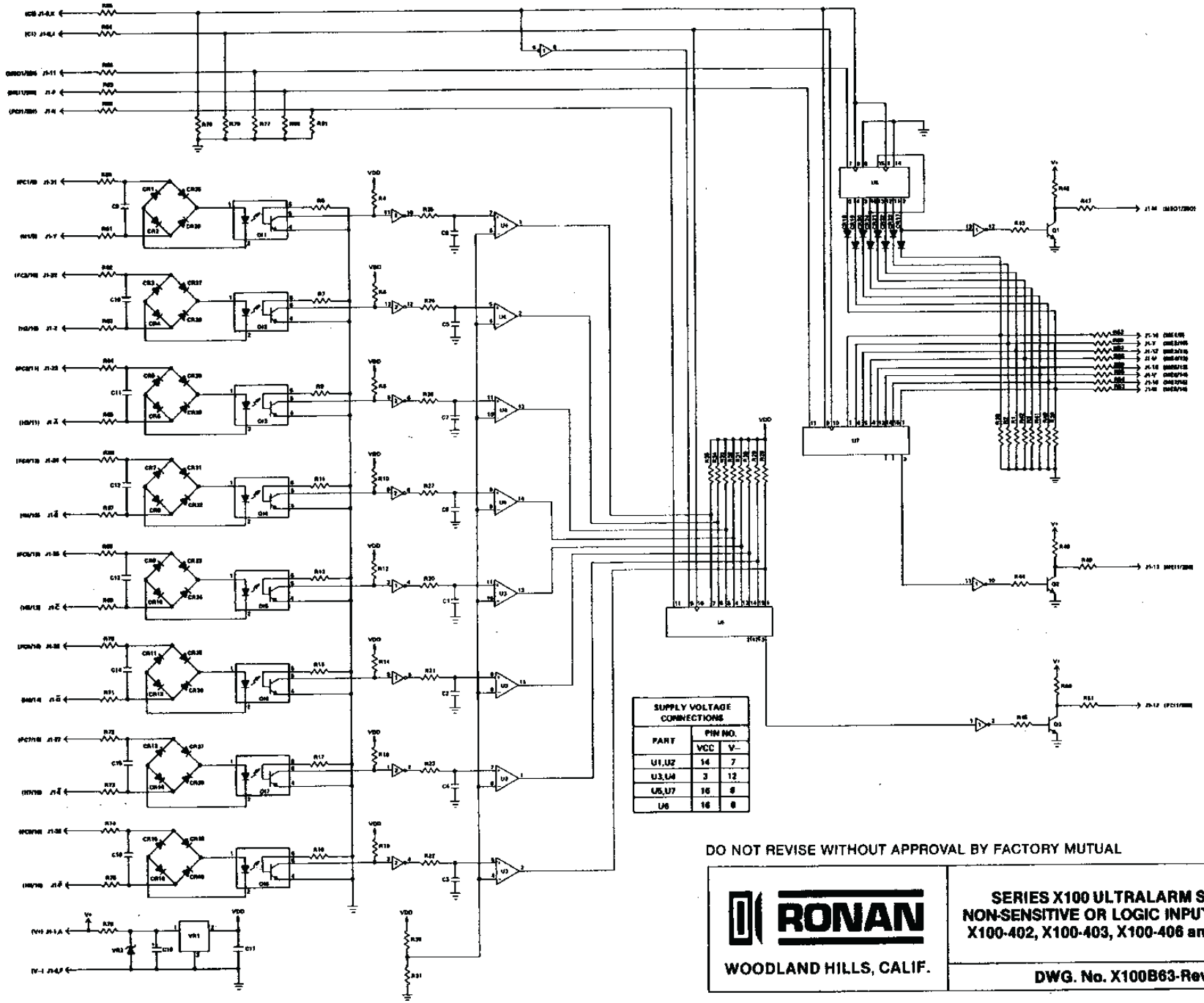
SERIES X100 ULTRALARM SYSTEM
STANDARD DRY CONTACT INPUT MODULE
X100-401 LIVE/DRY CONTACT INPUTS

DWG. NO. X100B62-Rev. 0



SUPPLY VOLTAGE CONNECTIONS		
PART	PIN NO.	
	VCC	V–
U1,U2	14	7
U3,U4	3	12
U5,U7	16	8
U6	16	8

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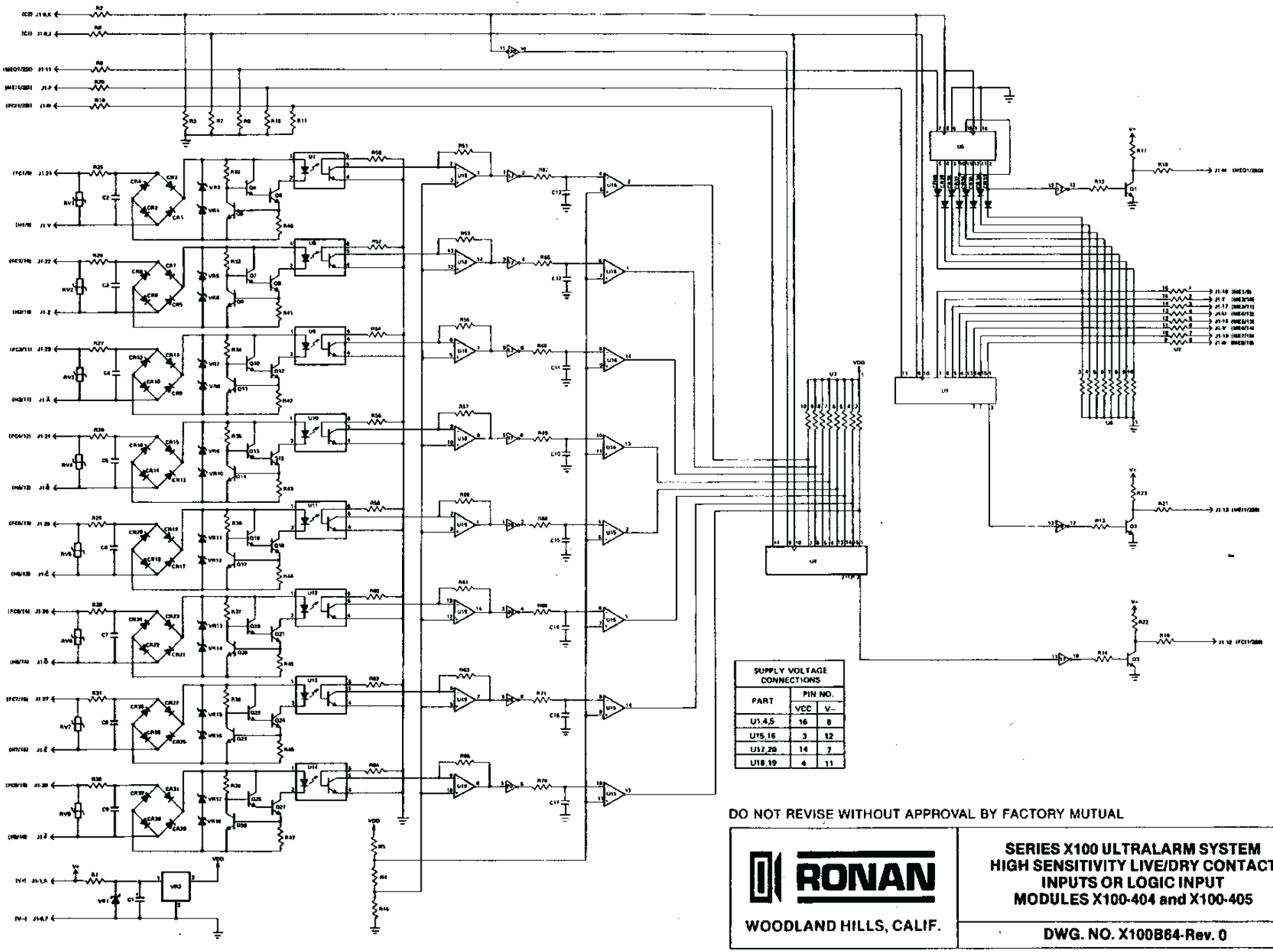
WOODLAND HILLS, CALIF.

SERIES X100 ULTRALARM SYSTEM
NON-SENSITIVE OR LOGIC INPUT MODULES
X100-402, X100-403, X100-406 and X100-407

DWG. No. X100B63-Rev. 0



SUPPLY VOLTAGE CONNECTIONS		
PART	PIN NO.	
	VCC	V–
U1,4,5	16	8
U15,16	3	12
U17,20	14	7
U18,19	4	11

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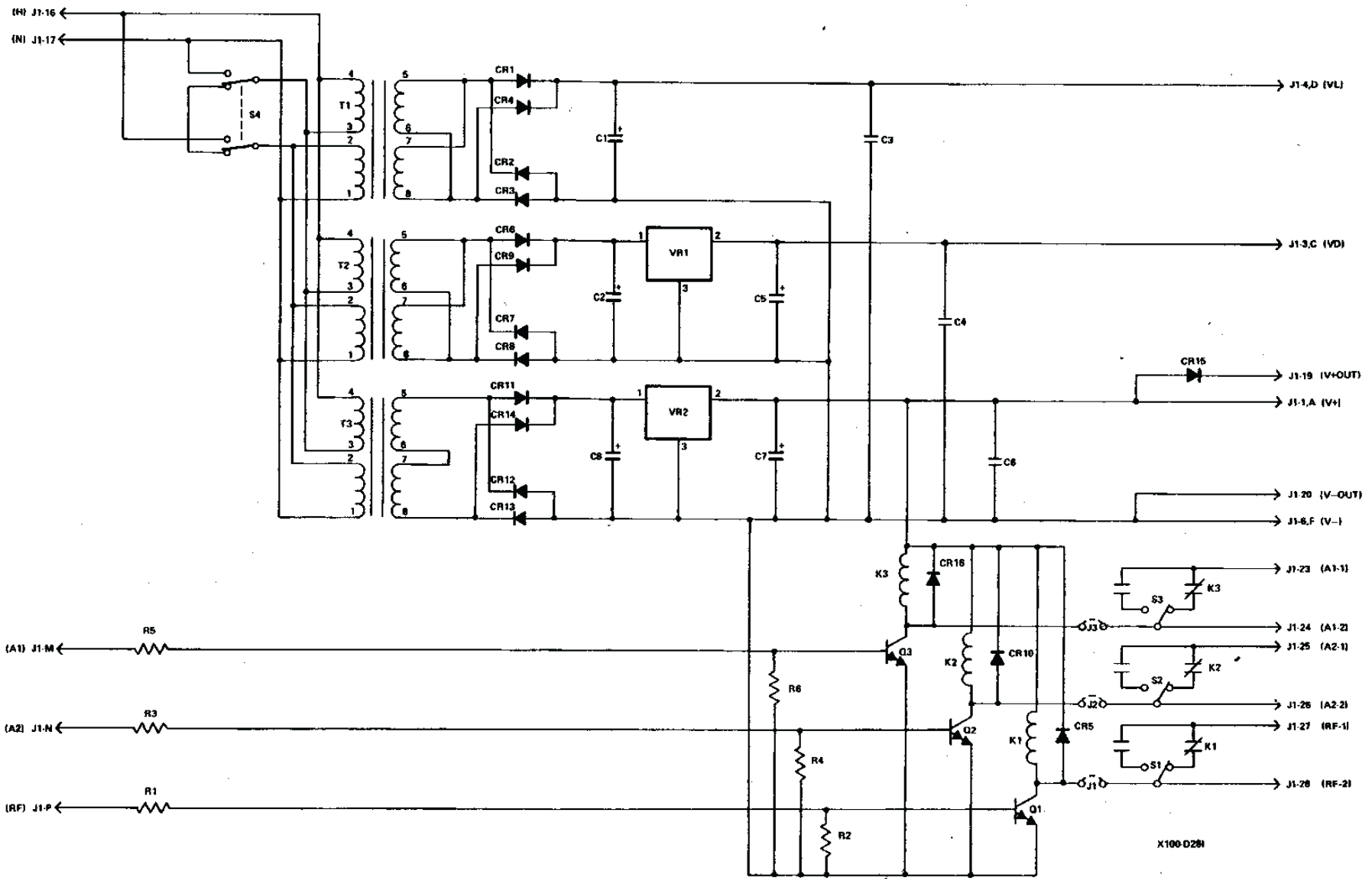
WOODLAND HILLS, CALIF.

SERIES X100 ULTRALARM SYSTEM
HIGH SENSITIVITY LIVE/DRY CONTACT INPUTS OR LOGIC INPUT
MODULES X100-404 and X100-405

DWG. NO. X100B64-Rev. 0



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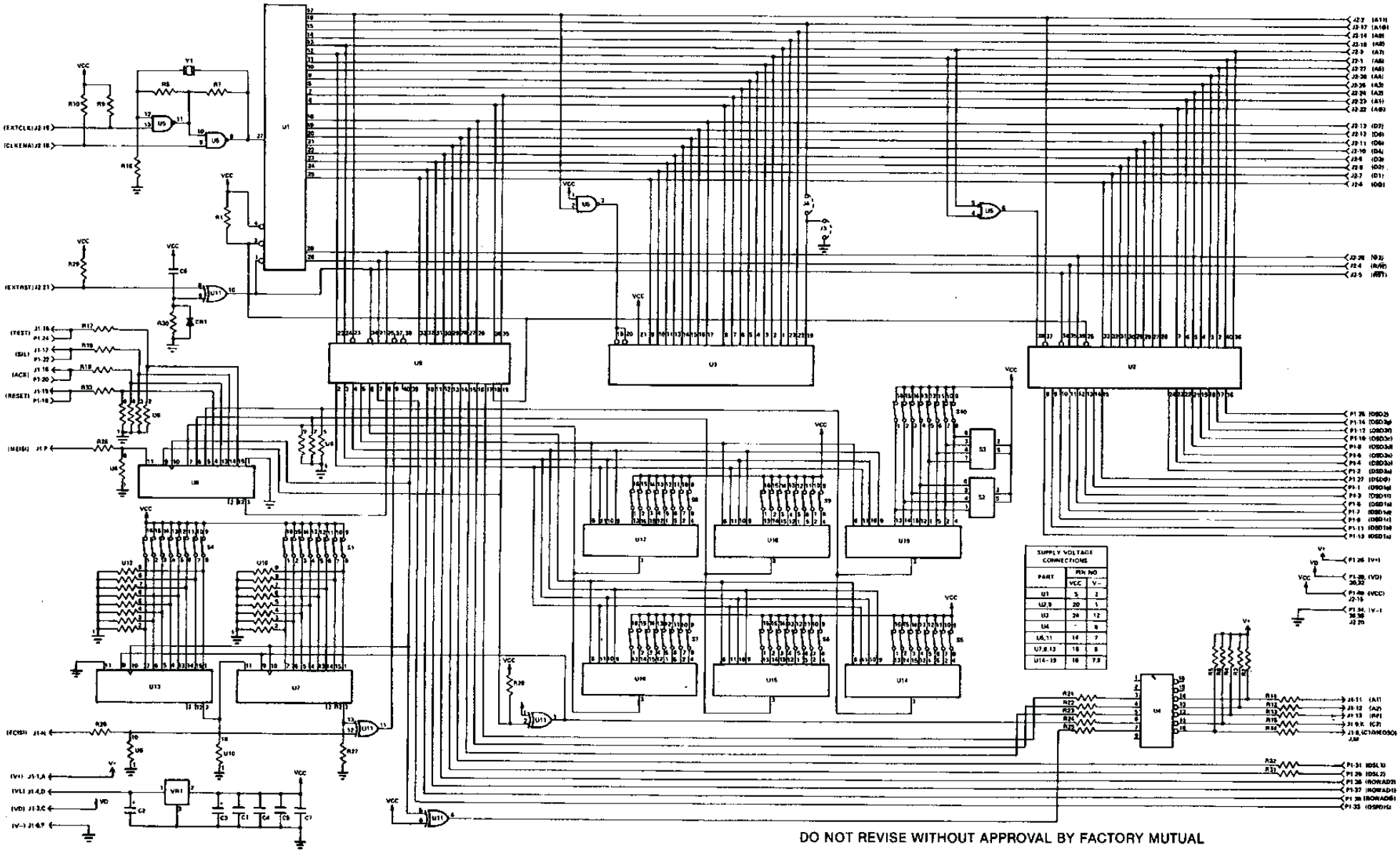
RONAN WOODLAND HILLS, CALIF.	SERIES X100 ULTRALARM SYSTEM POWER SUPPLY MODULE
	DWG. NO. X100B65-Rev. 1



SUPPLY VOLTAGE CONNECTIONS		
PART	PIN NO	
	VCC	V–
U1	5	2
U2,3	20	1
U3	24	12
U4	–	8
U5,11	14	7
U7,8,13	16	8
U14–19	16	7,8

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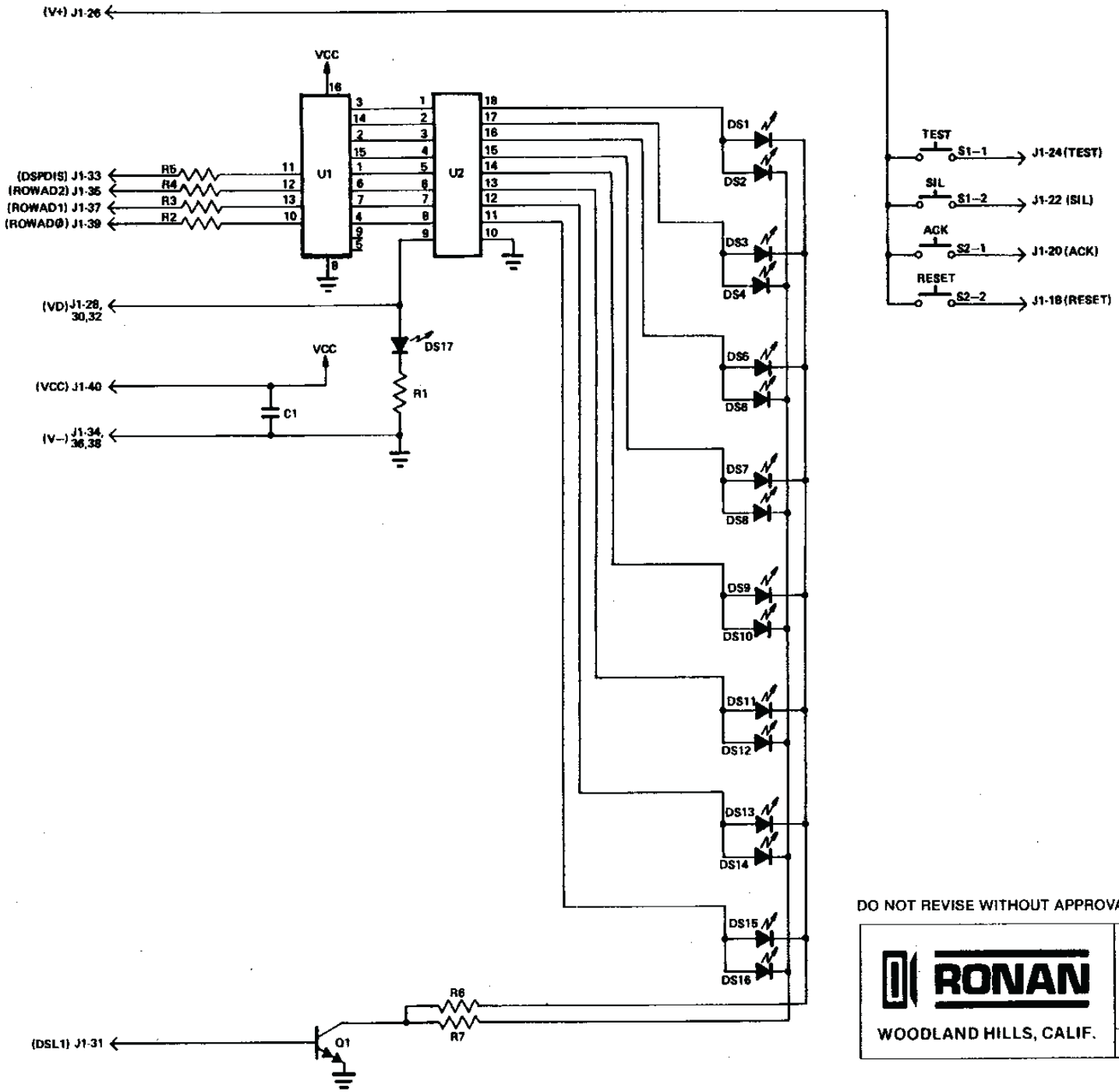
SERIES X100 ULTRALARM SYSTEM
CONTROLLER X100-508-(S or H)-(10 or 16)
CONTROLLER MODULE X100-516-(S or H)-(10 or 16)

DWG. NO. X100B66-Rev. 0



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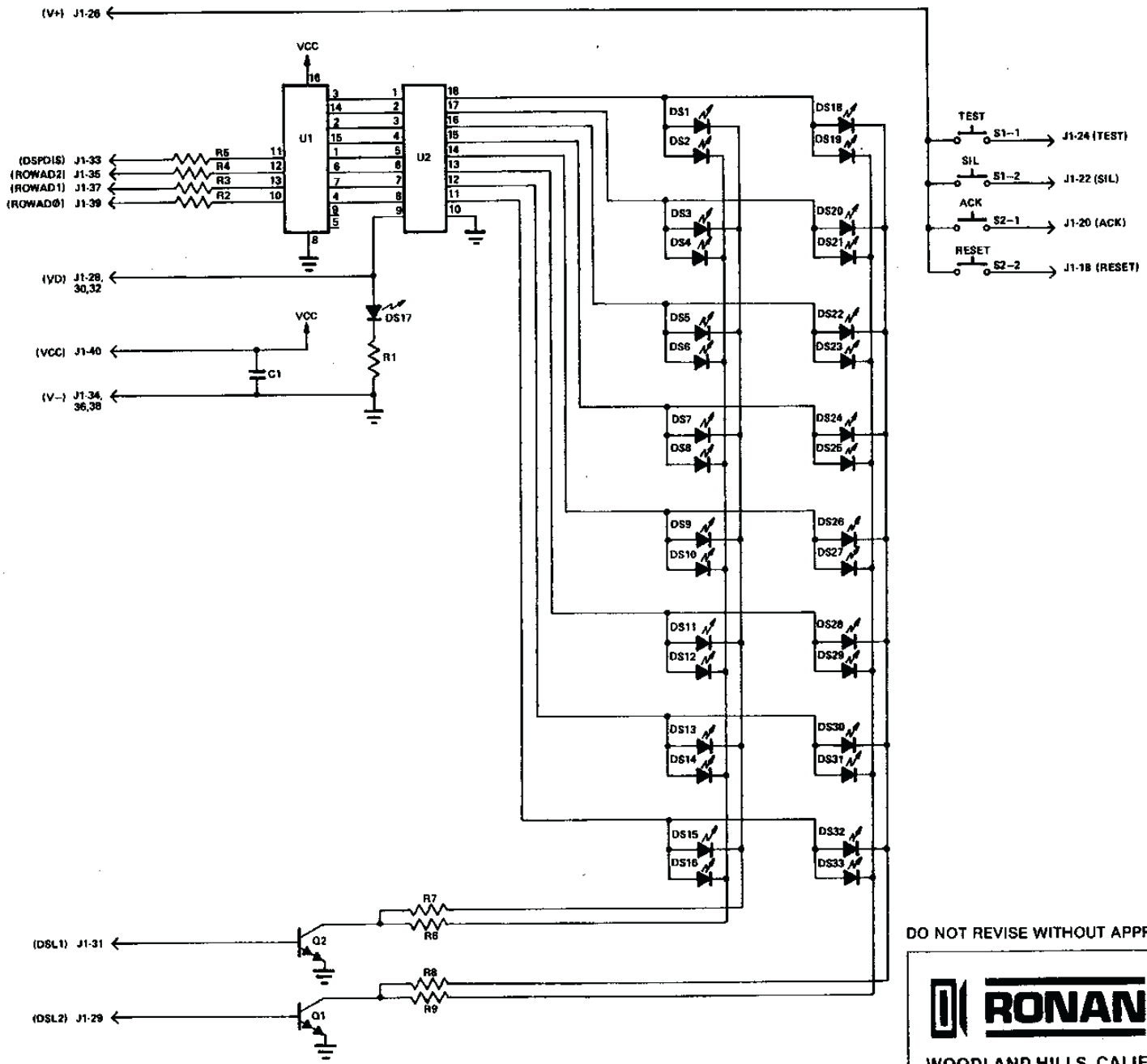
SERIES X100 ULTRALARM SYSTEM
8 POINT NON-NUMERIC DISPLAY
MODULE X100-208

DWG. NO. X100B67-Rev. 0



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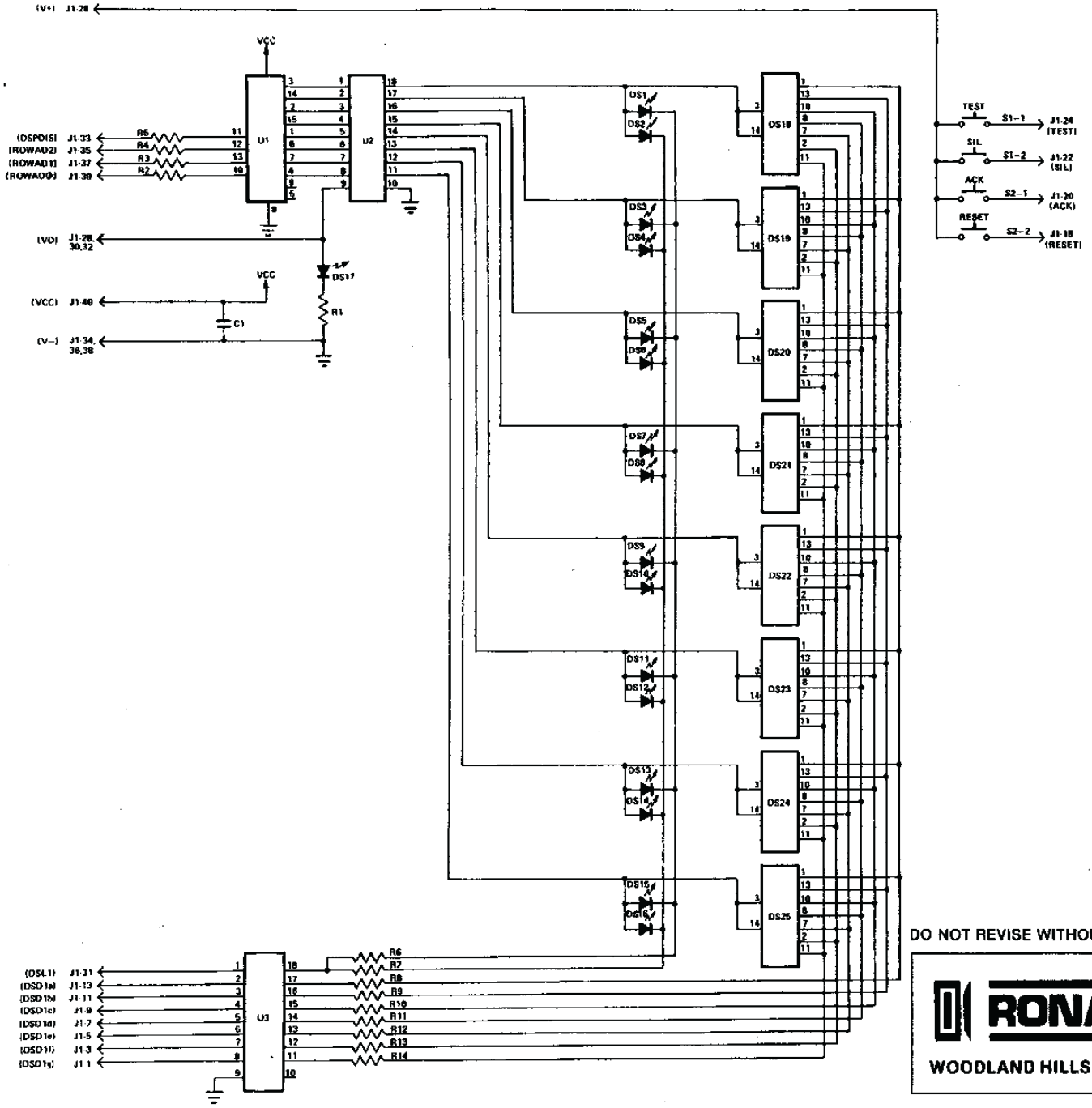
SERIES X100 ULTRALARM SYSTEM
16 POINT NON-NUMERIC DISPLAY
MODULE X100-216

DWG. NO. X100B68-Rev. 0



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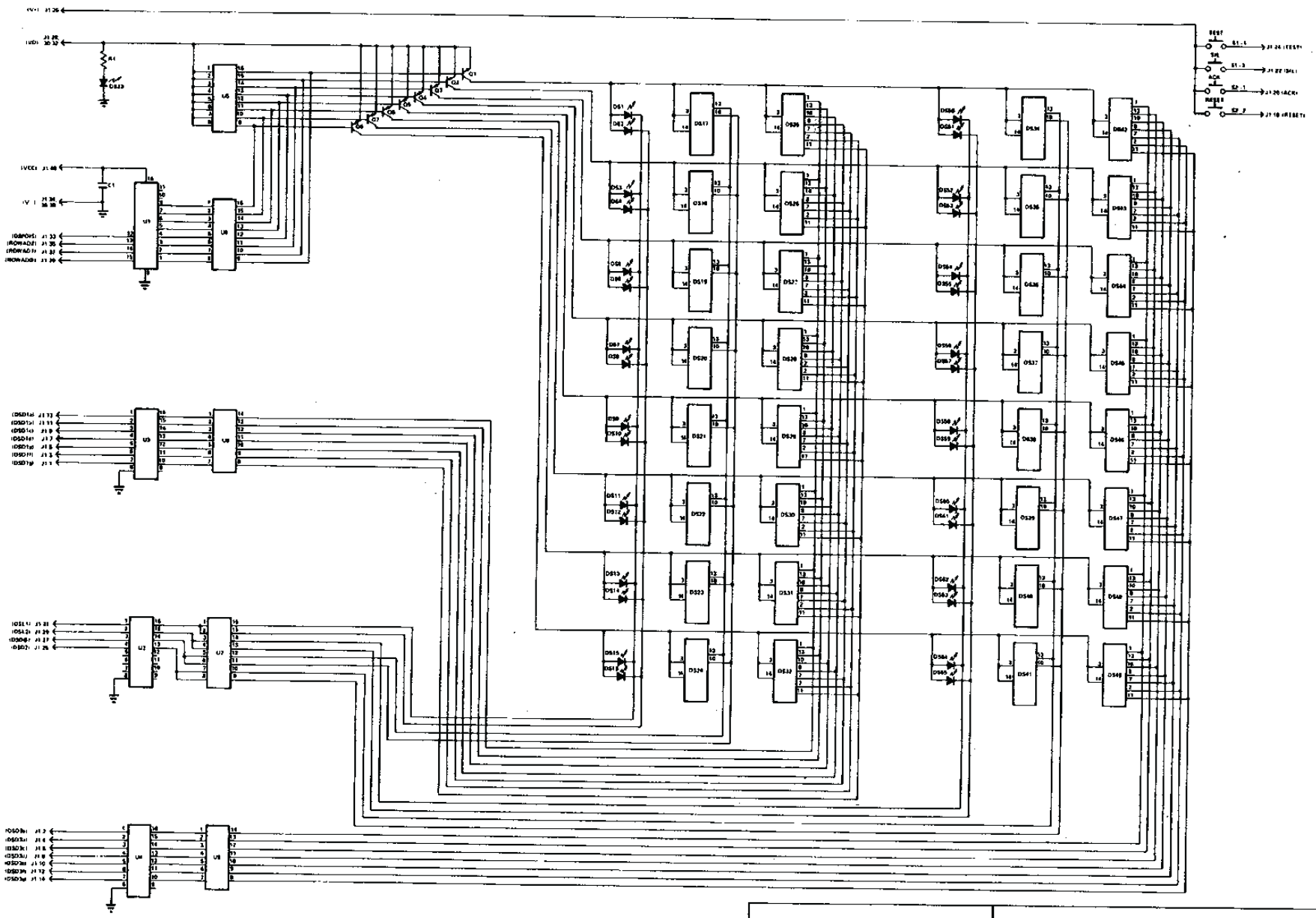
WOODLAND HILLS, CALIF.

SERIES X100 ULTRALARM SYSTEM
8 POINT NUMERIC DISPLAY
MODULE X100-308

DWG. NO. X100B69-Rev. 0



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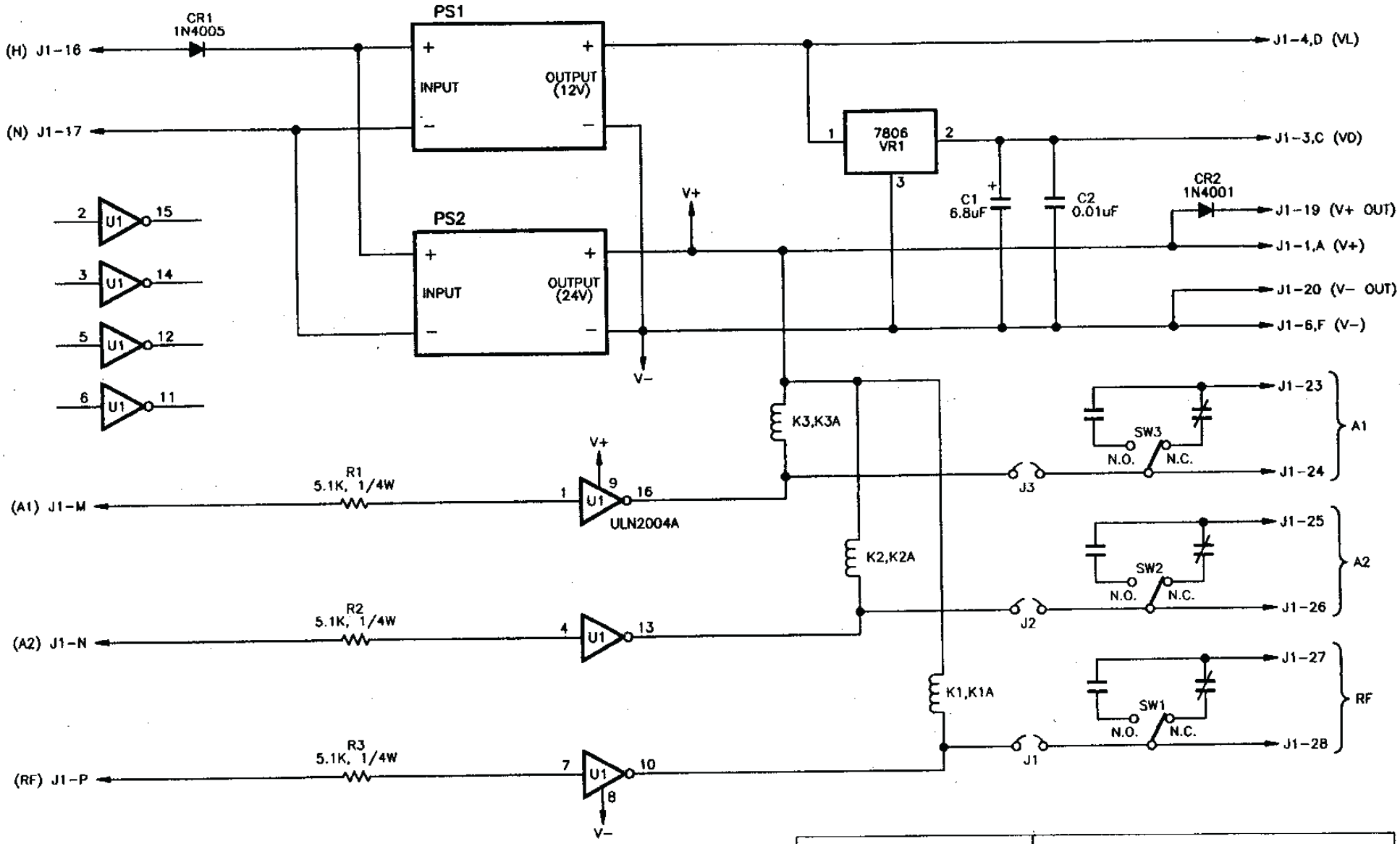
RONAN
WOODLAND HILLS, CALIF.

SERIES X100 ULTRALARM SYSTEM
16 POINT NUMERIC DISPLAY
MODULE X100-316

DWG. NO. X100B70-Rev. 0



RONAN WOODLAND HILLS, CALIF.	SCHEMATIC DC POWER SUPPLY
	DWG. NO. X100-1000-Rev. 2

WARRANTY

Ronan warrants equipment of its own manufacture to be free from defects in material and workmanship, under normal conditions of use and service, and will replace any component found to be defective, on its return, transportation charges prepaid, within one year of its original purchase. This warranty carries no liability, either expressed or implied, beyond our obligation to replace the unit which carries the warranty. NOTE: Specifications and designs subject to change without notice.

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