Publication No.: 1080-736 Rev. A

MPAS 90
ALARM ANNUNCIATOR SYSTEM

INSTRUCTION & SERVICE MANUAL

Rochester Instrument Systems, Inc.
255 North Union Street
Rochester, NY
14605

Tel: 716-263-7700
Fax: 716-262-4777

Revision History

Rev	Date	Description	Author	Approved
A	1/97	Converted to US Version		

Note To User

The terms AN-6100R and MPAS 90 are used interchangeably for the Alarm Annunciator. The terms DMS2000 and System 90 are used interchangeably for the TADS Distributed Monitoring System.

TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

1.1 GENERAL

The ROCHESTER developed controlled alarm system MPAS-90 is a long established system with many thousands of units working world wide.

The original 8 bit units based on the Motorola 6802 Processor are now complimented by the 16 bit units using the 68000 Processor.

MPAS-90 by its fundamentally simple mechanical design offers excellent reliability and by virtue of the large range of firmware options coupled with in-built editing facilities offer the user a high level of flexibility. Basic units can easily be upgraded allowing integration into larger computer based annunciator / logging systems.

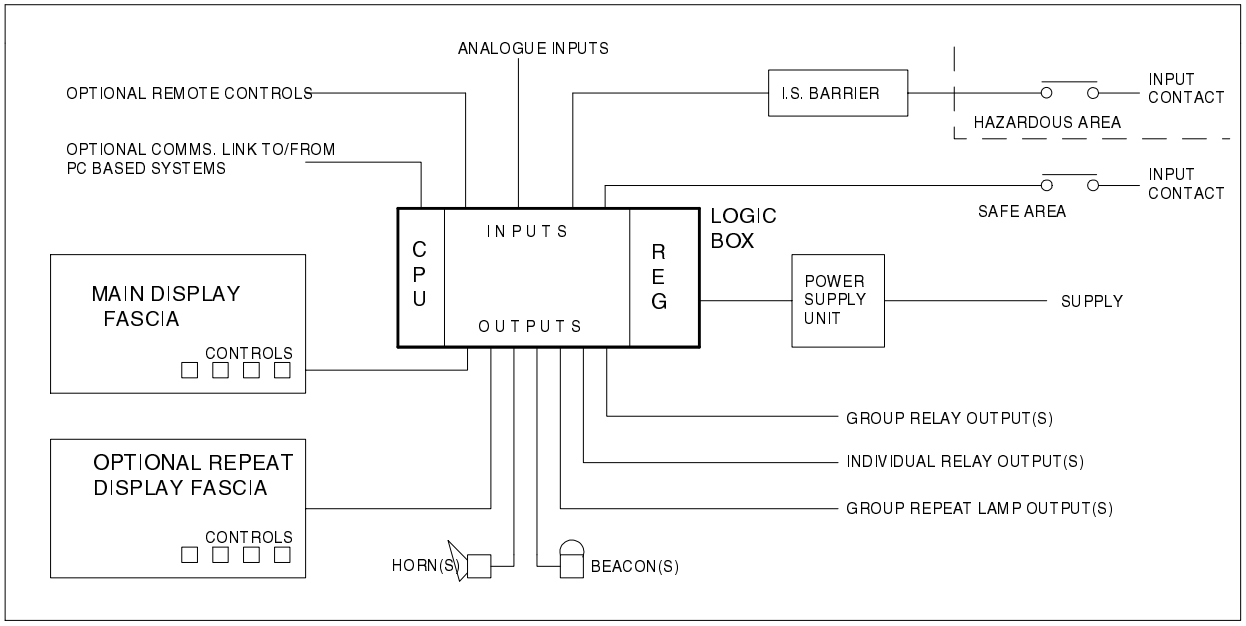


FIGURE 1 - BLOCK DIAGRAM

1.2. ALARM SYSTEM REQUIREMENTS

The purpose of an industrial alarm system is to give visual and audible warning of an alarm (fault) or abnormal plant condition A wide range of warning sequences are required to meet the various standards listed in the UK and the USA (ISA-S18.1) alarm sequence tables. ROCHESTER INSTRUMENTS have developed the system to meet these requirements at an economical cost and providing a high degree of system flexibility.

An alarm way consists essentially of an input, followed by some logical decisions, leading to visual and audible outputs (disregarding any other auxiliary outputs which may be required). The inputs and outputs are determined by the physical requirements such as the quantity of alarms (inputs) to be monitored and the type of display required (large, small, remote, mimic etc). The logic decisions, however, are more universal, and the manner in which these logic decisions are dealt with form the basis of the system.

An alarm signal in general terms will cause the annunciator to flash and the audible to sound. The operator will mute the horn and convert the lamp to a steady signal by 'accepting' the alarm. When the alarm condition has cleared the annunciator may be reset using the reset control switch.

Should first up discrimination be required where, by different flash rates for example, the operator can readily see which of several alarms was first up (perhaps causing the others to go into an alarm state), then the system can be set to make these logical decisions. Unrelated alarms may be excluded from this first up group(s).

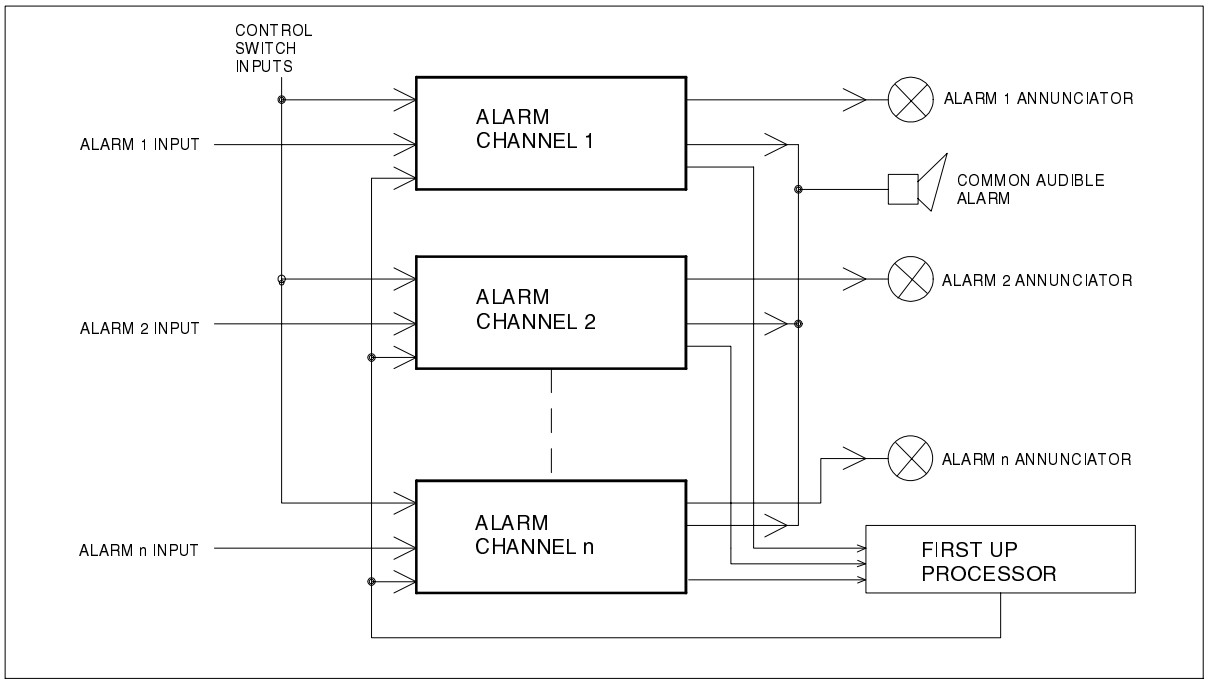


FIGURE 2 - FIRST-UP GROUP INTERNAL BLOCK DIAGRAM

ROCHESTER INSTRUMENTS therefore find it convenient to divide the system's logical decisions into two, SYSTEM WIDE and INDIVIDUAL.

The 'SYSTEM WIDE' aspect covers all the alarms in the system and the logical decision in this part relates to the entire system.

The INDIVIDUAL aspect allows logical decisions to be made for variables that can exist within the system, e.g. the alarm may or may not be in a first up group, the alarm may be controlled by one of the several control switches, the alarm may be included in a group relay output, etc.

The firmware to control and hold all this information is also split into two i.e.,

1. PROGRAM EPROM This holds the base MPAS90 program along with the editor program and two sequence tables. It is not accessible by the user.

2. SPEC EPROM This holds all the information which is specific to each system. i.e., no. of alarms, operating sequence, grouping controls, horn grouping, manual / auto reset, locking / non locking etc.

NOTE A feature which has been kept away from the SPEC EPROM is the ability of the user to select for normally open or closed initiating contacts. This is achieved by D.I.L. switches on the I/O cards without any change to firmware.
Control switches supplied by ROCHESTER are always set and wired as normally open.
The Power Monitor input should also be set as normally open.

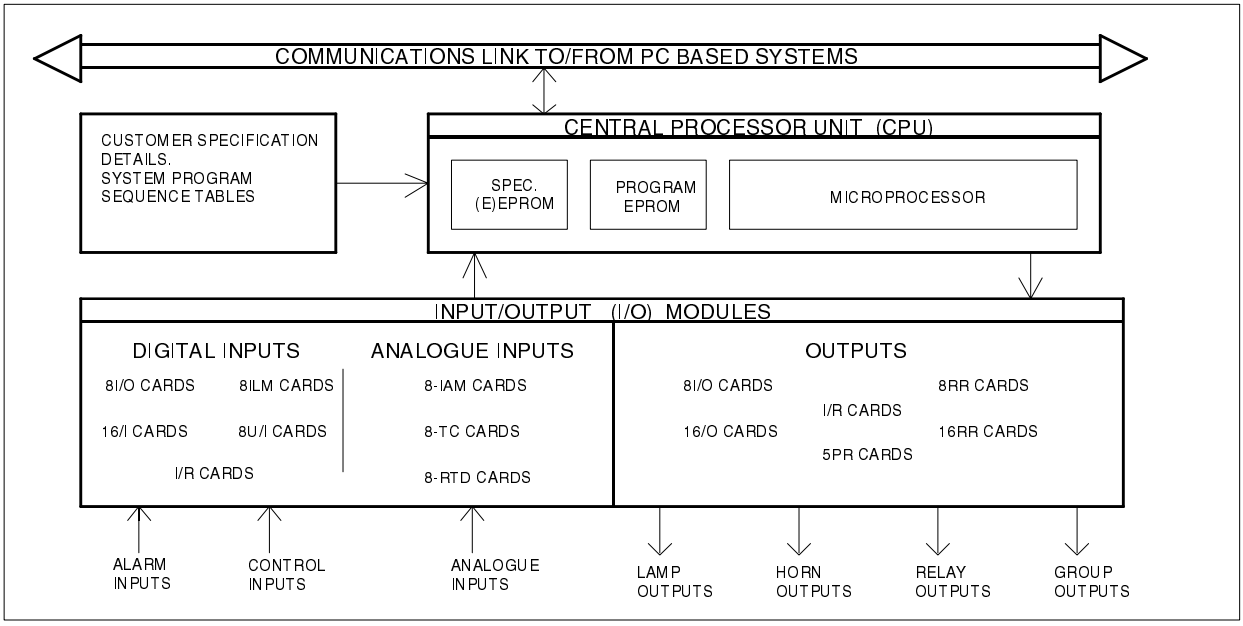


FIGURE 3 - MICROPROCESSOR CONTROLLED ALARM SYSTEM

1.3 THE SYSTEM

The alarm system firmware has to cope with the following variables:

1.3.1 The number of alarm inputs
1.3.2 The number of control switch inputs
1.3.3 The number of annunciator outputs
1.3.4 The number of auxiliary outputs (grouped)
1.3.5 The number of auxiliary outputs (individual)
1.3.6 The number of annunciator sequences (2 maximum software tables per system)

EXAMINING THESE POINTS IN DETAIL:

1.3.1 THE NUMBER OF ALARM INPUTS

The firmware must determine for each input whether:-
i) The input is analogue or digital
ii) If Analogue - is it HI-HI, HI, LO or LO-LO.
iii) If Digital - is the field contacts Normally Open or Normally Closed (switch selectable on I/O Card)
iv) It is locking (to capture fleeting faults) or non locking.
v) Is input time delay required ? (taking advantage of the processor's ability to provide software controlled time delay).

1.3.2 THE NUMBER OF CONTROL SWITCH INPUTS

Control switch inputs (64 max.) and alarm inputs (128 max) are added to give the total system input requirements, to this must be added one input dedicated to system power monitor. In principle the control

switches may be listed in the form type 'X' switch controlling group 'Y' (16 max) and connected to terminal 'Z'.

X = Any type of control
Y = Either less or equal to the total system fault inputs.
Z = Appropriate input terminal at I/O module - generally allocated after the alarm inputs.

In the control switch input list X can be:
i) Function test switch
ii) Lamp test switch
iii) Group lamp test switch
iv) Accept switch
v) First up accept switch
vi) Reset switch
vii) Horn cancel switch
viii) Inhibit switch
ix) First out Reset switch

1.3.3 THE NUMBER OF ANNUNCIATOR OUTPUTS

Each input operates, generally, an annunciator output. The annunciator sequence is specified by the program and held on the PROGRAM EPROM. Refer to ROCHESTER INSTRUMENTS sequence tables.

1.3.4 THE NUMBER OF AUXILIARY OUTPUTS (GROUPED)

Similar to the group inputs for control switch group numbers. The system firmware has to control grouped outputs. The user may specify for example that only some alarms operate one audible (urgent) and the remainder another audible (non-urgent).
or
It may be required that a selected quantity of alarms (in say, random positions on a display) are required to operate a shut down relay.
or
The total system is required to give a group repeater annunciator signal back to main control room from a remote mounted system.

The system must therefore provide:
i) Repeat annunciator outputs
ii) Audible outputs
iii) Relay outputs

1.3.5 THE NUMBER OF AUXILIARY OUTPUTS (INDIVIDUAL RELAY)

The system may require a relay for every Alarm Way to access a data logger or whatever. This relay sequence may be normal or fail safe, normally open or normally closed, with the following sequences:

i) Alarm on to alarm clear
ii) Alarm on to accept
iii) Alarm on to reset

This individual relay requirement is an additional output with which the system must cope.

1.3.6 THE NUMBER OF INDICATOR SEQUENCES

The most significant feature of dedicated alarm systems is the annunciator lamp output signalling which corresponds to each of the field inputs.

The system wide aspect of the microprocessor control will handle a number of sequences.

1.4 CONCLUSIONS

The system has been designed, using the system subdivision features detailed above to make it COST EFFECTIVE. The use of a proprietary computer to configure the alarm system, from the smallest to the largest, would NOT BE AS COST EFFECTIVE as the system described.

Similarly the use of a P.L.C. to configure an alarm system is inadvisable, apart from the cost aspect which make it uneconomical at the smaller system end, the computing time required of the alarm systems will quickly prejudice the primary control function of the P.L.C. The value of dedicating a microprocessor to an alarm system is that it offers independent security over a shared system.

2. SPECIFICATIONS

2.1 SYSTEM SOFTWARE CAPABILITY

2.1.1 ALARM WAYS

Up to a maximum of 128. These may be digital, analogue or a mixture of both. Each way programmable for :-

i) N/O or N/C (digital inputs only) (See Note 1, page 2.8)
ii) Auto or Manual Reset
iii) L or N/L
iv) Input delay (See Note 2, page 2.8)

MPAS90 WITH ANALOGUE CARDS

The CPU must be 16 Bit.

The standard range of analogue input cards for use in alarm systems are as follows:

8-IAM-90 Card - 8 Isolated 4-20mA Inputs
8-TC-90 Card - 8 Isolated Thermocouple Inputs
8-RTD-90 Card - 8 Isolated RTD Inputs

Each analogue input in the above range provide 4 trip level alarms for annunciation of out of limit conditions. (i.e., HI-HI, HI, LO and LO-LO) and therefore each 8 input card utilises 32 of the 128 alarm ways available on any one CPU.

Maximum possible combinations of analogue and digital inputs are as per table below. Note that digital inputs are added in blocks of 8 or 16, analogue in blocks of 32.

ANALOGUE		DIGITAL	
No. OF INPUTS	No. OF CARDS	No. OF INPUTS	No. OF I/O CARDS
0	0	128	16
8	1	96	12
16	2	64	8
24	3	32	4
32	4	0	0

In a mixed analogue / digital system, analogue inputs must be programmed starting at alarm channel 1 followed by the digital inputs.

Alarm 1 = Analogue Input 1 HI-HI trip point
Alarm 2 = Analogue Input 1 HI trip point
Alarm 3 = Analogue Input 1 LO trip point
Alarm 4 = Analogue Input 1 LO-LO trip point
Alarm 5 = Analogue Input 2 HI-HI trip point
etc.

2.1.2 CONTROL INPUTS

One power monitor. This **must** be used. (See Note 3, page 2.8) Maximum of 64 control switch inputs. A control switch input can be any one of:-

i) Accept
ii) First up accept (multiple flash first up sequences only - table M7 and M8)
iii) Reset
iv) Lamp test
v) Group lamp test
vi) Function test (See Note 5, page 2.8)
vii) Group inhibit
viii) Horn cancel (Silence)
ix) First out Reset (intermittent flash first up sequence only - Table M13)

A set of control switch inputs can be assigned to a group and 16 switch groups are available of which group 1 is a system wide group i.e., any control switch programmed for group 1 will affect every alarm way in the system irrespective of which group an alarm way is in.
A single switch may be assigned to more than one group if required.

For example:-

GROUP	SWITCH NUMBER	TYPE
1	1	R
2	2	LT
3	2	LT
4	3	LT

R for reset
LT for lamp test

would give rise to a system with a common reset, a lamp test that operates on points in groups 2 and 3 and a second lamp test that operates on points in group 4 only.

2.1.3 AUXILIARY OUTPUTS

There are a total of 224 auxiliary outputs available. (See Note 6, page 2.8) Auxiliary outputs are allocated as follows:-

i)	Individual relays	Max. 96*)
ii)	Audibles	Max. 16)
iii)	Clear Audible	Max. 1) This total of
iv)	Group Annunciators	Max. 16) auxiliary outputs
v)	Group relays	Max. 16) cannot exceed
vi)	First up Annunciators	Max. 16) 224
vii)	Individual Annunciators	Max. 128)

* With 96 individual relays and 128 individual indicators the total complement of outputs is used i.e., no horn output is available.

NOTE: On older 8 bit systems which used the CPU-90 a maximum of 240 outputs were available.

2.1.4 GROUPS

Groups are classified as:-

i)	Control groups	16 Max. (group 1 being system wide)
ii)	Audible groups	16 Max.
iii)	Repeat groups	16 Max. (Group Annunciators)
iv)	Relay groups	16 Max.
v)	First up groups	15 Max. (See para (v) below).

Consider these groups in turn:
i) CONTROL GROUPS - See Section 2.1.2
ii) AUDIBLE GROUPS
Two different audibles (primary and secondary) are available and the total mix of the two types is 16, i.e., there may be 2 primary audibles and 14 secondary audibles or 15 primary audibles and 1 secondary audible etc. Audibles are assigned to point number (alarm ways) and the use of the two types allows mixed groups

For example:-

ALARM WAY	PRIMARY AUDIBLE NUMBER	SECONDARY AUDIBLE NUMBER
1	1	3
2	1	3
3	1	4
4	2	4
5	2	3
6	2	3

gives rise to an audible group such that there are 4 audibles, No. 1 operated by points 1-3, No. 2 by points 4-6, No. 3 by points 1, 2, 5 and 6 and No. 4 by points 3 & 4.
Individual horn cancel switches may be assigned to secondary audibles. (See note 7, page 2.8).

iii) REPEAT GROUPS (Group Annunciators or Group Lamps)

Two different (GL1) and (GL2) group repeat annunciators are available and total mix of the two is 16.
The remarks above on mixing and grouping of audibles apply also to group repeat annunciators.

iv) RELAY GROUPS

Relay groups are assigned to alarm ways and mixed grouping is generally not possible, i.e., only 1 group relay per way up to a maximum of 16 group relays. Other options are available - Contact Rochester for details.

v) FIRST UP GROUPS

16 First up groups are available in principle and need not necessarily cover the same point groupings as relay groups, repeat groups and audible groups **but must be the same as control groupings.**
Note: Group 1 is a system wide group and if specified as a first up group then all the points in the system are in that first up group. This, in effect, limits the number of first up groups to 15.

For example:

ALARM WAY	FIRST UP GROUP	PRIMARY AUDIBLE	SECONDARY AUDIBLE	GROUP REPEAT	GROUP REPEAT	GROUP RELAY
1		1		1		1
2		1		1		1
3	2	2		1	4	2
4	2	2		1	4	2
5	2	2		2	4	3
6	2	2	4	2	4	3
7	2	3	4	2	5	4
8	2	3	4	2	5	4
9	2	3	4	3	5	5
10	2	3		3	5	5

Gives rise to a complex system in which first up, group repeat indicators and relay groups are all different.
Separate Controls could be assigned to first up alarms and non first up alarms or one set to cover all (system wide).

2.1.5 INHIBITS

Two types of inhibit are available, software inhibit of individual points and normal group inhibit.

SOFTWARE INHIBIT All unused points are automatically inhibited by the software. Any point which is inhibited can be allocated an output. This output will behave as a status indicator giving steady indication with no horn while the input is in the alarmed state. It can also be lamp tested.

GROUP INHIBIT Allows the inhibit of a specified group of points by means of a control input. Up to 16 inhibit groups are available but group 1 is system wide effectively limiting the number to 15.

2.1.6 SEQUENCES

Sequence software files are held in the PROGRAM EPROM in "LOOK UP TABLES" and two sequences are allocated into each system during configuration. They are designated as table 1 and table 2 and one of the following will reside in each.

Sequences available are:-

i) RV (or R) Recall (Reflash)
ii) RS Slow flash on fault clear
iii) F1 Single flash first up
iv) F1S Single flash first up with slow flash on fault clear
v) F2 Single flash first up
vi) F2S Dual flash first up
vii) F3 Intermittent fast flash first up

For full details of the sequences see ISA publication S-18.1, ANNUNCIATOR SEQUENCES & SPECIFICATIONS, and ROCHESTER INSTRUMENTS SEQUENCES.

In principle any two of the above sequences may be specified in a system but if, for instance, table 1 was specified as RS and table 2 as FS2 then considerable confusion could arise in the interpretation of the output display, therefore great care is required when selecting sequences.

NOTE: All first up sequence tables (F1 - F3) can also give non-first up indication by the ability to assign each point into a F.U. or non F.U. group.

2.1.7 SYSTEM TIMINGS

I) 8 Bit CPU's
System cycle time is 320mSec and 8 input samples are taken per cycle, i.e., each input is checked every 40mSec. First up discrimination is 40mSec.

ii) 16 Bit CPU's
System cycle time is 320mSec with each input being checked every 1mSec. First up discrimination is 1mSec on 8 groups (9-16) and 40mSec on groups 1-8.

2.1.8 CASCADING (AVAILABLE ON 8 BIT CPUs ONLY)

Each CPU can handle up to 128 alarm points. For the larger systems it is sometimes necessary to integrate more than 1 CPU to achieve grouping of more than 128 points and/or to get synchronised flashing although the latter is not generally seen as completely necessary as seldom does a single display fascia have more than 128 ways. The introduction of an Alarm Interface Card (ALIN) into each 128 way logic can provide the above facilities.

The following functions are cascadeable.

1. Lamp Oscillator (all Slave boxes will follow Master Oscillator)
2. Control Groups
3. Horn Groups
4. First Up Groups
5. Repeat Groups (group lamps)
6. Group Relays

NOTE: On Items 2-6, groups 1-12 are cascadeable, 13-16 local to each box.

2.2 SYSTEM HARDWARE SUMMARY

(Full details are given on individual data sheets for each module)

See hardware coding list for full range.

2.2.1 C.P.U. CENTRAL PROCESSOR UNIT

Houses microprocessor associated circuitry and RAM together with the PROGRAM EPROM and SPEC (E) EPROM as previously described in section 1.
A "CPU ON" indication LED and associated output terminals are mounted on front panel.
A Comms port is incorporated as below to allow on site (but off-line) editing of the system details contained in the SPEC EPROM, and/or for communication within integrated PC systems.

The following list identifies the CPUs currently being used in alarm annunciator systems.

NOTE: 16 Bit CPU must be used if analogue inputs are required.

CODE	PART No:	TYPE	DESCRIPTION	COMMENTS
CPU-90A	8025-177	8 Bit	BASIC MPAS90 - NO COMMS	GOING OBSOLETE
CPU-91B	8025-344	8 Bit	BASIC MPAS90 - NO COMMS	
CPU-92B	8025-339	8 Bit	WITH RS232 PORT	
CPU-166	8025-357	16 Bit	WITH RS422 PORT	
CPU-168	8025-359	16 Bit	WITH RS232 PORT	

Other CPUs are available both 8 bit and 16 bit for using in integrated PC based systems. These will be identified and detailed in the Contract specific documentation.

2.2.2 I/O BOARD CODE 8 I/O-90 SERIES

Houses the circuitry for 8 opto-isolated inputs (isolators have a common return precluding the use of twin wire inputs), 8 standard open collector transistor NPN outputs (63V max. @ 5W). switches for setting board address, switches for setting N/O or N/C initiating contact state and a change over wire link which allows inputs to be powered from a power source other than the system supply.
Input current is approx. 2mA per input. Standard inputs are 24 DC and 50V DC positive, but others can be accommodated i.e., 125V DC - Contact Rochester.

2.2.3 CASCADE BOARD CODE ALIN SERIES

Houses the circuitry required to cascade the flash rate oscillator across more than one system and allow the cascading of the group facilities.
The cascade port on the Board front panels are all connected by a daisy-chain multicore cable. One ALIN card is required for each 128 points.

2.2.4 8 POINT REED RELAY CARD Type 8RR-90 and 8RR-91

Provides eight volt-free reed relays contact pairs.
8RR-90 has contacts which are OPEN when de-energised.
8RR-91 has contacts which are CLOSED when de-energised.
Connection is by screw type terminals.

2.2.5 16 POINT REED RELAY CARD Type 16RR-90 and 16RR-91

Provides sixteen volt-free reed relay contact pairs.
16RR-90 has contacts which are OPEN when de-energised.
16RR-91 has contacts which are CLOSED when de-energised.

Connection is by 34 way IDC connector. The card is supplied with a 2 metre (standard) ribbon cable with IDC header at both ends. The flying end can be inserted into a proprietary ribbon interface device (i.e., Klippon RI34 or equivalent) or the header can be cut off and the wires individually terminated as required.

2.2.6 5 POINT POWER RELAY CARD Type 5PR-90 and 5PR-91

Provides five volt-free power relay changeover contacts (single pole)
5PR-90 is used in 24V systems.
5PR-91 is used in 50V systems.
Connection is by screw type terminals.

2.2.7 REGULATOR Type REG-90A and REG-91A

This unit is used in 3U logic boxes where the system supply is 24V DC.
It provides the 5V supply necessary for the 10 usable slots plus the CPU which equates to 80 inputs and outputs maximum.
A large capacitor provides power break hold up for 100mSec and an auxiliary horn relay is mounted within.
REG-90A (STANDARD) has an additional regulator which provides a smooth 24V DC (identified as "INPUT COMMONS") for field contact voltage.
REG-91A (ISOLATED) does not have the above regulator and is intended for use where the initiating contacts are being powered from a supply other than the system supply. This isolated supply would be connected to "+VIN" and “OV IN” terminals. All connections to the above units are by screw type terminals.

2.2.8 REGULATOR Type REG-92A and REG-93A

This unit is used in 6U logic boxes where the system supply is 24V DC.
It provides the 5V supply necessary for the 23 usable slots plus the CPU which equates to 128 inputs and outputs plus auxiliary cards to box capacity. Otherwise they are generally as per REG-90A/91A.
REG-92A - STANDARD
REG-91A - ISOLATED

2.2.9 REGULATOR Type REG-96A and REG-97A

This unit is used in 3U logic boxes where the system supply is 50V DC.
It provides the 5V supply necessary for the 10 usable slots plus the CPU which equates to 80 inputs and outputs maximum.
A large capacitor provides power break hold up for 100mSec and an auxiliary horn relay is mounted within.
REG-96A (STANDARD) has a wire link fitted which connects the 50V supply to the "INPUT COMMON" terminal for use as field contacts voltage. (It is assumed that all 50V supplies are from batteries or other smooth supplies and therefore suitable for F.C.V)
REG-97A (ISOLATED) does not have the above wire link and therefore the "INPUT COMMON" terminals are isolated and can be fed from a separate source via the "+VIN" and “0V IN” terminals.
All connections to the above units are by screw type terminals.

2.2.10 REGULATOR Type REG-94A and REG-95A

This unit is used in 6U logic boxes where the system supply is 50V DC.
It provides the 5V supply necessary for the 23 usable slots plus the CPU which equates to 128 inputs and outputs plus auxiliary cards to box capacity. Otherwise they are generally as per REG-96A/97A.
REG-94A - STANDARD
REG-95A - ISOLATED

2.2.11 ADDRESS CARD - TYPE ADD-90A

This unit can be used in 24V or 50V systems to provide LB addressing facility or to provide a Power Monitor input.

2.2.12 INPUT LINE MONITOR CARD - TYPE 8/ILM SERIES

This unit provides input line monitoring on an individual input basis i.e., each has 8 alarm inputs and 8 line monitor inputs. (Requires a shunt resistor to be fitted across the alarm contact).

2.2.13 UNIVERSAL INPUT CARD - TYPE 8/UI SERIES

These are 8 way input cards covering a wide voltage range and input type. Each input has 2 terminals and are totally isolated from each other.

2.2.14 4 INPUT / 6 OUTPUT CARD - TYPE I/R SERIES

This unit has 4 inputs (with same input specification) as the 8I/O cards and 6 single pole, single throw relays. Typical application would be - inputs used for controls and Power Monitor and relays used as horn or group relays.

2.2.15 16 WAY INPUT CARDS - 16/I SERIES

Houses the circuitry for 16 opto-isolated inputs (isolators have a common return precluding the use of twinwire inputs), switches for setting N/O or N/C initiating contact state, switches for setting board address and a changeover wire link to allow inputs to be powered from a power source other than the system supply.

Input current is approximately 2mA per input, Standard inputs are 24V d.c. and 50V d.c. positive, other voltages and polarity are available - Consult ROCHESTER.

Connection is by screw type terminals (1.5mm^2 max.) as standard. IDC connector models available, consult ROCHESTER.

2.2.16 16 WAY OUTPUT CARDS - 16/O SERIES

Houses the circuitry for 16 standard open collector transistor NPN outputs (63V max @ 5W), and a switch for setting board address.

Connection is by screw type terminal (1.5mm^2 max.) as standard, but IDC connectors models are available. PNP type outputs are also available - Consult ROCHESTER.

2.2.17 ANALOGUE INPUT CARDS - TYPE 8-IAM-90

Houses the circuitry for 8 isolated 4-20mA analogue inputs and a switch for board addressing.
A maximum of 4 cards can be run on one CPU = 32 analogue inputs = 128 alarm trip points.

Connection is by two screw type terminals (1.5mm² max.) per input.

2.2.18 THERMOCOUPLE INPUT CARDS - TYPE 8-TC-90

Houses the circuitry for 8 isolated thermocouple inputs and a switch for card addressing. A maximum of 4 cards can be run on the CPU = 32 analogue inputs = 128 alarm trip points. Front panel connection is a 37 way 'D' type socket. As standard card will be supplied complete with a connecting length of 17 pair ribbon cable (length as specified) and a Klippon RI34 ribbon interface device.

2.2.19 8 WAY RTD INPUT CARDS - the 8-RTD-90

Houses the circuitry for 8 isolated RTD inputs and a switch for card addressing. A maximum of 4 cards can be run on one CPU = 32 analogue inputs = 128 alarm trip points.
Front panel connector is a 37 way 'D' type socket. As standard card will be supplied with a connecting length of 17 pair ribbon cable having 37 way 'D' connection at one end and 34 way IDC connector at other, (length as specified) and a Klippon RI34 ribbon interface device.

2.2.20 LOGIC BOX Type LBM OR LBMW

This is a standard 19"- 3U single euro-crate which will house the CPU and REG units plus 10 usable slots for any combination of I/O, relay, cascade boards.
The mounting angles are easily moveable to give front or rear mounting.

LBM - 3U Front Mounting
LBMW - 3U Rear (Wall) Mounting

NOTE: Both types can be 19" rack mounted so that terminals / card withdrawal is either outwards or inwards to cubicle.

2.2.21 LOGIC BOX Type LB2M OR LB2MW

This is a standard 19"- 6U double euro-crate which will house the CPU and REG units plus 23 usable slots for any combination of I/O, relay, cascade boards.
The mounting angles are easily moveable to give front or rear mounting.

LB2M - 6U Front Mounting
LB2MW - 6U Rear (Wall) Mounting

NOTE: Both types can be 19" rack mounted so that terminals / card withdrawal is either outwards or inwards to cubicle.

NOTES ON SOFTWARE AND HARDWARE CAPABILITIES

1 **N/O or N/C** Normally open or normally closed contacts may be programmed in software but are field changeable by means of 8 way SPST DIL switches mounted on the I/O boards. To avoid confusion, input contacts are always programmed as N/O and, if required, set N/C by means of the I/O board switches. (i.e., one switch per input)

2 **Input Delays** Input delays are in 0.04 Sec increments; minimum 0.04 Sec, maximum 2611.2 Sec. The program is such that delay times programmed at intermediate values will be returned at the next lowest increment value.

Programmed	Result

1.5 Sec 1.48 Sec

3 **Power Monitor** One input **must** be dedicated to the power monitor and this input is connected directly to a +v “Input Common” terminal. Loss of this input will be detected by the CPU watchdog which will extinguish the "CPU ON" LED and remove power from CPU terminal. (Open collector output)

4 **Group Lamp Test** This control input will actuate the group repeat lamp(s) of the group to which it is assigned. It can be assigned to the same terminal as the main L.T. switch.

5 **Function Test** Operation of Function Test causes the operation of all auxiliary outputs in the same group. Lamp test is generally accepted as an adequate system test in the MPAS 90.
Function Test also causes lamp outputs to flash and requires controls to be used to regain the normal state.

6 **Individual Annunciator** Individual repeat annunciators can be provided by using a parallel connection to the individual lamp outputs, provided that output driver wattage is not exceeded. (5 watts)

7 **Horn Cancel** Each secondary horn programmed can have its own dedicated Horn Cancel switch, primary horns then being controlled by a group 1 (system wide) Horn Cancel. Dedicated Horn Cancel switches each occupy one control group.

2.3 THE LOGIC BOX

FIGURE 4 Code LBM 3U Front Mounting
LBMW 3U Rear (Wall) Mounting

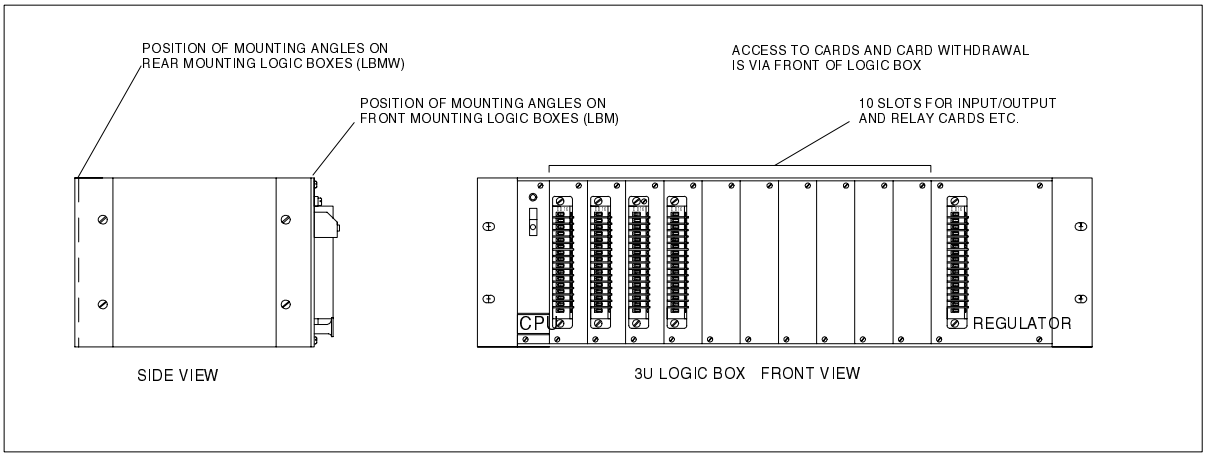
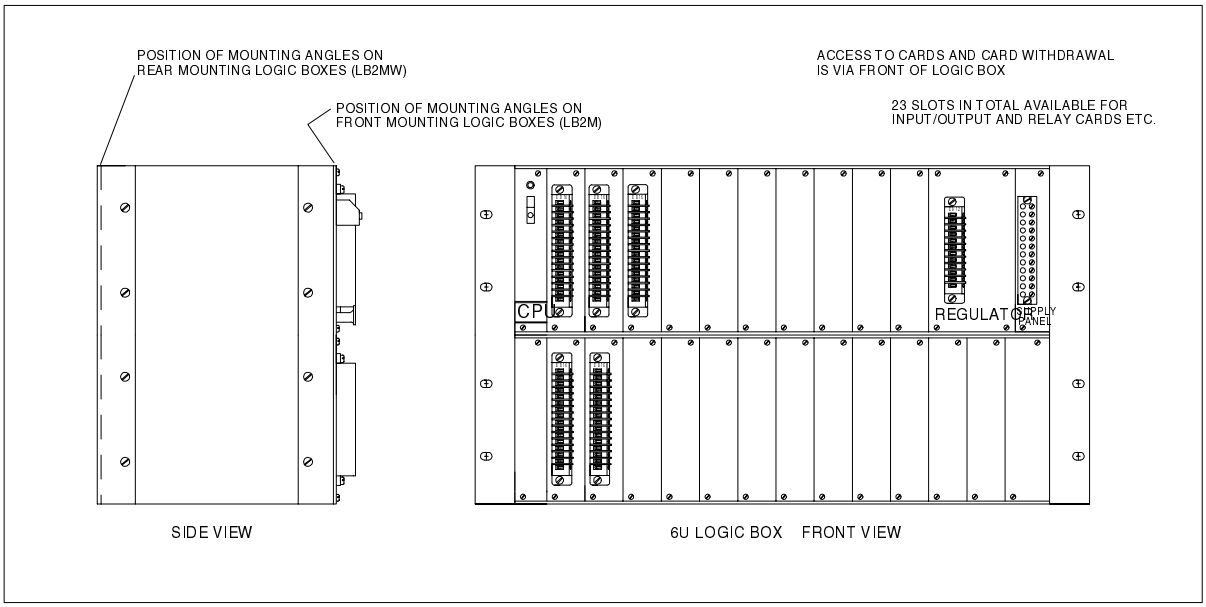


FIGURE 5 Code LB2M 6U Front Mounting
LB2MW 6U Rear (Wall) Mounting



The LOGIC BOXES are standard depth single (3U) or double (6U) 19" wide euro crates. The boxes are designed to contain the C.P.U., the I/O, the relay cards and the regulator.
The size of LOGIC BOX (either 3U or 6U) is dependant on the system size, its number of alarms to be monitored, the number of control switches and the number of lamp outputs etc.
The LOGIC BOXES are constructed using a motherboard(s) such that the C.P.U. and regulator have their position pre-determined, while the cards, be it I/O cards or relay cards, can be located in any other slot.
The LOGIC BOXES can be ordered front or rear mounted - the angle brackets are simply moved from back to front to suit.

Refer to Figure 13 on page 3.1 for dimensional details.

FIGURE 6 - 3U HIGH LOGIC BOX - BLOCK DIAGRAM

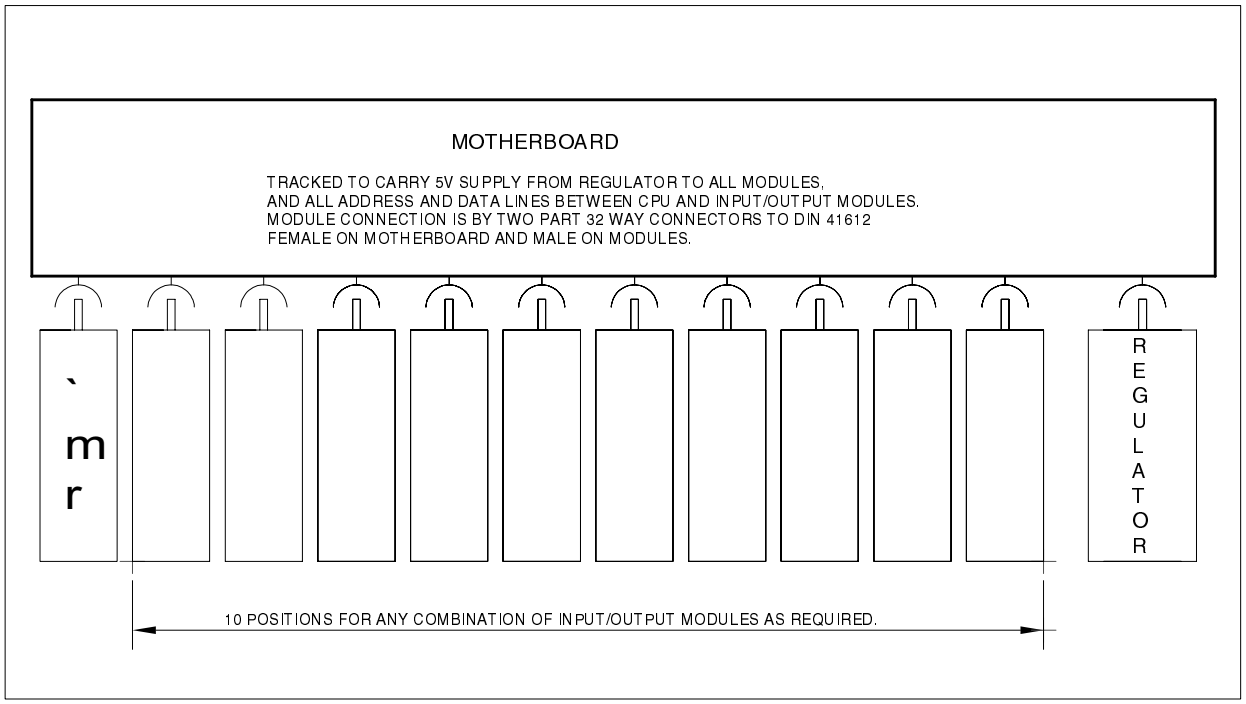


FIGURE 7 - 6U HIGH LOGIC BOX - BLOCK DIAGRAM

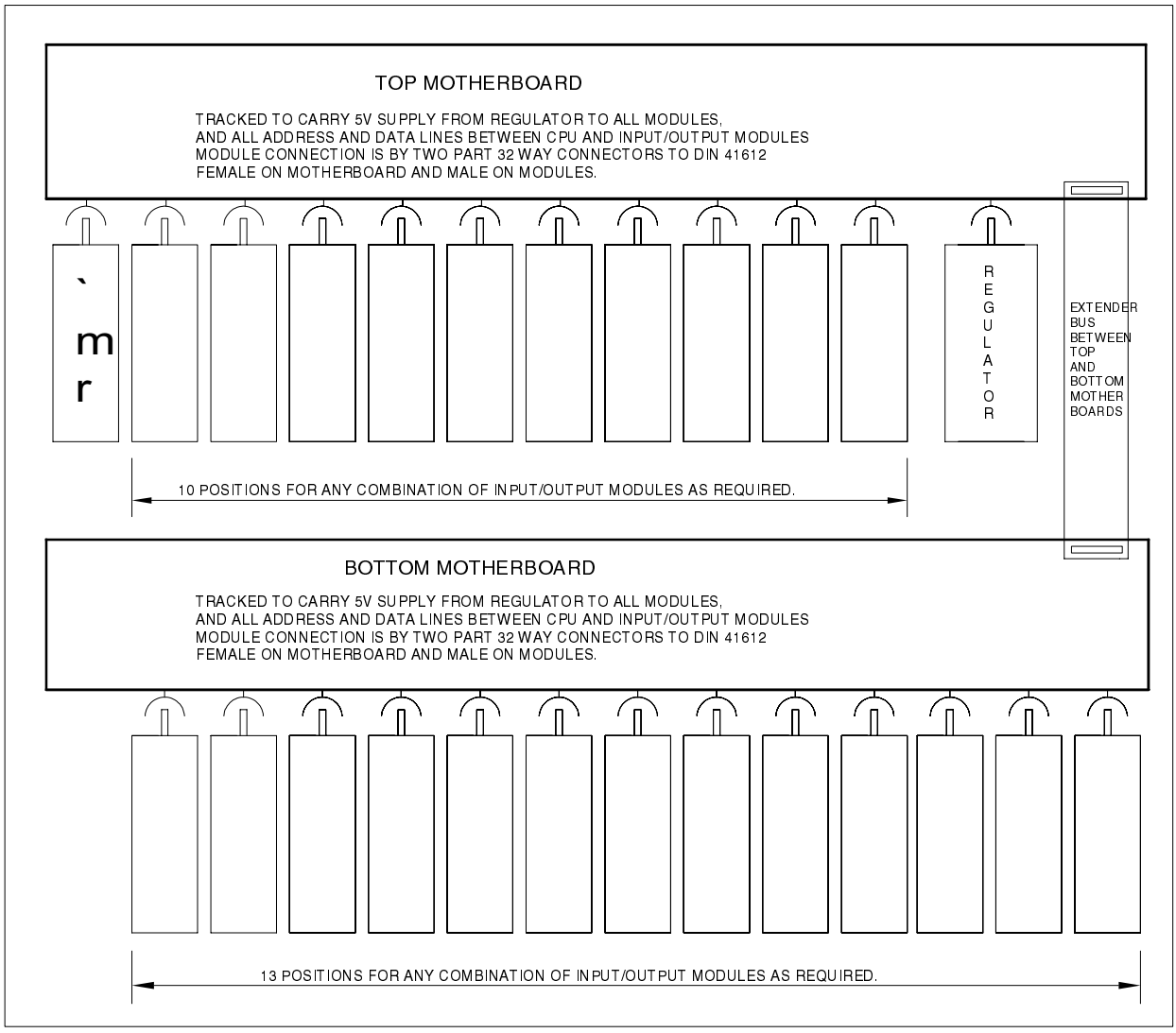


FIGURE 8 - MOTHERBOARDS - GENERAL ARRANGEMENT

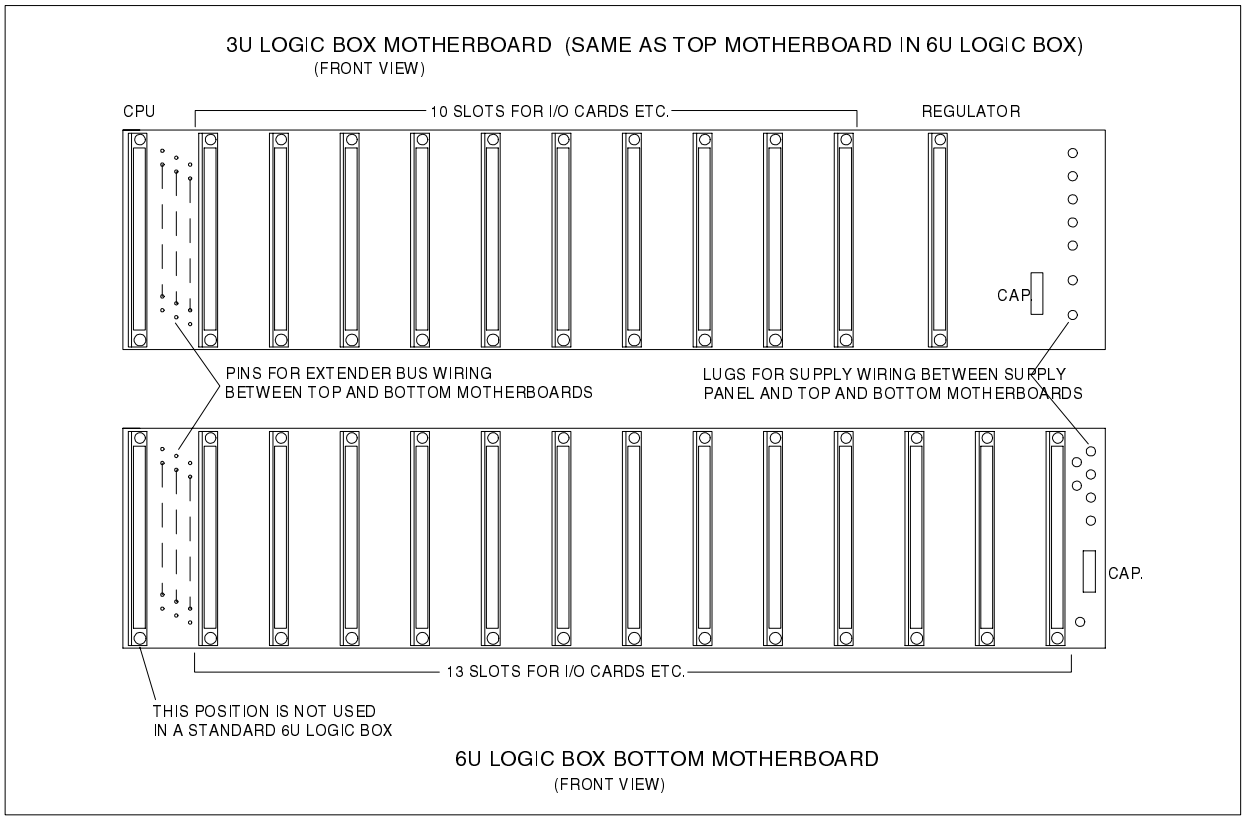


FIGURE 9 - MOTHERBOARD CONNECTION DETAILS - FRONT VIEW (3U LB)

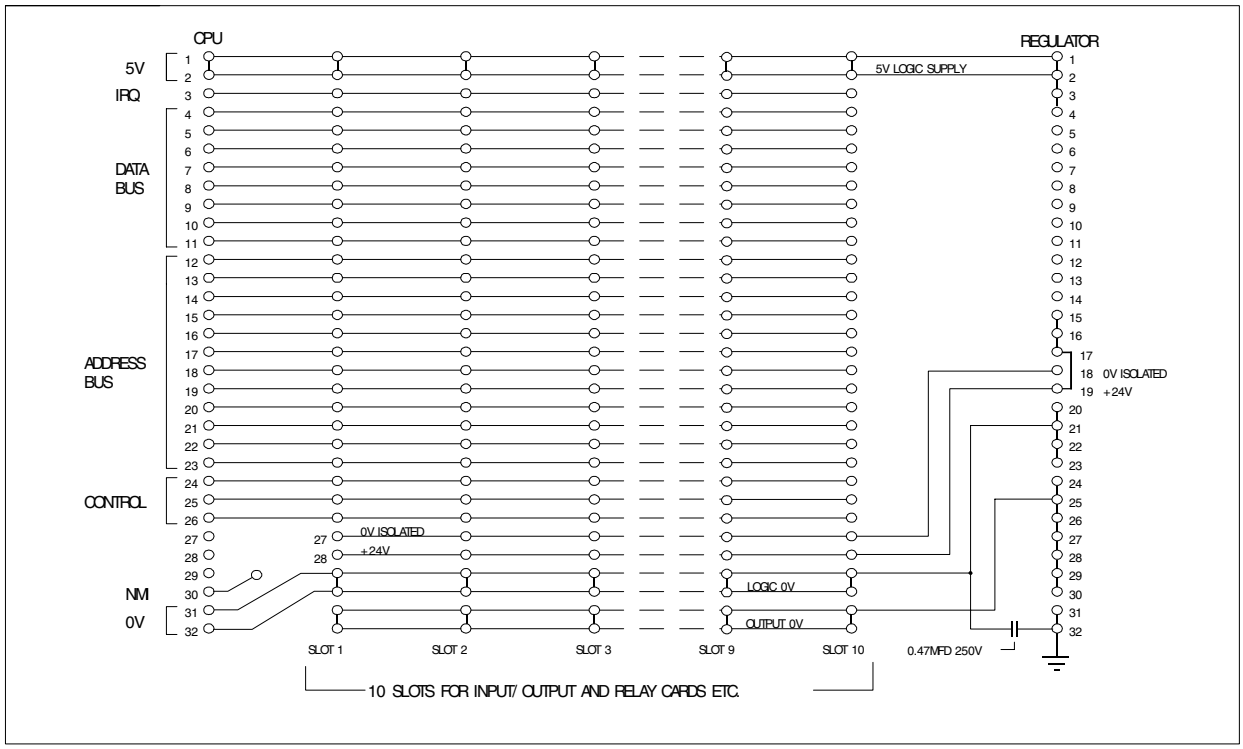
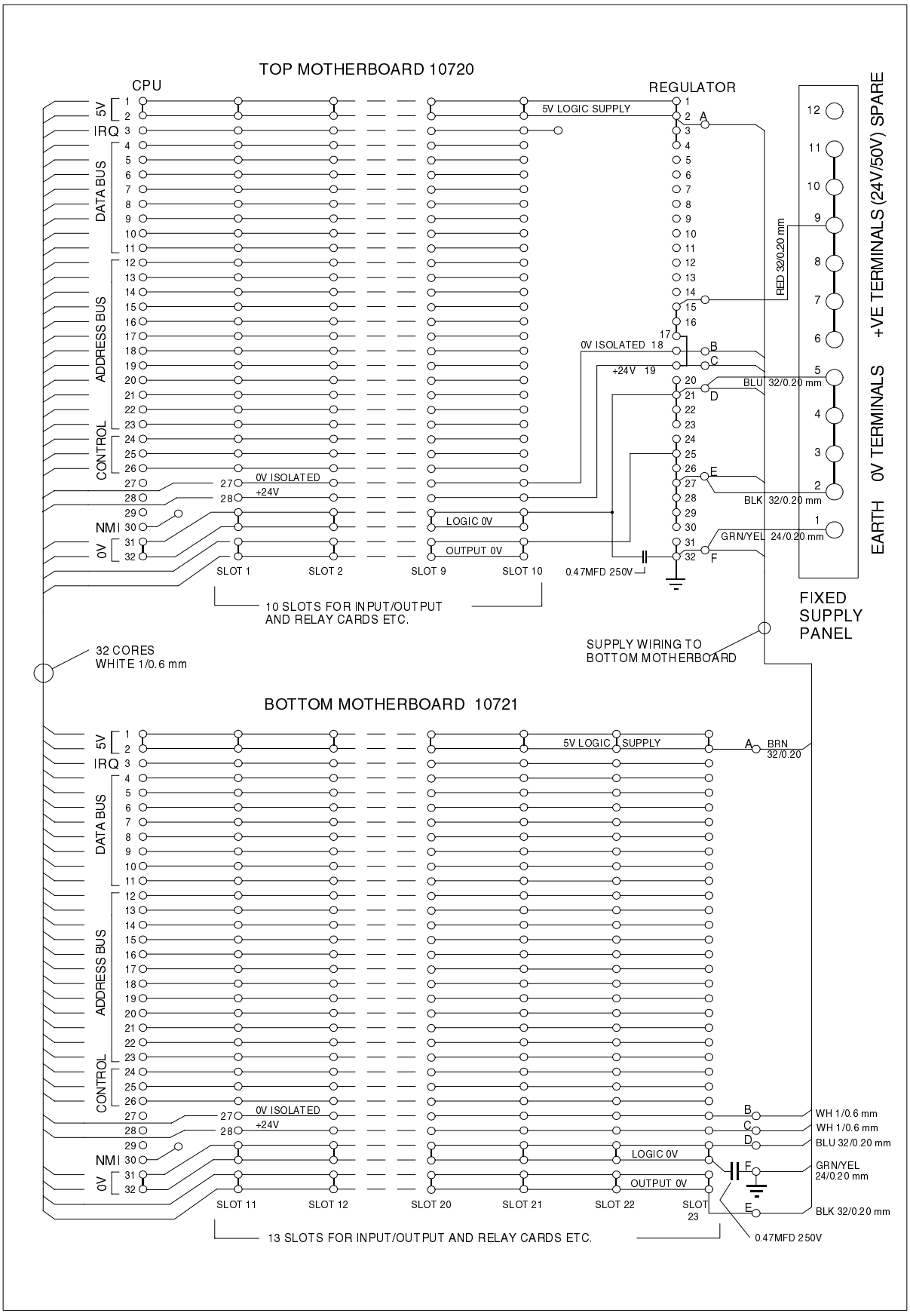
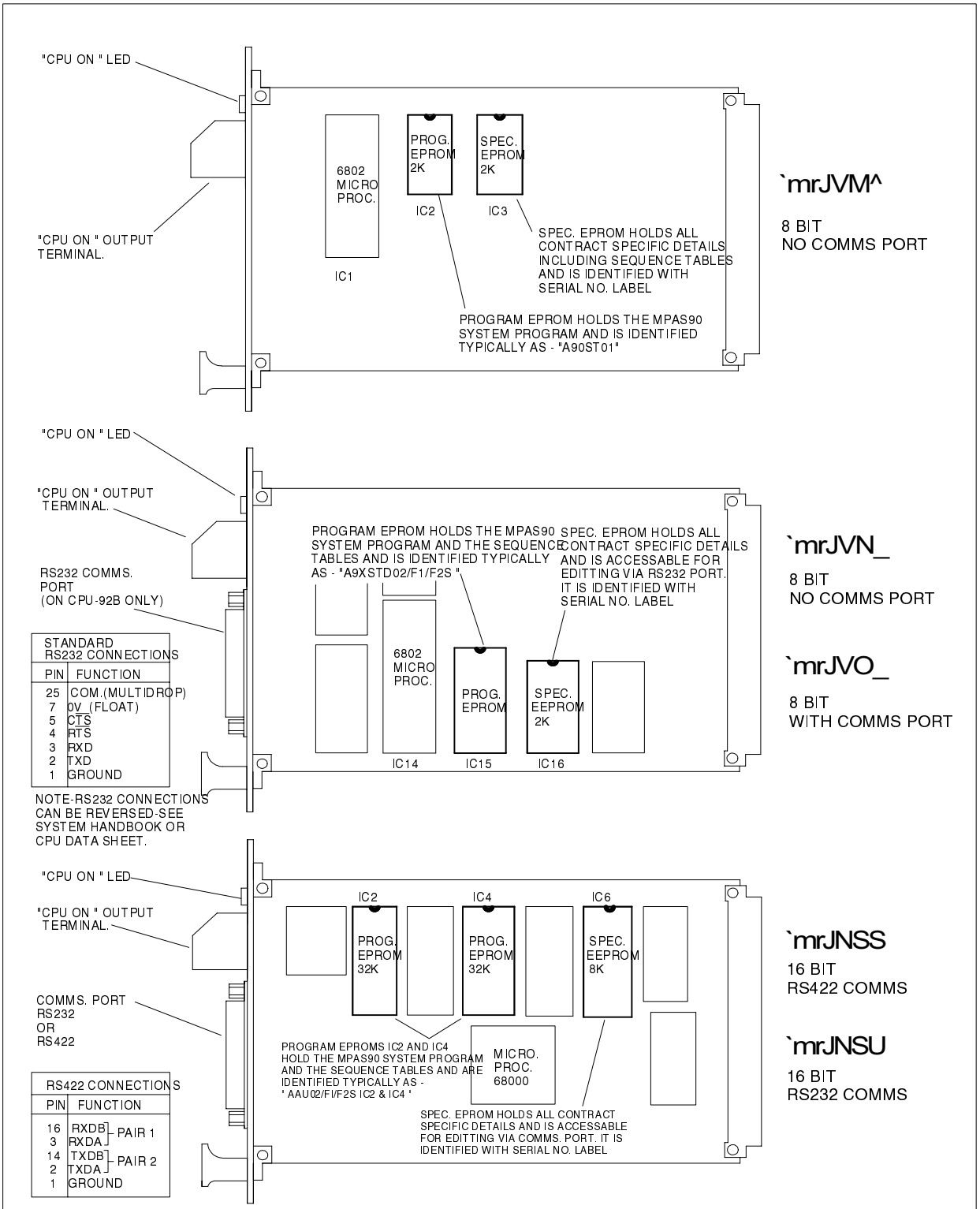


FIGURE 10 - MOTHERBOARDS - FRONT VIEW (6U LB)



2.4 CENTRAL PROCESSOR UNITS - EPROM AND COMMS INFORMATION

FIGURE 11 CENTRAL PROCESSOR UNITS

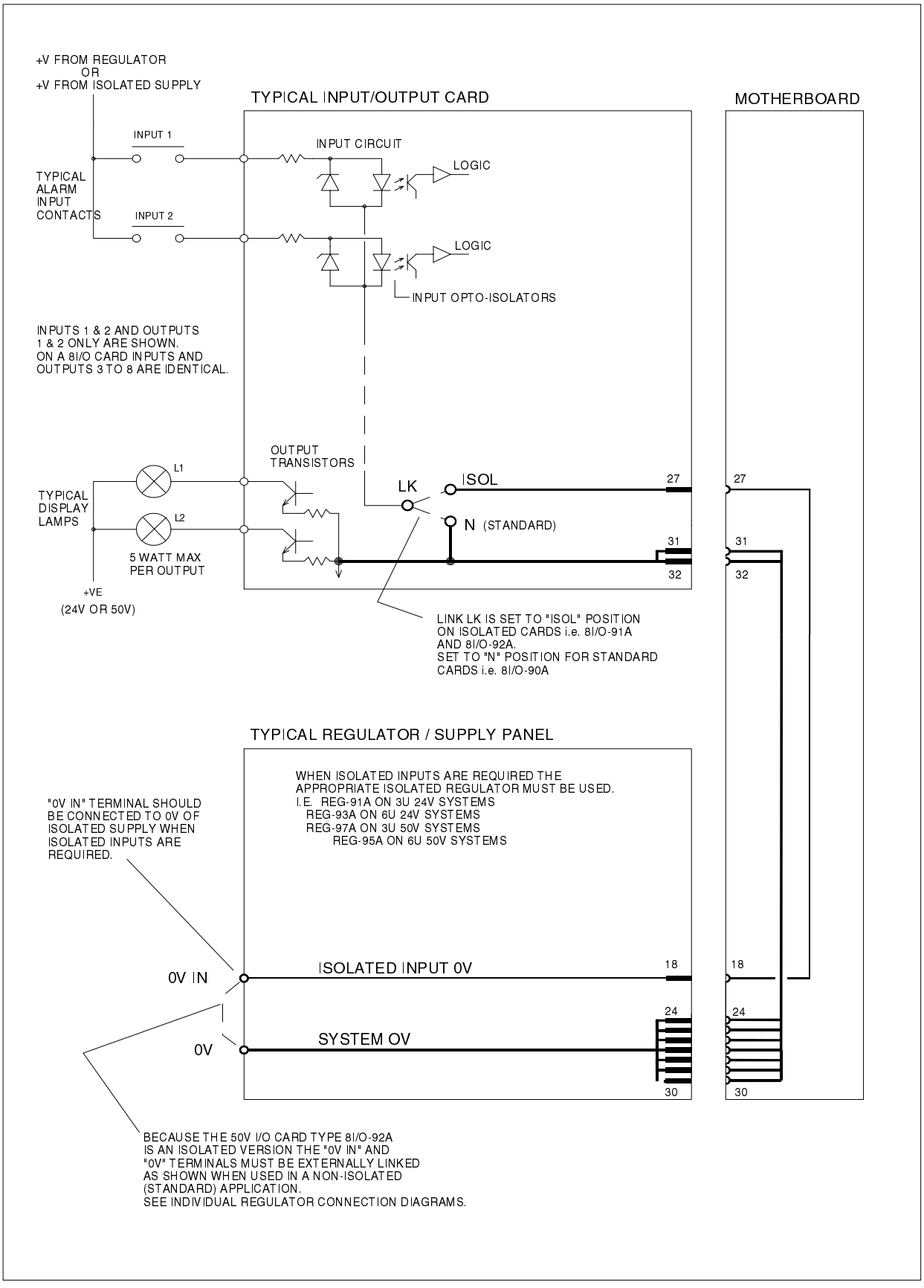


NOTES.

THE LOGIC BOX MUST BE POWERED DOWN BEFORE ANY CPU IS REMOVED OR INSERTED.
WITH THE EXCEPTION OF CPU-90A ALL CPUs HAVE VARIOUS LINKS WHICH ARE PRESET AT FACTORY AND DETAILED ON RESPECTIVE DATA SHEETS WITHIN MANUAL. THESE LINKS SHOULD NOT BE CHANGED IN ANY WAY UNLESS SPECIFICALLY ADVISED TO DO SO BY ROCHESTER.

2.5 ALARM INPUT CIRCUIT - STANDARD AND ISOLATED

FIGURE 12 ALARM INPUT CIRCUIT



2.6 DISPLAYS

ROCHESTER can offer a wide range of displays to cover most applications.

General features are -

- Wide range of window sizes
- Wide range of display sizes
- 24V or 50V
- LEDs or filament lamps
- Engraved or laser printed legends
- Flush panel mounting or 19" rack mounting

Standard displays types are -

AN6150	(Small, medium, large and extra large windows available)
03-MLS SERIES	(4 wide and 8 wide, without controls)
03-MLCS SERIES	(4 wide and 8 wide, with controls)
03-MS SERIES	(sizes as required, with / without controls)
SLC30/40 SERIES	(Sizes as required with / without controls)

Other types / sizes of displays and MIMIC panels can be supplied - Consult ROCHESTER.

Full display details are provided on the data sheets provided in the System Handbook.

It should be noted that some larger displays may require forced ventilation. See relevant data sheet and / or consult ROCHESTER.

Replacement lamp and LED details are listed below.

AN6150

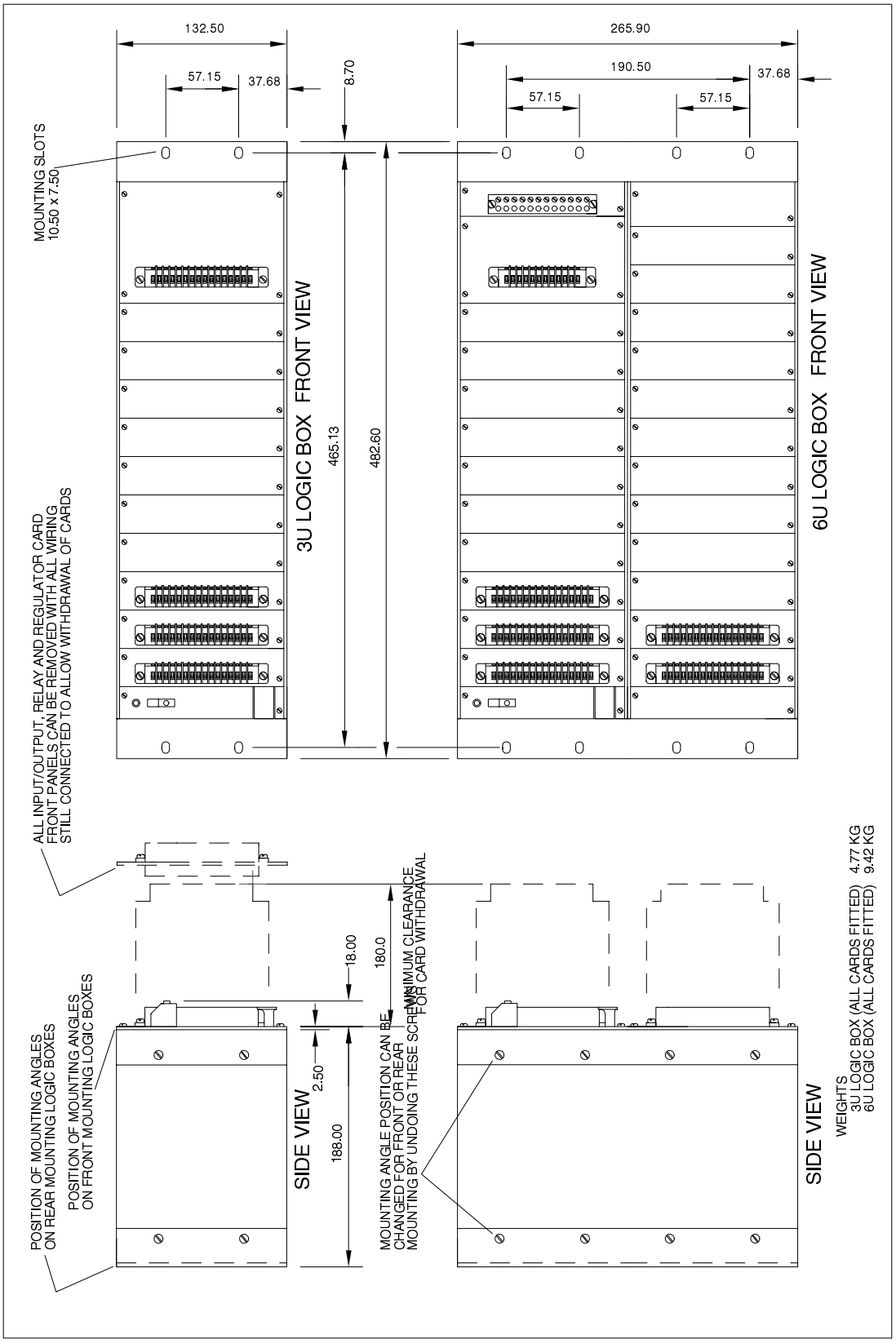
MODEL (24V)	RiS PART No:
AN6150 Small window	2800-061
AN6150 Larger windows	2804-123
LED COLOUR	
White / Yellow / Amber	2702-235
Red	2702-234
Green	2702-236

03 SERIES

MODEL	TYPE	RiS PART No:
03MS	24V T6.8 Slide Base 1.2W	5803-016
03MS	28V T6.8 Slide Base 1.2W	5803-017
03MS	48V T6.8 Slide Base 1.2W	5803-021
03MS	60V T6.8 Slide Base 1.2W	5803-022
03MS	24V LED Green	4864-008
03MS	24V LED Red	4864-009
03MS	24V LED Yellow	4864-010
03MLS / 03MLCS	24V T1¾ LES 1W	5803-005
03MLS / 03MLCS	28V T1¾ LES 1W	5803-006
03MLS / 03MLCS	60V T1¾ LES 1W	5803-004

3 DIMENSIONS

FIGURE 13 - LOGIC BOXES - DETAILS



4 INSTALLATION

4.1 PRE-INSTALLATION SYSTEM HANDBOOK

4.1.1. Two combined INSTRUCTION / SERVICE MANUALS and SYSTEM HANDBOOKS are issued free with each system. One is enclosed with the system, the other is posted to your Engineer prior to manufacture for checking.

4.1.2 The Engineer must examine his set and assure himself that the proposed system is as he ordered. Any discrepancy found is better fixed during manufacture rather than when received on Site.

4.1.3 The Engineer must check the following:-
Logic box dimensions and whether front or rear mounted.
Display size and layout
Auxiliary equipment dimensions and cabling details.

System specification

a) Number of ways
b) Sequence for lamps
c) Sequence for audibles
d) Sequence for relays
e) Control Switches - number and type
f) Repeaters
g) Power supply
h) Display cable lengths

If in doubt, contact Rochester Instruments Engineering Department for assistance.

4.2 MOUNTING THE EQUIPMENT

4.2.1 UNPACKING

Unpack carefully, checking all items against Parts List in System Handbook. Observe any warning labels / tape which may be attached to the equipment.

4.2.2 LOGIC BOX

Ensure the LOGIC BOX is mounted horizontally in a location free from excess moisture, vibration, heat and dust.
Allow access for maintenance, ensure that the CARDS can be easily removed and that future equipment to be assembled does not obstruct CARD removal.
Check the LOGIC BOX location with reference to the remote display ensuring that the specified length of display cable is sufficient to wire to the I/O CARDS.

ii) POWER SUPPLY UNITS

Mount near to the LOGIC BOX.
Use mounting details supplied. (With some DC-DC Convertors it is important to obey the mounting instructions to allow air flow over heat sink).
The POWER SUPPLY UNITS dissipate heat and should therefore be mounted above or to the side of the LOGIC BOX if possible.

Supply Filters (SF-90 and SF-91) are a requirement for EMC protection purposes and must be fitted as near to the logic box supply terminals as possible or on the main incoming supply to a panel if no transients will be generated within panel.

iii) DISPLAYS

Displays supplied by ROCHESTER INSTRUMENTS with the systems:--

Check the display cable lengths ordered are sufficient to route from the DISPLAY mounting position to the LOGIC BOX. The DISPLAY cables exit the DISPLAY from the right viewed from the rear. The standard cable length is 2 metres.
On DISPLAYS with more than 7 rows or where a large number of indicators are grouped together, ensure adequate ventilation is allowed - consult ROCHESTER INSTRUMENTS if in doubt.
Displays not supplied by ROCHESTER INSTRUMENTS:-
Wire to the appropriate output terminals designated on the 'ENGINEERING CHART' in the 'SYSTEM HANDBOOK'.
NOTE: To benefit fully from the design features of the MPAS-90 I/O Cards, care should be taken to arrange wiring such that the front terminal panels can be moved with wiring intact to allow card withdrawal.

iv) AUXILIARY EQUIPMENT

Check equipment parts list and drawings for mounting information, access requirements, possible cable lengths and any further details required to install the auxiliary equipment.

4.3 CABLING

The CONNECTION DIAGRAM DRAWING in the 'SYSTEM HANDBOOK' gives the details of input and output connections for all card positions.
When preparing the wiring schedules for the system it is advisable to note the following points before proceeding.

4.3.1 CABLE - GENERAL

i) The INPUT and OUTPUT CARDS do not contain a common +ve terminal for either inputs or outputs. The appropriate commons are found on the REG unit or adjacent supply panel and are clearly identified on drawing and on HARDWARE.
ii) Alarm inputs have 4 common REGULATED 24V supply terminals on the regulator on 3U logic boxes and 6 common REGULATED 24V supply terminals on 6U logic boxes. These are identified as "INPUT COMMONS".
THESE TERMINALS MUST NOT BE USED FOR ANY OTHER PURPOSE EXCEPT WHERE SPECIFIED BY ROCHESTER INSTRUMENTS.
iii) All outputs including lamp outputs, group lamp outputs, group relay outputs have 4 common UNREGULATED 24V supply terminals on the regulator on 3U logic boxes, and 5 common UNREGULATED 24V supply terminals on the supply terminal panel in the case of 6U logic boxes. These are identified as "OUTPUT COMMONS" and "+24V" respectively.
iv) A separate voltage can be used to supply the field contacts if required. Use 8I/O-91A Cards for 24V and 8I/O-92A for 50V in conjunction with the appropriate isolated regulator.

4.3.2 CABLING - ALARM INPUTS

i) Alarm input loop resistance is 1 Kohm maximum.
ii) The common +VE regulated wetting voltage per logic box for all alarm inputs can be used provided:
- Normally Open or Normally Closed volt free initiating contacts are used.
- The initiating contacts are in a non-hazardous 'safe' area.
- No alternative instructions are issued in the 'SYSTEM HANDBOOK' with the system.

iii) Multiple contacts per input are possible; in parallel for normally open; in series for normally closed provided the loop resistance of 1KOhm is not exceeded.
iv) All spare ways or unwired inputs must be fitted with a shorting link if normally closed contacts are specified.
v) The initiating contacts must not be used for any other purpose unless advised by 'ROCHESTER INSTRUMENTS'.
vi) Systems operating from inputs other than volt free contacts see special instructions in the 'SYSTEM HANDBOOK'.
vii) The input terminals can accommodate 1.5mm^2 cables. It is recommended, however, that smaller rated cables are used to facilitate easy access to the front panel for internal access.
viii) To benefit fully from the design features of the MPAS-90 I/O Cards, care should be taken to arrange wiring such that the front terminal panels can be moved with wiring intact to allow card withdrawal.

4.3.3 CABLING - CONTROL SWITCHES

i) The CONTROL SWITCHES all have volt-free normally open contacts, - close to operate. The following control switches require only an impulse to perform their function:
ACCEPT, FIRST UP ACCEPT, HORN CANCEL, RESET, FIRST OUT RESET
The following control switches maintain their control for the duration of their operation:
INHIBIT, LAMP TEST, GROUP LAMP TEST, FUNCTION TEST. (depending on mode of alarm)
ii) If the control switches are mounted on a ROCHESTER INSTRUMENTS display they will be pre-wired with a cable length matching the display's indicators cable.
iii) Control switches supplied loose or by others should be wired according to the 'SYSTEM HANDBOOK' instructions.
iv) When more that one set of control switches are connected to the same logic box ensure the inputs are correctly connected.
v) When more that one logic box is required, check the cascading / interconnection instructions carefully. The data will be detailed in the 'SYSTEM HANDBOOK'.
vi) Two or more control switches can be connected in parallel to operate the control function.

NOTE: The control switch input circuit is the same as alarm inputs.

4.3.4 CABLING - LAMP AND DISPLAY OUTPUTS

I) The ROCHESTER INSTRUMENT's display is pre-wired either by ribbon cable or multicore cable with a 2 metre standard free ended cable to connect to the I/O CARDS.
ii) A single heavy duty common +VE wire is normally supplied as the feed to all indicators (and audible if fitted) on the display. - (Connect to "Output Common" on L.B.)
iii) A separate common +ve wire is supplied as the feed to control switches (connect to "Input Common" on L.B.)
iv) Lamp and display output drivers are rated up to 63V max. 5 watts.

NOTE: The system firmware programme can allocate any output to any position in the display.
This allows display to be wired sequentially.

4.3.5 CABLING - REED RELAY OUTPUTS (8RR CARDS)

i) The standard 8 WAY REED RELAY CARD has a single pole single throw contact; two terminals per relay.
ii) Consult the 'SYSTEM HANDBOOK' for details of contact configuration, number of relays, operating mode etc.
iii) The relay designation normally matches the alarm input number and the display number.
iv) **CAUTION**: THE LOADING OF THE REED RELAYS MUST NOT BE EXCEEDED. Check the specification of the relay contacts in the data sheet within the System Handbook.. Do not use the contacts to switch lamps direct as the cold start current could weld the contacts. Insert suppression diodes across any auxiliary relays operated by the reed relays to prevent back EMF causing damage.
The REED RELAYS are intended for low current use, e.g., Data logging.

4.3.6 CABLING - REED RELAY OUTPUTS (16RR CARDS)

i) The standard 16 WAY REED RELAY CARD has a single pole single throw contact; two terminals per relay.
ii) Consult the 'SYSTEM HANDBOOK' for details of contact configuration, number of relays, operating mode etc.
iii) The relay designation normally matches the alarm input number and the display number.
iv) **CAUTION**: THE LOADING OF THE REED RELAYS MUST NOT BE EXCEEDED. Check the specification of the relay contacts in the data sheet within the System Handbook.. Do not use the contacts to switch lamps direct as the cold start current could weld the contacts. Insert suppression diodes across any auxiliary relays operated by the reed relays to prevent back EMF causing damage.
The REED RELAYS are intended for low current use, e.g., Data logging.
v) 16 way REED RELAY CARDS have a 34 way IDC connector on the front panel and are supplied complete with a 2 metre length of 34 way ribbon cable fitted with an IDC header at both ends. The flying end can be plugged into a proprietary Ribbon Interface Device (i.e., KLIPPON RI34 or equivalent) or the header can be cut off and the wires individually terminated as required..

4.3.7 CABLING - POWER RELAY OUTPUTS (5PR CARDS)

I) The standard 5 WAY POWER RELAY CARD has a single changeover contact (3 terminals) per relay.
The bottom terminal (No.16) is the relay coil common (all 5 relays) and this must be wired to an “OUTPUT COMMON” terminal on Regulator or supply panel.
NOTE : Card Type 5PR-90 has 24V relay coils. Card Type 5PR-91 has 50V relay coils.
ii) Consult the “SYSTEM HANDBOOK” for details of contact configuration, number of relays, operating mode etc.
iii) The relay designation normally matches the input number and the display number.
iv) CAUTION : THE LOADING OF POWER RELAY CONTACTS MUST NOT BE EXCEEDED. Check the specification of the relay contacts in the data sheet within the System Handbook.
Insert suppression diodes across any relay coils being operated by power relays to prevent back EMF.
v) Wiring to power relay contacts should be suitably rated according to load.

4.3.8 CABLING - ANALOGUE INPUTS

4.3.8.1 ANALOGUE INPUTS (8-IAM CARDS)

The standard 8-IAM-90 Card has 8 off 4-20mA isolated inputs.
Termination is by a 16 way terminal block with 2 terminals per input suitable for 1.50mm² maximum wire size. See System Handbook for specific details.

4.3.8.2 ANALOGUE INPUTS (8-RTD-90 CARDS)

The standard 8-RTD-90 Card has 8 off independent channels.
Termination is by a 37 way ‘D’ type socket on front panel of card.
Each card is supplied complete with a pre-terminated length of 17 pair (twisted) ribbon cable having a 37 way ‘D’ connector at one end and a 34 way IDC connector at other, and a Klippon RI34 rail mounting Ribbon Interface Device to give screw termination for field wiring.
See System Handbook for specific details.

4.3.8.3 ANALOGUE INPUTS (8-TC-90 CARDS)

The standard 8-TC-90 Card has 8 off independent channels. Termination is by a 37 way ‘D’ type socket on front panel of card.
Each card is supplied complete with a pre-terminated length of 17 pair (twisted) ribbon cable cable having a 37 way ‘D’ connector at one end and a 34 way IDC connector at other, and a Klippon RI34 rail mounting Ribbon Interface device to give screw termination for field wiring.
Terminals are provided on the RI34 Unit for direct connection of a CJC Device or alternatively to wire in a remote CJC Device.

See System Handbook for specific details.

4.3.9 CABLING - AUDIBLE

The audibles are driven by an output from the I/O CARD and have the same type of driver circuit as the lamps, i.e., an open collector transistor.
i) The open collector transistor is limited to 63V DC maximum and 5 Watt load maximum.
ii) For high power audibles use the horn relay supplied in the regulator.
iii) Systems supplied with a display which has an integral audible will be pre-wired along with the indicators and control switches.

4.3.10 CABLING - AUXILIARY FEATURES

i) ROCHESTER INSTRUMENTS' SYSTEMS DIVISION supply a wide range of auxiliary equipment to augment the basic alarm system.
ii) The ENGINEERING DEPARTMENT will supply all the required data on the auxiliary equipment to allow the wiring and installation of the equipment.
iii) The alarm system, which will be part of the total system, will be supplied with its 'SYSTEM HANDBOOK' as normal.

4.3.11 CABLING-POWER SUPPLY UNITS

4.3.11.1 PSU SERIES

The standard ROCHESTER INSTRUMENTS MAINS TO 24V D.C. P.S.Us should be wired in accordance with the instructions. See P.S.U. terminal label and the P.S.U. data sheet in System Handbook.

Check:

- i) The correct input tapping is connected.
- ii) Earth connection.
- iii) Cable rating is sufficient.
- iv) For parallel operation check connection details - ensure power fail indication is available.
- v) Do not use the P.S.U. to operate other equipment unless specified by ROCHESTER INSTRUMENTS.
- vi) All inductive loads must be diode suppressed.
- vii) On models PSU-90, PSU-91, PRR24SD50 check that Mains Input Filter (Suppressor Capacitor) is connected to voltage input terminal being used.

NOTE : The PSU series of power supplies are to replaced soon by the AN6160 Series - See page 9.2 for specific code numbers.

4.3.12 CABLING 'CPU ON' OUTPUT

The terminal on the C.P.U. front panel is an output terminal from the processor 'watchdog' circuit. Should a processor fault occur, the open collector transistor output will be switched off. This output should be used, if required to e.g., operate independent alarm, indicate on console etc. The open collector transistor is limited to 63V d.c. and 5 Watt maximum load.
See data sheet in System Handbook for connection diagram.

4.4.1 CONNECTION DIAGRAM - 3U LOGIC BOX - STANDARD 24V SUPPLY

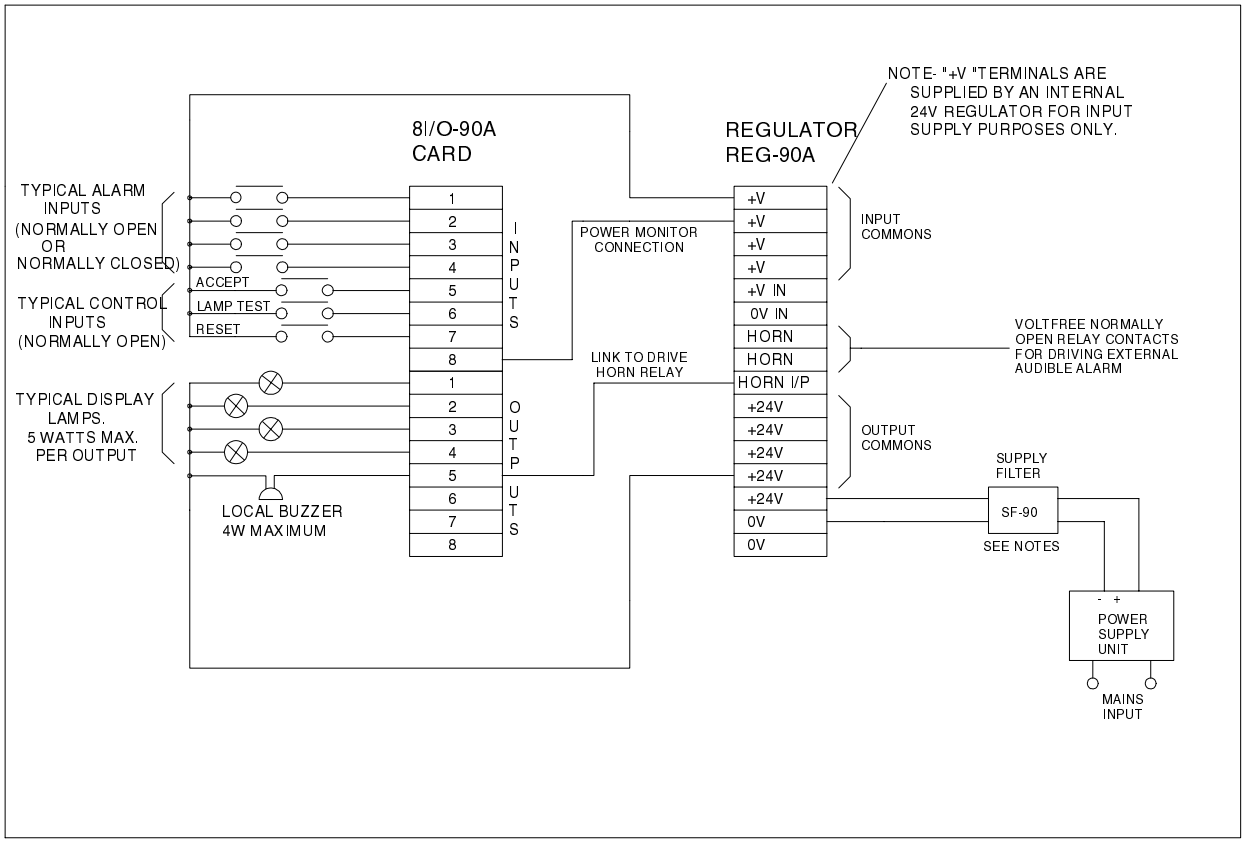


FIGURE 14 CONNECTION DIAGRAM - 3U LOGIC BOX - STANDARD 24V SUPPLY

STANDARD 24V SUPPLY

1. Use 8 I/O-90A Card
2. Use REG-90A Regulator
3. Supply:- P.S.U. 24V output or any 24V D.C. supply within limits of 21 to 27V.
4. The Alarm contacts, control switches and power monitor only are connected to the regulated +V terminals. (Input Commons)
5. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.
6. Lamps, Auxiliary Lamps and any external horns or relays are connected to the 24V terminals. (output commons) or direct to P.S.U. positive output.
7. A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

4.4.2 CONNECTION DIAGRAM - 3U LOGIC BOX - ISOLATED SUPPLY FOR ALARM CONTACTS

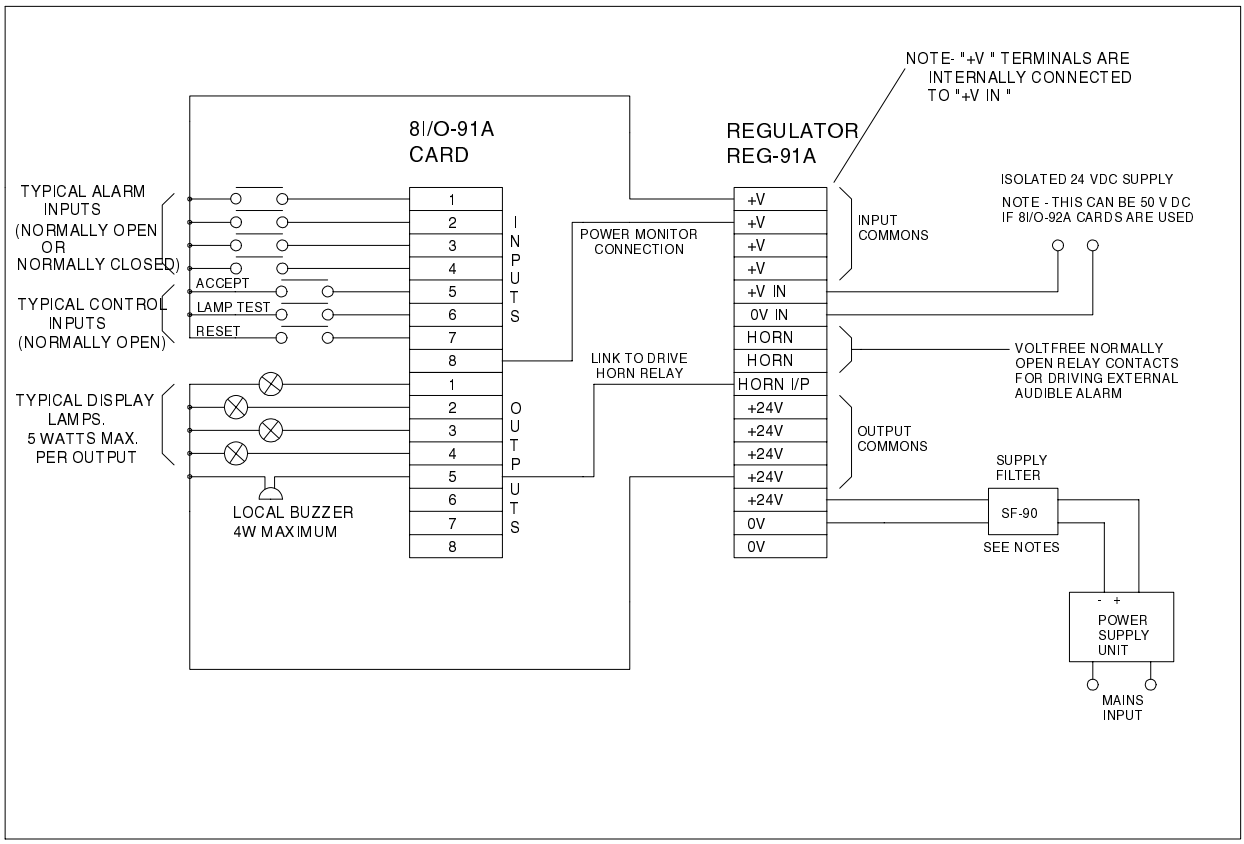


FIGURE 15 CONNECTION DIAGRAM - 3U LOGIC BOX - ISOLATED SUPPLY FOR ALARM CONTACTS

ISOLATED ALARM CONTACT WETTING VOLTAGE

1. Use 8 I/O-91A Card. (or 8 I/O-92A Cards for 50V isolated inputs).

2. Use REG-91A Regulator.

3. Supply P.S.U.:- 24V output or any 24V D.C. supply within the limits 21 to 27V.

4. The Alarm contacts are connected either to the +V terminals (input commons) on regulator or direct to the isolated supply positive.

   NOTE: Connect isolated supply negative to “0V IN” terminal. - See figure 12 on page 2.14 for isolated input circuit diagram.

5. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.

6. Lamps, Auxiliary Lamps and any external horns or relays are connected to the 24V terminals. (output commons) or direct to P.S.U. positive output.

7. Power monitor and control switches are connected to the +V terminals (input commons) on regulator.

A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

4.4.3. CONNECTION DIAGRAM - 6U LOGIC BOX - STANDARD 24V SUPPLY

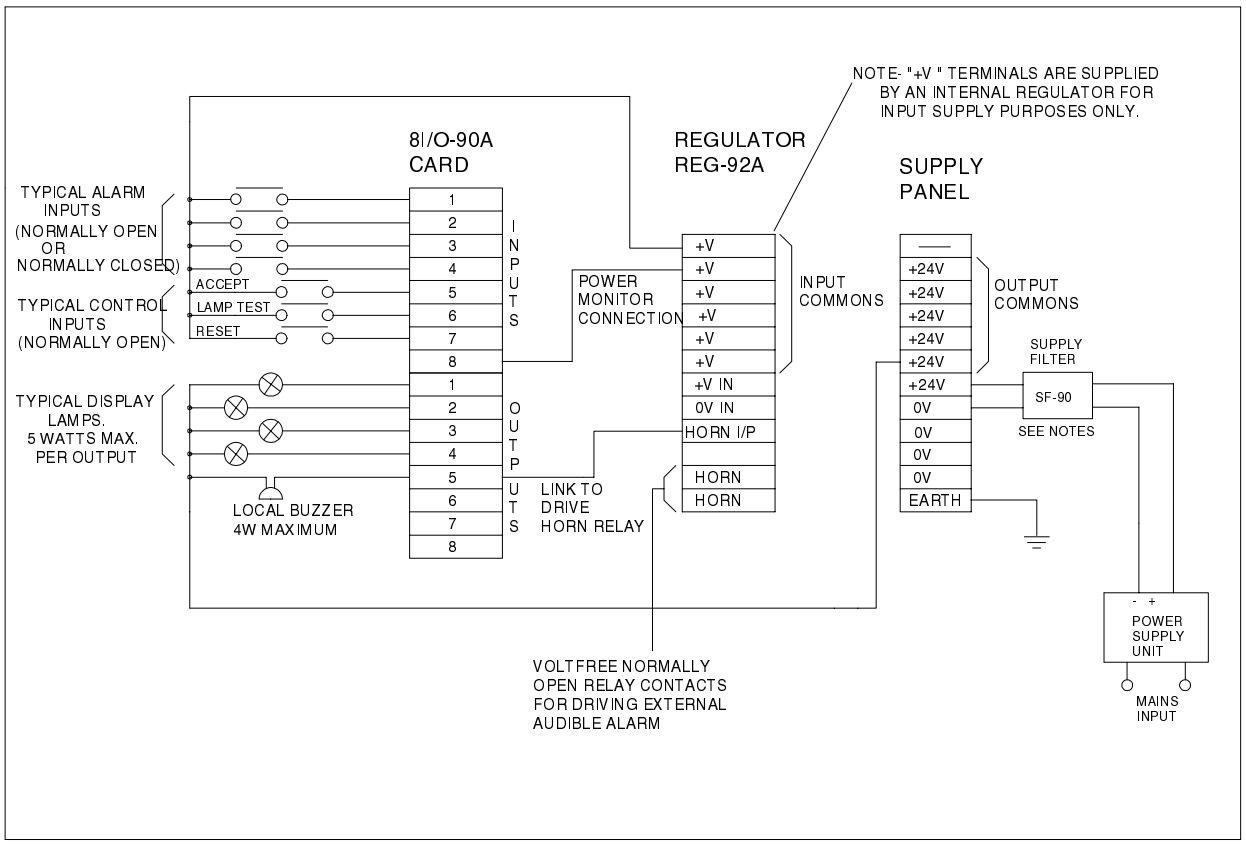


FIGURE 16 CONNECTION DIAGRAM - 6U LOGIC BOX - STANDARD 24V SUPPLY

STANDARD 24V SUPPLY

1. Use 8 I/O-90A Card

2. Use REG-92A Regulator

3. Supply:- P.S.U. 24V output or any 24V D.C. supply within limits of 21 to 27V.

4. The Alarm contacts, control switches and power monitor only are connected to the regulated +V terminals. (Input Commons)

5. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.

6. Lamps, Auxiliary Lamps and any external horns or relays are connected to the 24V terminals. (output commons) or direct to P.S.U. positive output.

7. A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

4.4.4 CONNECTION DIAGRAM - 6U LOGIC BOX - ISOLATED SUPPLY FOR ALARM CONTACTS

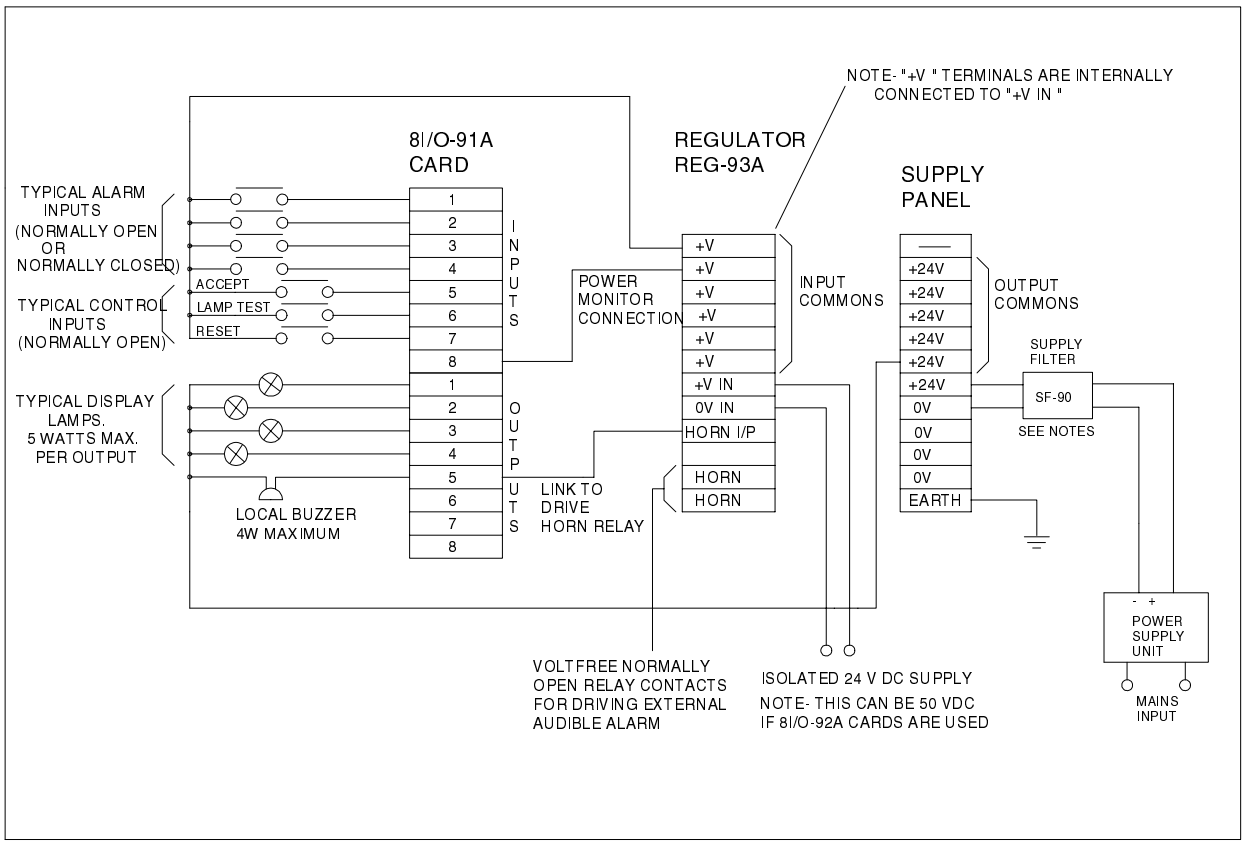


FIGURE 17 CONNECTION DIAGRAM - 6U LOGIC BOX - ISOLATED SUPPLY FOR ALARM CONTACTS

ISOLATED ALARM CONTACT WETTING VOLTAGE

1. Use 8 I/O-91A Card. (or 8 I/O-92A Cards for 50V isolated inputs).

2. Use REG-93A Regulator.

3. Supply P.S.U.:- 24V output or any 24V D.C. supply within the limits 21 to 27V.

4. The Alarm contacts are connected either to the +V terminals (input commons) on regulator or direct to the isolated supply positive.

   NOTE: Connect isolated supply negative to “0V IN” terminal - See figure 12 on page 2.14 for isolated input circuit diagram.

5. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.

6. Lamps, Auxiliary Lamps and any external horns or relays are connected to the 24V terminals. (output commons) or direct to P.S.U. positive output.

7. Power monitor and control switches are connected to the +V terminals (input commons) on regulator.

8. A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

4.4.5 CONNECTION DIAGRAM - 3U & 6U LOGIC BOXES - STANDARD 50V SUPPLY

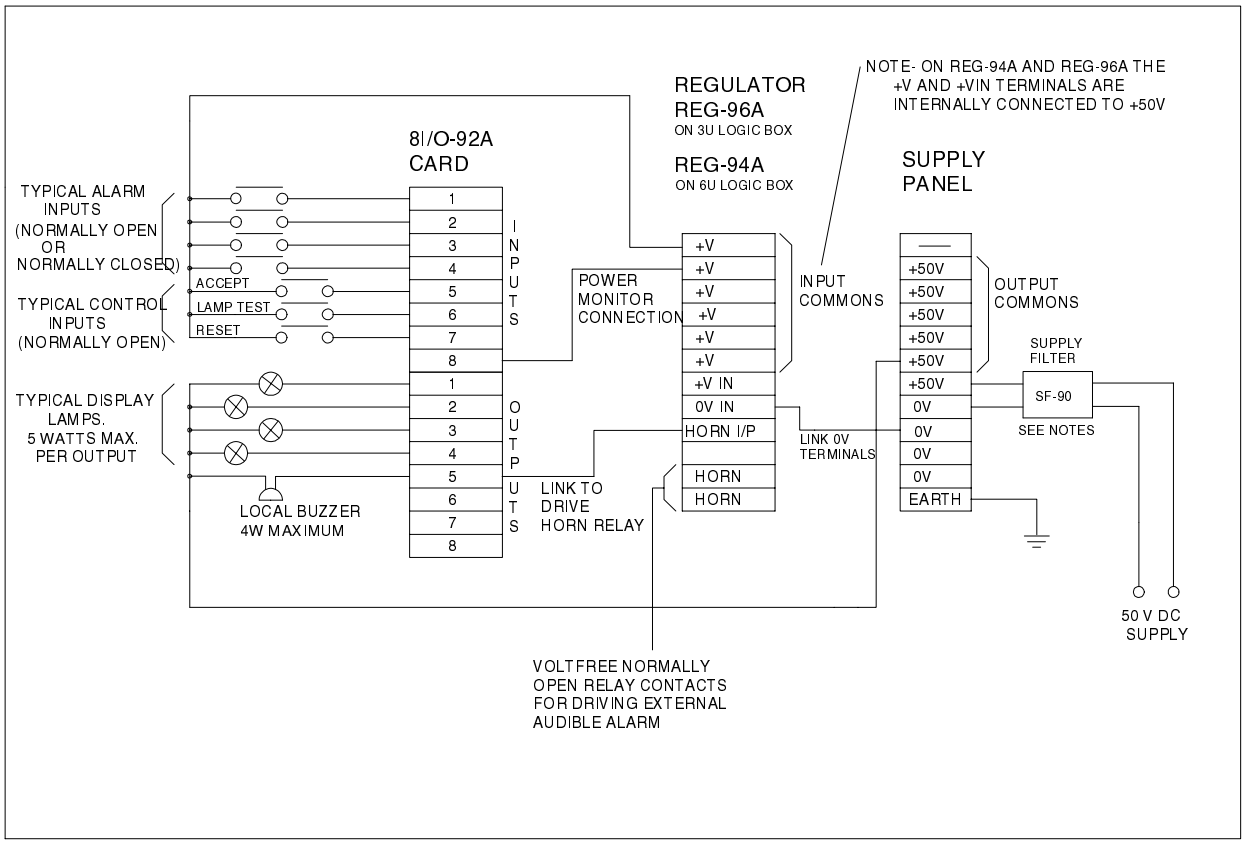


FIGURE 18 CONNECTION DIAGRAM - 3U & 6U LOGIC BOXES - STANDARD 50V SUPPLY

STANDARD 50V SUPPLY - 3U AND 6U LOGIC BOXES

1. Use 8 I/0-92A Card

2. Use REG-94A Regulator in 6U Logic Boxes
   Use REG-96A Regulator in 3U Logic Boxes

3. Supply voltage 50V DC within limits 44V - 65V DC (smooth)

4. The Alarm contacts, control switches and power monitor are connected to the regulated +V terminals. (Input Commons) or directly to the 50V supply positive.

5. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.

6. Lamps, Auxiliary Lamps and any external horns or relays are connected to the +50V terminals or directly to the 50V supply positive.

A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

4.4.6 CONNECTION DIAGRAM - 3U & 6U LOGIC BOXES - ISOLATED SUPPLY FOR ALARM CONTACTS

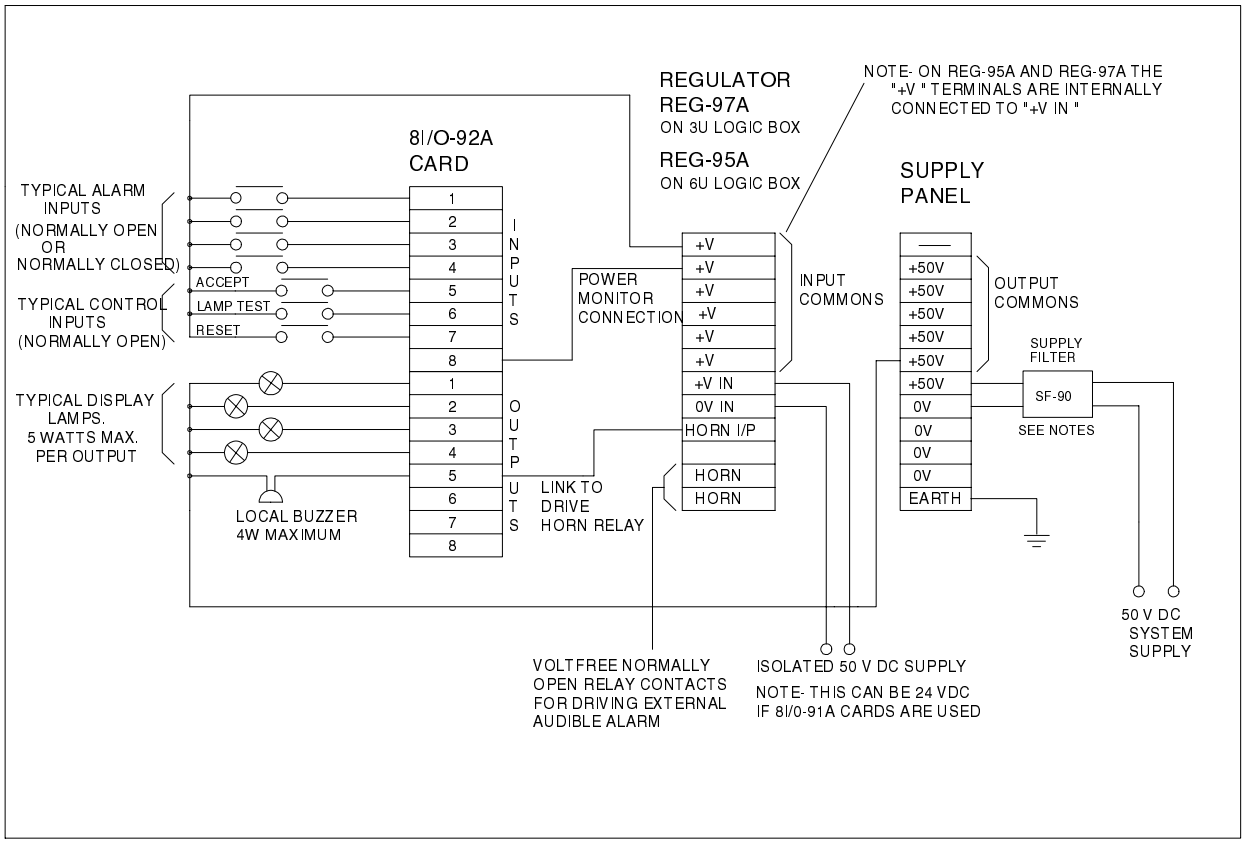


FIGURE 19 CONNECTION DIAGRAM - 3U & 6U LOGIC BOXES - ISOLATED SUPPLY FOR ALARM CONTACTS

ISOLATED ALARM CONTACT WETTING VOLTAGE

1. For isolated 24V contact wetting use 8 I/O-91A.
   For isolated 50V contact wetting use 8 I/O-92A

2. Use REG-95A Regulator in 6U Logic Boxes
   Use REG-97A Regulator in 3U Logic Boxes

3. Supply voltage 50V DC within limits 44V - 65V DC (smooth)

4. The field contacts are connected to the +V terminals (input commons) on Regulator or directly to the isolated supply positive.

5. **NOTE:** Connect isolated supply negative to “0V IN” terminal. See figure 12 on page 2.14 for isolated input circuit diagram.

6. The Horn output terminal on the I/O Card can be connected to H I/P terminal on Regulator if the auxiliary Horn Relay is required, as well as driving the audible device within any of the ROCHESTER display fascias.

7. Lamps, Auxiliary Lamps and any external horns or relays are connected to the +50V terminals or directly to the 50V supply positive.

A supply filter (ROCHESTER SF-90) should be fitted as near to the Logic Box as possible or on main incoming supply to a panel if no transients will be generated within panel.

5 COMMISSIONING

The system is highly reliable. It is microprocessor controlled with the advantage of the high degree of reliability of microprocessors.

There are fewer discrete components than in conventional systems. The microprocessor is electrically protected from the outside world by input circuits with an extremely high noise protection specification. Interconnections are minimal with two part rear connectors used for maximum life and reliability.

Correct and careful commissioning will ensure the system has a long trouble-free working life.

POWER DOWN SYSTEM BEFORE WITHDRAWING OR INSTALLING ANY CARD IN LOGIC BOX.

5.1 PRE-CHECKS

5.1.1 Check all cards are in correct position as shown in the 'SYSTEM HANDBOOK' (Logic Box General Arrangement drawing).
Check for correct supply voltage before connecting.
All card address switches are factory set. If cards are unplugged for any reason, they must be put back in same position.

5.1.2 Check I/O card contact mode switches (normally open / closed) as shown in the 'SYSTEM HANDBOOK' are as required - If not, remove one card at a time and set switches to required condition.

5.1.3 Check installation including:-

5.1.3.1 Inputs from initiating contacts are correct mode and volts-free - all inputs should be connected to +V (Input common) terminals.
5.1.3.2 Control switch wiring-control switches should be normally open in all cases with one pole connected to +V (Input common) terminal.

5.1.3.3 Display wiring - takes care, short circuits can damage open collector drive transistors.
5.1.3.4 Check audible and relay outputs - similarly check for short circuits.
5.1.3.5 Check power supply unit wiring.
5.1.3.6 Check logic box earthing.

5.1.4 Equipment should be free from excess dirt, heat and moisture.

5.1.5 Check supply voltage and frequency to power supply unit.
Check transformer tapping is correct.
Check mains suppresser is connected to the appropriate transformer tap.
Check DC input voltage to DC-DC regulators for magnitude and polarity.

5.2 SYSTEM OPERATION

5.2.1 **Switch on power and check that "CPU ON" LED is lit.**

5.2.2 If preferred, temporarily disconnect audible(s) (replace with a lamp) to avoid annoyance while checking alarms.

5.2.3 Check each alarm way in turn according to its sequence, including:

Indicators

Audibles

Auxiliary outputs

Controls etc.

Return each alarm to normal, i.e., indicator and audible off, before proceeding to the next input. In the case of first up groups a second test can check the lamp sequences required by initiating grouped alarms.

5.2.4 Should plant conditions not allow the test to proceed, i.e., permanent fault, disconnect plant wiring and simulate alarm input using a wire link between input terminal and +V.

5.2.5 Continue until every condition has been checked.

5.2.6 Re-connect the Audible(s) and test (if it was disconnected at start of testing see 5.2.2)

5.3 'SYSTEM HEALTHY' CHECK ('C.P.U. ON')

Remove power monitor link and check "CPU ON" L.E.D. on C.P.U. goes off and that any auxiliary device connected to the C.P.U. terminal goes off. Replace link and check C.P.U. restores to healthy.

5.4 COMMISSIONING NOTES ON CONTROL SWITCHES

5.4.1 All control switches should be normally open and connected to a +V INPUT COMMON terminal..

5.4.2 Accept, first up accept, first out reset, reset and horn cancel switch functions are operated by a pulse, i.e., momentary action of the switch.

5.4.3 Lamp test, function test and inhibit functions are maintained for the duration of switch operation.
(See later note 5.4.8 on function test)

5.4.4 **ACCEPT SWITCH**
In non first up sequences the accept switch will mute the audible and steady all flashing indicators.

5.4.5 **FIRST UP ACCEPT SWITCH**

Used in dual flash first up sequences only (M7 and M8); two switches are required - accept and first up accept.

Stage I

The accept should be operated first to mute audible and change subsequent slow flash indicators to steady, leaving first up indicator flashing fast.

Stage II

Operation of first up accept changes first up fast flash indicator to steady and thereby cancels the first up sequence. Any further alarm would then claim first up status. The first up accept switch, if operated first, would by-pass Stage I.

5.4.6 RESET SWITCH

For manual reset systems only.

Manual operation of a reset switch is required before 'accepted' alarms in the fault clear condition can return the indicator to OFF (and the fault clear audible to OFF if fitted).

5.4.7 LAMP TEST SWITCH

The lamp test switch is, in fact, more than a simple filament test. It checks the CPU, I/O card, address and data links and output transistors.

Repeater lamp displays will be lamp tested with the main display since they are merely wired out in parallel at the output terminals. Therefore both displays will be tested as standard, but independent lamp testing is available on some program versions - Consult Rochester.

A lamp test on a repeater display would be wired in parallel with the lamp test switch on the main display.

Group lamps and status indicators are not tested unless specified. These can be programmed on the main lamp test input or separate input as required.

Lamp test will over-ride any flashing sequence for the duration of the lamp test switch operation but will not otherwise interfere with the sequence.

Lamp test will not operate auxiliary relay outputs.

5.4.8 FUNCTION TEST SWITCH

The function test switch tests all alarms as if in full alarm condition including all indicators, audibles and auxiliary outputs.

Take care that any auxiliaries in a control loop are by-passed or supervised during a function test.

Non-locking alarms will clear on release of the function test switch.

Locking - Auto reset alarms will have to be accepted to clear after a function test.
- Manual reset alarms will have to be accepted and reset to clear after a function test.

First up discrimination is not given on a function test, i.e., all alarms flash at the same time. (All first-up)

It is inadvisable to have more than one switch per group.

It is advisable to key lock a function test switch, to avoid unnecessary false alarm situation.

5.4.9 HORN CANCEL SWITCH

A horn cancel is a momentary action switch which does not interfere with the indicators.

5.4.10 FIRST OUT RESET SWITCH

Used in intermittent flash first up sequences only (M13).
Accept is used to mute audible and change indicators state. First out Reset is used to Reset the First Up alarm thereby cancelling the original first up sequence.
The next alarm would then claim first up status.

5.4.11 INHIBIT SWITCH

This is a specialist requirement to inhibit alarm operation. It must be a maintained action, preferably a key or illuminated switch which inhibits the operation of all alarms controlled by it.

5.5 FIRST UP GROUP TESTING

a) Check and reset each alarm individually before testing the first up sequence.

b) Bring up any alarm in first up group followed by other alarms in the group - check sequence is correct as per appropriate sequence table.

c) Accept and reset and repeat with another alarm in the same group as the first up alarm.

NOTE: When all alarms are clear and a function test is initiated on a first up group, no discrimination is given. All alarms will flash in same mode. (i.e. all as first up)

5.6 GROUP REPEATER LAMP TESTING

a) Check each alarm in group operates the group lamp.

b) Check alarms not in group do not operate group lamp.

c) Check that group lamp reflashes. Operate any alarm in group and press the accept switch, i.e., group lamp goes steady. Operate another alarm in group and check that group lamp reflashes.

5.7 REED RELAY TESTING

a) Check the output wiring / cabling is correctly connected.

b) Check contact configuration (normally open or normally closed) is as required.
(Note whether relays are normally energised or de-energised when checking contacts)

c) Use a meter (or data logger etc) to check output.

d) Operate each relay from alarm source and check mode is correct (e.g., fault to accept, fault to reset or fault to fault clear).

IF ANY PROBLEMS ARISE DURING TESTING USE TROUBLE SHOOTING SECTION TO IDENTIFY FAULT.

6 STORAGE

6.1 It is advisable to power up any stored system every twelve months to reform electrolytic capacitors in the system.

6.2 Storage temperature: 10deg.C minimum
Storage temperature: 40deg.C maximum
with a relative humidity of 90 per cent or less at 10deg.C.

These parameters are for standard 'ROCHESTER INSTRUMENTS' packing.

6.3 Installed equipment which has not been put into service should be switched on every two or three months.

6.4 If the storage temperature is below 10deg.C, or above 40deg.C with maximum 60deg.C, Instruction 6.3 should be carried out.

NOTE Operating Temperature Range: 0°C to 60°C
Humidity: 0 to 95% non-condensing

7 TROUBLESHOOTING

TROUBLE SHOOTING INFORMATION

GENERAL

The alarm system is designed to have a high degree of reliability. As previously detailed in the 'commissioning' section, if the system is correctly installed in the correct environment it will operate trouble-free for the duration of its operational life. Inexpert or careless handling, harsh temperature/shock/moisture conditions will degrade the performance of the system.

Should malfunction occur, the following trouble shooting instructions give guidance to locating and curing the fault. However, it is again stressed that the system, in particular the cards, must be handled with respect and knowledge, and any rework to the boards or logic boxes should be left to ROCHESTER INSTRUMENTS or other experienced personnel.

The trouble shooting information details the fault area and possible solutions. The fault finding procedure per section is written in order of priority; Work through the sequence until the fault is found. If the fault is still present, ROCHESTER INSTRUMENTS' engineers will give further assistance.

All major problems occur during commissioning and are generally due to one of four reasons.

1. Incorrect specification on the order.

2. Power supply problems.

3. Short circuit outputs (indicators, audibles, relays).

4. Inexpert handling (finger trouble).

7.1 TROUBLE SHOOTING - GENERAL FAULTS

Faults of a more general nature are listed below for examination should malfunction occur.

7.1.1 NO RESPONSE FROM AN INPUT

- Incorrect installation - check input voltage and polarity

- Power supply problems - check voltage levels.

- Fleeting fault too fast. (i.e., alarm system will not respond to inputs of less than 16mS duration)

7.1.2 SYSTEM OPERATION WRONG

- Specification on order incorrect - check purchase order / specification.

- System handbook information does not align with order - check for any conflicting specification details.

- Wiring incorrect - check all wiring against Connection details in System Handbook.

Should the system operation be incorrect, inform ROCHESTER INSTRUMENTS' After Sales (01383 822911) to determine the cause and instigate correction process.

7.2 TROUBLE SHOOTING - ALARM INPUTS

7.2.1 The standard input circuit is from clean contacts, whether normally open or normally closed and/or fleeting or maintained.

7.2.2 8 way DIL switches on the I/O card allows alteration to suit open or closed contacts.

7.2.3 There are several different input possibilities. Check the 'SYSTEM HANDBOOK' and the installation commissioning sections of this manual before proceeding with any trouble shooting to ensure compliance's with the ROCHESTER INSTRUMENTS' instructions.

7.2.4 TROUBLE SHOOTING - NO ALARM WILL INITIATE.

a) Check supply voltage, fuses, main polarity. See commissioning SECTION 6.

b) Check Power Monitor connection to +V input common terminal is OK and check voltage level of +V terminals.

c) Check “CPU ON” LED is 'ON' - to 'reset' the microprocessor simply switch power off, after a small delay (10 secs) switch power on -”CPU ON” LED should be on.

d) Check control switches are normally open and Power Monitor input is set for normally open as per System Handbook.

e) Check initiating contact wetting voltage is present. On normally closed contacts - input terminal voltage is +Ve. On normally open contacts - input terminal voltage is OV. In both instances voltages should alter on initiation. (These checks are at input terminal of I/O Card).

f) Check microprocessor and EPROMS on C.P.U. are fitted in the correct sockets and secure.

g) Check 5V ±0.25V regulator output on motherboard. (On tracks 1 and 32 on CPU slot, and on tracks 1 and 30 on I/O slots) See section 7.8.2 on page 7.11.

h) Check I/O card DIL switch settings (see 'SYSTEM HANDBOOK').

i) Check no inhibit circuit is on.

7.2.5 TROUBLE SHOOTING - INDIVIDUAL ALARMS WILL NOT INITIATE

a) Check initiation by substituting initiating contact with a jumper link.

b) Check input contacts have the correct supply voltage and no other voltage is present; if necessary with the system supply switch off and isolated.

c) Check DIL switch settings on the I/O board. If the address switches are wrongly set, the output indication will be incorrect. If the mode (N/O - N/C) switch setting is wrong the associated alarms may not work.

d) Swap I/O Card for a known good one - remember to check address and mode DIL switch settings of other card before inserting into the slot.

NOTE: As each of the 10 slot positions in a 3U high crate have identically hard wired motherboard fitted edge connectors, the slot position is, electrically speaking, immaterial. The DIL switches on the board and not the position determine the card's operation, i.e., an I/O card can plug in any slot: obviously the connections to the card must be as specified in the 'SYSTEM HANDBOOK'.

e) After card is proven check input circuit for normally open / normally closed.
Check that closed, line and Open Circuit resistance is within specification.
Check wiring is correct.

f) Check no inhibit circuit is on.

g) If a proven good I/O card and a proven alarm contact still fail to operate the alarm way then check system for:

i) Mechanical damage to front edgeblock connector.
ii) Mechanical damage to Motherboard connector

7.2.6 TROUBLE SHOOTING - ALARMS WILL NOT CLEAR

a) Check mode (N/O - N/C) DIL switch on I/O card.

b) Check input circuit - remove field wiring if necessary and use shorting link.

c) Check reset switch circuit.

d) Check function test/lamp test circuits are correct. (i.e., normally open contacts)

7.2.8 TROUBLE SHOOTING - ALARM INDICATOR/AUDIBLE NOT OPERATIVE

Refer to display or audible section

7.3 TROUBLE SHOOTING - CONTROL SWITCHES

GENERAL

The alarm system has 9 types of control switches:

7.3.1 Accept

7.3.2 Lamp test

7.3.3 Group lamp test

7.3.4 Reset

7.3.5 Function test

7.3.6 Horn cancel

7.3.7 First up accept

7.3.8 Inhibit

7.3.9 First Out Reset

The switches are mounted remotely from the logic box, either pre-wired in a ROCHESTER INSTRUMENTS display, or as loose items to be fitted to a panel.

The switches can be momentary on maintained action, illuminated or keylock type, dependent on the function or requirement.

The switch rating requirement is approx. 2mA per input as it is switching a standard input circuit only.

The control switches are usually from normally open contacts with a common +Ve (+V input common)

7.3.1.1 TROUBLE SHOOTING - CONTROL SWITCH SPECIFICATION

The control switch input circuit is identical to the alarm ways input circuit, using the normal input circuit on the 8 way I/O card, 16 way input card or I/R card.

7.3.1.2 TROUBLE SHOOTING - ACCEPT SWITCH

The operator accepts an initiated alarm by operating the accept switch. This silences the audible alarm and changes the lamps from a flashing to a steady state. Before proceeding check the specification and commissioning section. Consult the 'SYSTEM HANDBOOK' for sequences and alarm groupings relevant to accept switch(es).
Switch type - non illuminated - momentary action.

7.3.1.3 TROUBLE SHOOTING - NO ALARM WILL ACCEPT

a) Check wiring to accept switch from logic box. (+V Input common via switch normally open contact and back to accept input on I/O Card).

b) Check accept switch is operating correctly, normally open momentary action.

c) Check switch is switching common +Ve (+V input common)

d) Change I/O card with control switch inputs for a known good one.

e) Check edge connector for damage.

f) With multiple accept switches check correct switch is being operated and is wired correctly.

g) Check address switch settings on I/O card with control switch inputs.

7.3.1.4 TROUBLE SHOOTING - INDIVIDUAL ALARM WILL NOT ACCEPT

a) If other alarms will accept it infers the accept switch, the I/O card for the accept switch and the C.P.U. are O.K.

b) With multiple accept switches check correct switch is being operated and is wired correctly.

7.3.1.5 TROUBLE SHOOTING - ALARMS ARE IN ACCEPT STATE ON INITIATION

a) Short circuit on accept switch circuit - check that switch is wired correctly (i.e., normally open contact)

b) Alarm in a single flash first up group with a first up alarm flashing - check this is as specified.

7.3.2 TROUBLE SHOOTING - LAMP TEST SWITCH

Lamp test is self explanatory. Before proceeding check the specification and commissioning sections for full details of lamp test switching circuits. Consult the 'SYSTEM HANDBOOK' for lamp test groups.
Switch type - momentary action with normally open contacts.

The lamp test function is maintained for the duration of operation of the lamp test switch.

7.3.2.1 TROUBLE SHOOTING - NO INDICATORS WILL LAMP TEST

a) Check lamp test switch wiring from the switch to the logic box. (+V input common via switch normally open contact and back to LT input on I/O card)

b) Check lamps are fitted and of the correct voltage and ratings.

c) Check supply is on.

d) Check common +Ve to lamps. (From output common terminals on logic box)

e) Check output terminals are correctly wired.

f) Check individual lamps will operate under alarm conditions, if so the fault is in the lamp test circuit only.

g) Change the lamp test input I/O card for known good card and / or double check correct input terminal is used.

7.3.2.2 TROUBLE SHOOTING - INDIVIDUAL INDICATOR WILL NOT LAMP TEST

a) Check lamp and lamp holder.

b) Check common +Ve to lamp holder.

c) Check terminal output wiring is correct. Check lamp operates with alarm input, if so this means alarm and lamp circuit is OK and that either the lamp is not included in the lamp test group specified or is in another lamp test group (if multiple lamp test groups exist).

d) Check that lamp driver is not damaged, either by meter or by changing I/O card for a known good card (alter address DIL switches) or using spare I/O card. (in which case set address switches as required).

NOTE: The lamp driver circuit is an open collector transistor and will be damaged by short circuits. As the output is an open collector a load MUST be applied to check - a voltmeter will not give correct indication.

7.3.2.3 TROUBLE SHOOTING - LAMP TEST - DIM LAMPS

a) Mains voltage too low.

b) DC voltage low due to incorrect mains tapping on supply input - check.

c) Powerpack overloaded - check.

d) Incorrect lamps fitted - check.

e) Remote display wiring too long; cable rating too low causing excessive line volts drop.

7.3.2.4 TROUBLE SHOOTING - NOTES ON LAMP TEST

a) The standard lamp test will test repeat panels.

b) Lamp test will not interfere with or alter sequences.

c) Lamp test switch does not carry lamp current, it initiates a software function.

7.3.3 TROUBLE SHOOTING - GROUP LAMP TEST NOT OPERATING

Follow paragraphs 7.3.2. - Note : Group Lamp test can be either a separate input or combined with main lamp test switch - Check System Handbook.

7.3.4 TROUBLE SHOOTING - RESET SWITCH

In manual reset systems the reset switch returns accepted alarms which have cleared to the normal condition. Before proceeding check the specification and commissioning section for full details of reset switching circuits. Consult the 'SYSTEM HANDBOOK' for sequences and alarm switch type - non-illuminated momentary action with normally open contacts.

7.3.4.1 TROUBLE SHOOTING - ALARMS WILL NOT RESET FOR AUTO RESET SYSTEMS

a) Check auto reset and not manual reset is specified. If manual reset is supplied put permanent link between +V input Common terminal and Reset input on I/O card for auto reset sequence.

b) Check alarm input has cleared otherwise reset will not operate.

c) Check normally open alarm input circuits for possible short circuits.

d) Change I/O card for the alarm input for a known good one.

7.3.4.2 TROUBLE SHOOTING - NO ALARMS WILL RESET - MANUAL RESET SYSTEM

a) Check reset switch wiring from switch to logic box. (+V input common terminal via switch normally open contact and back to Reset input on I/O Card)

b) Check switch is operating (normally open momentary action).

c) Check the correct reset switch is being operated where multiple reset switches are required.

d) Check the alarm inputs are accepted and fault condition cleared.

e) Change I/O card for reset switch and re-check.

f) Check I/O card for damaged edge connector.

g) Check function test switch/circuit is correct if fitted (i.e., no permanent function test in operation).

7.3.4.3 TROUBLE SHOOTING - INDIVIDUAL ALARMS WILL NOT RESET - MANUAL RESET SYSTEM

a) Check as 7.3.4.

b) Change alarm input I/O board for a known good one.

7.3.4.4 ALARM RESETS AUTOMATICALLY INSTEAD OF MANUALLY

a) Check system specification.

b) Check for short circuit on reset switch wiring or contact on switch is wired normally closed.

c) Change reset switch I/O card for known good one.

7.3.5 TROUBLE SHOOTING - FUNCTION TEST SWITCH

Function test is self explanatory. Before proceeding check the specification and commissioning sections for full details of function test switching circuits. Consult the 'SYSTEM HANDBOOK' for function test group(s). Switch type - non-illuminated momentary action with normally open contacts. Function test initiates a full alarm condition on all alarms in the group. All outputs are activated. Care must be exercised if auxiliary output relays are being used for shutdown etc.
See para 7.3.5.3 for function test notes.

The function test is maintained for the duration of the switch operation, followed by control functions Accept and Reset to regain the normal condition.

7.3.5.1 TROUBLE SHOOTING - NO ALARMS WILL FUNCTION TEST

a) Check function test switch wiring from switch to logic box (+V input common via switch normally open contact and back to F.T. input on I/O Card)

b) Check function test switch action.

c) Check I/O Card edge connector for damage.

d) Check system specification includes alarm(s) in function test group.

7.3.5.2 TROUBLE SHOOTING - INDIVIDUAL ALARMS WILL NOT FUNCTION TEST

a) Check/change I/O boards.

b) Check lamps for open circuit or short circuit drivers.

7.3.5.3 TROUBLE SHOOTING - NOTES ON FUNCTION TESTS

a) Function test will test spare or unused alarms, if they are included in the group.

b) Function test check lamp, audible and auxiliary outputs.

c) If the system has control functions as part of the auxiliary outputs, i.e., data logging or shut down, the function test will operate these controls.

d) Systems with non-locking alarms will go from flashing to off when the function test is released if no other control is operated.

e) Alarms in (d) which are accepted will go off when the function test is released.

f) Alarms in (e) which are manual reset require to be reset after the function test is released.

g) Locking alarms will require only a function test impulse to remain on.

h) There is no first up discrimination with a function test. (i.e., all will come up as first up alarm)

7.3.6 TROUBLE SHOOTING - HORN CANCEL SWITCH

The horn cancel switch mutes the audible with no effect on indicators. Before proceeding check the specification and commissioning sections for full details of horn cancel switching circuits.
Consult the 'SYSTEM HANDBOOK' for horn cancel group(s).
Switch type - non-illuminated momentary action with normally open contacts.

7.3.6.1 TROUBLE SHOOTING - AUDIBLE WILL NOT CANCEL

a) Check horn cancel switch wiring. (+V input common via switch normally open contacts and back to H.C. input on I/O Card).

b) Check horn cancel switch action.

c) Change horn cancel I/O card.

d) Check for damaged edge connector on I/O cards.

e) Check system specification includes alarm(s) in horn cancel group.

7.3.7 TROUBLE SHOOTING - FIRST UP ACCEPT SWITCH

The first up accept switch function applies to the multiple flash first up sequences only (M7 and M8). The normal accept acts on subsequent alarms only, while the first up accept 'accepts' and steadies the first up indicator - the next input alarm way being the 'first up'. A monitor lamp can illuminate this switch. Before proceeding check the specification and commissioning sections for full details of first up accept switching circuits. Consult the 'SYSTEM HANDBOOK' for sequences and groups relevant to first up circuits.

7.3.7.1 TROUBLE SHOOTING - ALARMS WILL NOT FIRST UP ACCEPT

a) Check switch action and wiring. (+V input common via normally open switch contacts and back to F.U.A. input on I/O card).

b) Change I/O card for switch input.

c) Check specification includes alarm(s) in multiple flash first up group.

d) Check for damaged edge connectors.

e) If individual alarms will not accept change the respective alarm I/O card.

f) Check the correct first up switch is being operated in multiple first up group systems.

g) Alarms in the accepted state on initiation may be caused by short circuit (normally closed) first up accept circuit (switch) - check.

7.3.8 TROUBLE SHOOTING - INHIBIT SWITCH

Alarms included in an inhibit group do not operate on initiation if the inhibit switch is operated. Before proceeding check the specification and commissioning sections for full details of inhibit switch circuits. Consult the 'SYSTEM HANDBOOK' for inhibit switching group(s).
Switch type - illuminated maintained action or keylock switch with normally open contacts.

Note : Inhibit switch effectively takes all alarms in group “OFF LINE”, therefore, an illuminated switch or Keyswitch is recommended.

The inhibit function is maintained for the duration of the inhibit switch operation.

7.3.8.1 TROUBLE SHOOTING - INHIBIT SWITCH DOES NOT INHIBIT

a) Check switch action and wiring. (+V input common via switch normally open contact and back to Inhibit input on I/O Card).

b) Change inhibit switch I/O card.

c) Check inhibit switch is required in the specification and 'SYSTEM HANDBOOK'.

7.3.8.2 TROUBLE SHOOTING - NOTES ON INHIBIT SWITCH

a) Operation of inhibit will return alarms in any stage of their sequence to off or normal including all auxiliary outputs.

b) Release of the inhibit switch will initiate the alarm ways which are in an alarm state. The sequence starting from the beginning. (i.e., horn will sound until accepted).

c) Active alarms within a first up group will not give first up indication on release of inhibit switch.

7.4 TROUBLE SHOOTING - DISPLAYS AND INDICATORS

Before proceeding check the specification and commissioning sections for full details of indicator circuits. Consult the 'SYSTEM HANDBOOK' for the relevant display and indicator connection details.

7.4.1 TROUBLE SHOOTING - INDICATORS DO NOT OPERATE

Refer to lamp test section 7.3.2.

7.4.2 TROUBLE SHOOTING - INDICATORS NOTES

a) LEDs require a series resistor if driven from 24V or 50V supply. (This may be integral in the LED)

b) Ensure adequate ventilation especially on high density displays.

c) Ensure vibration is minimised where filament lamps are fitted.

d) Ensure on battery back-up systems that the boost charge voltage (typically 33V and more on nominal 24V systems) is not supplied to the lamps.

e) Ensure display common supply is connected to correct polarity, as per display drawing in System Handbook.

7.5 TROUBLE SHOOTING - AUDIBLES

The main 'alarm on' audible sounds until the alarm is accepted or the horn is cancelled. The auxiliary clear horn sounds on an accepted alarm clearing until the system is reset. Consult the specification and commissioning sections for full details of audibles. Consult the 'SYSTEM HANDBOOK' for audible group(s).

7.5.1 TROUBLE SHOOTING - MAIN ALARM WILL NOT SOUND

a) Check audible wiring is as per system connection diagram in System Handbook.

b) Check audible relay operates in regulator (if used).

c) Check audible's supply voltage for magnitude, and polarity - ensure audible is not open circuit.

d) Check any horn cancel circuit is correct and not short circuited i.e., Horn cancel switch contacts should be normally open.

e) Check no inhibit circuit is activated.

f) Change I/O card with the horn output.

g) Check for damaged edge connector.

7.5.2 TROUBLE SHOOTING - FAULT CLEAR AUDIBLE NOT WORKING

a) Check as 7.5.1 sections (a), (c), (e), (f) and (g).

b) Check 'SYSTEM HANDBOOK' that the fault clear audible is included.

c) The fault clear audible can be 'suppressed' if main audible is on - check this suppression is not mistaken for malfunction - consult 'SYSTEM HANDBOOK'.

NOTE: Audible driver circuits are open collector transistors (5 Watt maximum) They can be damaged by short circuits or un-suppressed relay coils.

7.6 TROUBLE SHOOTING - GROUP LAMPS AND RELAYS

Group lamps and external group relays are driven from standard I.O card output drivers. Before proceeding check the specification and commissioning sections for full details of the group lamps and relays. Consult the 'SYSTEM HANDBOOK' for details of the relevant lamp and/or relay group(s), sequence and group(s) number.

7.6.1 TROUBLE SHOOTING - GROUP LAMPS/RELAYS NOT OPERATING

a) Check group Lamp Test function - This can be separate input or combined with the main lamp test. See System Handbook.

b) Open circuit relay coil/lamp filament - check.

c) No supply voltage - check for voltage and polarity.

d) Driver transistor open circuit due to short circuit damage - change I/O module.

e) Check no inhibit circuit is operated.

f) Check alarms to operate in the group are detailed to do so in 'SYSTEM HANDBOOK'.

7.7 TROUBLE SHOOTING - REED RELAYS

The reed relay cards are operated by the C.P.U. to the required operating mode Check the commissioning and specification sections for full details of reed relays. Consult the 'SYSTEM HANDBOOK' for details of operating mode of reed relays,

7.7.1 TROUBLE SHOOTING - REED RELAY NOT OPERATING

a) Check System Handbook for correct relay assignment / alarm point / grouping.

b) Damaged relay - check contact operation

c) If (b) is not OK - Change relay card.

d) Check front terminal block (or IDC Connector and Ribbon cable if 16RR)

e) Check edge connector for damage.

f) Check no inhibit circuit is operating.

g) Check the alarm system is operating correctly.

h) If (g) is not OK check relevant paragraph. repair before returning to this paragraph.

7.8 TROUBLE SHOOTING - POWER SUPPLY AND REGULATOR UNITS

The logic box regulator supplies 5V for the logic and 24V regulated alarm contact wetting voltage. Various other external supplies are available to meet the system requirements. Check system Handbook for full details of P.S.U. supplied with the system.

7.8.1 TROUBLE SHOOTING - VARIOUS P.S.U. PROBLEMS

a) INTERNAL REGULATOR - NO 5V (CHECKED ON PINS 1 AND 32 ON CPU SLOT AND ON PINS 1 AND 30 ON I/O SLOTS OF MOTHERBOARD) See 7.8.2 below.

1. Short circuit load - clear fault.
2. Regulator series components open circuit. Replace regulator card.
3. No 24V supply - check and restore.
4. P.C.B. damage - check - replace regulator if necessary.

b) INTERNAL REGULATOR - 5V TOO HIGH (GREATER THAN 5.25V)

1. Switching regulator damaged - replace -Regulator card.

c) INTERNAL REGULATOR - NO 24V REGULATED SUPPLY

1. 24V regulator damaged - Replace the Regulator card.
2. No supply voltage - Restore supply.

d) EXTERNAL P.S.U. - NO RAW 24V SUPPLY

1. Mains input lost/fuse blown.
2. Output fuse blown.
3. Constantly blown O/P due to short circuit. Remove short circuit.
4. Check zener diode is not short circuit.
5. Check DC/DC regulator if applicable.

7.8.2 EXTENDER CARD

An extender card code EXC-90 is available to facilitate checking of 5V supply etc. See page 9.2

8 ROCHESTER INSTRUMENTS ALARM SYSTEMS DEFINITIONS

ACCEPT A control function which alters an annunciator in the flashing state to a steady state and simultaneously silences the audible.

ALARM Plant fault, abnormal condition, or warning requiring indication.

ANALOGUE INPUTS Inputs of analogue form wired into appropriate analogue cards to allow alarms to be derived from present trip points. See also INPUTS.

ANNUNCIATOR A visual indicator, sometimes referred to as a WINDOW.

AUDIBLE An audible warning signal used in conjunction with the visual indicators; also referred to as a horn.

AUTOMATIC RESET - See Reset

AUXILIARY OUTPUTS The main outputs from an alarm system are the individual annunciators for each input. All other outputs are referred to as AUXILIARY OUTPUTS, i.e., individual and group relays; individual and group repeat annunciators, first up indicator and audibles.

BEACONS A high powered indicator, generally a group repeat indicator.

CASCADING Interconnecting of a logic box to others as the first and subsequent systems overflow their limits of software and/or hardware.

CHANNELS - See 'WAYS'.

CLEAR HORN A sequence which operates an auxiliary horn when an alarm clears. Only used with manual reset sequence. See sequence tables.

CLEAR HORN SUPPRESSION A refinement to the clear horn sequence whereby operation of the main audible (by another alarm) will suppress the less important clear horn. Clear horn sounds after main horn is accepted, and is silenced, when an accepted cleared alarm state exists and the alarm is reset.

CODES All assemblies used in the alarm system are coded. The codes must be referred to when ordering spares etc. Codes are also used to abbreviate alarm functions. See Codes list.

CONTROL SWITCHES The alarm is controlled by a number of control switches. Generally the switches are volt free normally open momentary action switches. However, inhibit switches may be maintained action.

The controls are:

ACCEPT
FIRST UP ACCEPT (SEQ. M7 AND M8 ONLY)
RESET
LAMP TEST
GROUP LAMP TEST
FUNCTION TEST
HORN CANCEL (or SILENCE)
INHIBIT
FIRST OUT RESET (SEQ. M13 ONLY)

DIGITAL INPUTS Inputs from normally open or normally closed initiating contacts. See also INPUTS.

DISPLAY Array of annunciators driven by the alarm system, sometimes referred to as a FASCIA. Rochester offer a wide choice of display types and sizes.

DUAL FLASH FIRST UP A sequence, using two flash rates, to give first up discrimination. See sequence tables (M7 And M8).

EDITABLE SYSTEM Alarm system configuration data can be edited by the user by means of the RS232 Edit Port on the appropriate CPU. Edit mode is entered by operating a KEYSWITCH which takes system off-line during the edit process.

FAIL SAFE RELAY A relay which is normally energised in the normal - non-alarm condition.

FIRST UP ACCEPT A Control switch function which accepts the first up alarm in a Dual Flash First Up sequence, thereby terminating the current first up indication. Used on sequence tables M7 and M8 only.

FIRST UP RESET A control switch function which resets the first up alarm in an Intermittent Flash First Up sequence, thereby terminating the current first up indication. Used on sequence table M13 only.

FIRST UP INDICATOR An indicator (generally incorporated within the first up accept switch) which illuminates when a first up alarm requires acceptance.

FIRST UP SEQUENCE An annunciator sequence used to discriminate between the first and subsequent alarms. (See Single, Dual and Intermittent Flash First Up paras)

FLASH RATES The alarm annunciator flashing frequency.

FLEETING ALARM A momentary alarm condition as opposed to signal noise or voltage transient. The duration of the fleeting alarm would need to be sufficient for the system response time to lock on to the alarm.

FUNCTION TEST A control function which simulates a full **"**All Alarms On**"** condition.

GROUPING In every alarm system it is necessary to have some grouping of functions. Grouping can be control switch groups, output groups or first up groups.

GROUP INHIBIT A GROUP INHIBIT is a control switch function which, if operated, will inhibit the operation of any alarms in the inhibit group. Removal of the inhibit will allow the alarms to operate at the start of their sequence. First up alarms will NOT be discriminated if they come up during inhibit.

GROUP LAMP OR GROUP REPEAT ANNUNCIATOR is a group output with an annunciator sequence as follows:

Any alarm in the group will cause the group repeat annunciator to flash with the individual alarm annunciator, both group repeat annunciator and the individual annunciator go steady on accept. The group repeat annunciator will reflash on receipt of any other alarm in the group coming up. The group repeat annunciator will go off when all the alarms in the group are cleared and reset.

GROUP LAMP TEST A control switch function which checks the group annunciators and associated logic. It can be a separate input or assigned to the same input as the Main Lamp Test Switch..

GROUP RELAY A group relay is a relay driven from a grouped output. The group relay can have the following sequences:

		CONDITION		**CODE**	
1	Relay energise on	Alarm on	De-energise on Alarm clear	CS	(**C**LEAR-**S**TANDARD)
2	Relay de-energise on	Alarm on	Energise on Alarm clear	CF	(**C**LEAR-**F**AILSAFE)
3	Relay energise on	Alarm on	De-energise on Accept	AS	(**A**CCEPT-**S**TANDARD)
4	Relay de-energise on	Alarm on	Energise on Accept	AF	(**A**CCEPT-**F**AILSAFE)
5	Relay energise on	Alarm on	De-energise on Reset	RS	(**R**ESET-**S**TANDARD)
6	Relay de-energise on	Alarm on	Energise on Reset	RF	(**R**ESET-**F**AILSAFE)

GROUP REFLASH RELAY A group relay which is normally energised (failsafe). It de-energises an occurrence of first alarm in group, then gives a 300mS pulse on occurrence of each subsequent alarm. Re-energises when all alarms in group are cleared and reset.

HORN See Audible, Urgent Audible and Non-urgent Audible.

HORN CANCEL (or SILENCE) is a control switch function which mutes the audible without interfering with the indicator sequences. (Also referred to as SILENCE)

INDICATORS (or ANNUNCIATORS) (sometimes referred to as lamps, screens, fascia, window) are the visual displays which operate in the sequence specified.

INDIVIDUAL RELAY An individual relay giving an auxiliary relay output. The relay can have the same sequences as the group relay (see GROUP RELAY).

INDIVIDUAL REPEAT An INDIVIDUAL REPEAT ANNUNCIATOR is an additional indicator (wired in parallel) to the main annunciator to give identical remote indication of the main annunciator.

INHIBIT An alarm can be inhibited either individually or in groups. Inhibiting an alarm prevents it from operating any outputs, be it individual (annunciator) or group (horn, group repeat annunciators, group relays).

INPUTS The system has three types of input: a mandatory 'POWER MONITOR' input (wired to an “INPUT COMMON” Terminal), ALARM INPUTS and CONTROL INPUTS. The standard alarm inputs (digital) are from volt free normally open or normally closed contacts, and Control inputs are from normally open contacts. Alarm inputs can be ANALOGUE wired into the appropriate Analogue Input Card.

INTERMITTENT FLASH FIRST UP SEQUENCE A first up discrimination sequence which indicates a first up alarm by means of an intermittent fast flash indicator. (See Sequence table M13)

KEYSWITCH MODULE See Editable System.

LAMP TEST This is a control switch function which checks the annunciators and the associated logic.

LOCKING Locking is an alarm MODE which allows the alarm system to LOCK ON TO A MOMENTARY FAULT provided its duration is within the input response time parameters - see RESPONSE TIME.

LOGIC BOX The logic box is the sub-rack (crate) which contains the system logic and regulator.

MANUAL RESET - See RESET.

NON-LOCKING Non-locking is an alarm MODE which ensures the alarm system will NOT LOCK ON TO A MOMENTARY FAULT.

NORMALLY CLOSED Field contacts or relay contacts which are normally closed in the healthy state and open on alarm.

NORMALLY OPEN Field contacts or relay contacts which are normally open in the healthy state and closed on alarm.

NON-URGENT AUDIBLE Audible which operates on selected alarms which are specified as non-urgent - See URGENT AUDIBLE.

OUTPUTS This system has six standard outputs:

Individual annunciator
Individual relays
First up indicator
Audibles
Group repeat annunciators
Group relays

POINT Used in software to identify an alarm way - See 'WAYS'.

POWER MONITOR An input from the “INPUT COMMON” supply. Loss of this input initiates a power break protection procedure within the system.

POWER SUPPLY UNIT External supply unit to feed the alarm system.

PROGRAMMING The three PROGRAMMING functions referred to in the system are:

1 The EPROM firmware programming which customises the system.
2 The 8 way DIL switch on the I/O CARD used to set normally open or closed alarm input contacts.
3 I/O board address switches programmed to suit the program in #1.

RECALL Sometimes referred to as REFLASH. An alarm sequence which causes the annunciator to flash and the audible to sound after accept if the alarm clears and re-occurs, prior to reset. (Manual reset alarms only).

REGULATOR The integral voltage REGULATOR, in the LOGIC BOX which provides the +V "INPUT COMMON" field contact wetting voltage and the system logic 5V supply.

RELAY MODE AND TYPES Relays can be defined as FAIL SAFE (normally energised) or STANDARD (normally de-energised); individual or group; reed; power or solid state.

REPEAT(ER)S Repeat(er)s refer to indicators or annunciators only (i.e., not relays) and can be either individual or group.

RESET Reset is a control switch function which is used in manual reset systems, which causes the annunciator of an accepted and cleared alarm to return to normal. In Automatic Reset systems the annunciator of an accepted alarm will return to normal automatically when the alarm condition clears.

RESPONSE TIME Momentary alarms must be present for at least 16mSEC for the alarm system to respond.

SEQUENCES Annunciators, audibles and relays have different sequences to operate. The sequences referred to in the manual and in ROCHESTER INSTRUMENTS sequence tables detail the standard variations possible.

SILENCE See Horn Cancel.

SINGLE FLASH FIRST UP This is a standard first up discrimination using one (fast) flash rate for FIRST UP alarm and steady indication for subsequent alarms (See sequence tables M5 and M6).clears.

SLOW FLASH ON CLEAR An alarm sequence which causes the annunciator to slow flash when an accepted alarm clears.

STANDARD RELAY Normally de-energised in the non-alarm state as opposed to a failsafe relay.

TRIP POINT Preset value(s) at which analogue inputs will cause alarm(s) to be initiated.
e.g., LO-LO, LO, HI, HI-HI.

URGENT AUDIBLE Audible which operates on selected alarms which are specified as urgent - See NON-URGENT AUDIBLE.

WAYS An alarm input to the system and its associated outputs.

WINDOW A single indicator or annunciator within a display.

ZENER BARRIER An intrinsically safe input device for use in hazardous areas.

9. CODING

9.1 LOGIC BOXES AND MODULES

DESCRIPTION	CODE	PART No:
Logic Box 3U front or rear mounting - 24V	LBM(W)	8025-122
Logic Box 3U front or rear mounting - 50V	LBM(W)	8025-123
Logic Box 6U front or rear mounting - 24V	LB2M(W)	8025-124
Logic Box 6U front or rear mounting - 50V	LB2M(W)	8025-125
Central Processor Unit (8 Bit) Basic - No Comms (Going Obsolete)	CPU-90A	8025-177
Central Processor Unit (8 Bit) Basic - No Comms	CPU-91B	8025-344
Central Processor Unit (8 Bit) with RS232 Port	CPU-92B	8025-339
Central Processor Unit (16 Bit) with RS422 Port	CPU-166	8025-357
Central Processor Unit (16 Bit) with RS232 Port	CPU-168	8025-359
8 Way Input / Output Card - 24V Standard	8I/O-90A	8025-145
8 Way Input / Output Card - 24V Isolated	8I/O-91A	8025-187
8 Way Input / Output Card - 50V Isolated	8I/O-92A	8025-209
8 Way Input / Output Card - 125V Isolated	8I/O-95A	8025-239
16 Way Input Card - 24V Standard	16I-90A	8025-146
16 Way Input Card - 24V Isolated	16I-91A	8025-188
16 Way Input Card - 50V Isolated	16I-92A	8025-210
16 Way Input Card - 125V Isolated	16I-95A	8025-240
16 Way Input Card - 24V Standard (IDC Conn.)	16I-96	8025-194
16 Way Input Card - 50V Isolated (IDC Conn.)	16I-97	8025-155
16 Way Input Card - 24V (0V Inputs)	16I-98A	8025-193
16 Way Input Card - 24V (0V Inputs - IDC Conn.)	16I-99	8025-167
16 Way Input Card - 110V Isolated (IDC Conn.)	16I-124	8025-572
16 Way Input Card - 125V Isolated - 0V Inputs	16I-125	8025-533
16 Way Output Cards, 63V Max, 5 Watt (NPN)	16/O-90	8025-139
16 Way Output Cards, 63V Max, 5 Watt (NPN) (IDC Conn.)	16/O-91	8025-166
16 Way Output Cards, 48V Max, 5 Watt (PNP)	16/O-92	8025-174
16 Way Output Cards, 24V Max, 5 Watt (PNP)	16/O-93	8025-175
4 Input / 6 Output Card, 24V Standard	I/R-90	8025-157
4 Input / 6 Output Card, 24V Isolated	I/R-91	---
4 Input / 6 Output Card, 50V Isolated	I/R-92	8025-214
4 Input / 6 Output Card, 50V Non-Isolated (RLE/F WATCHDOG)	I/R-93	8025-227
4 Input / 6 Output Card, 24V Non-Isolated (RLE/F WATCHDOG)	I/R-94	8025-228
8 Way Reed Relay Card, N/O Relays	8RR-90	8025-137
8 Way Reed Relay Card, N/C Relays	8RR-91	8025-180
16 Way Reed Relay Card, N/O Relays (IDC Conn.)	16RR-90	8025-164
16 Way Reed Relay Card, N/C Relays (IDC Conn.)	16RR-91	8025-201
5 Way Power Relay Card, C/O Relays 24V	5PR-90	8025-142
5 Way Power Relay Card, C/O Relays, 50V	5PR-91	8025-182
Regulator - 3U LB, 24V Standard	REG-90A	8025-159

DESCRIPTION	CODE	PART No:
Regulator - 3U LB, 24V Isolated	REG-91A	8025-197
Regulator - 6U LB, 24V Standard	REG-92A	8025-215
Regulator - 6U LB, 24V Isolated	REG-93A	8025-229
Regulator - 6U LB, 50V Standard	REG-94A	8025-235
Regulator - 6U LB, 50V Isolated	REG-95A	8025-242
Regulator - 3U LB, 50V Standard	REG-96A	8025-244
Regulator - 3U LB, 50V Isolated	REG-97A	8025-246
8 Way Input Line Monitor Card, 24V Standard (10K Res.)	8/ILM-90	8025-148
8 Way Input Line Monitor Card, 24V Isolated (10K Res.)	8/ILM-91	8025-190
8 Way Input Line Monitor Card, 24V Standard (2K Res.)	8/ILM-92	8025-211
8 Way Input Line Monitor Card, 24V Standard (2K Res.)	8/ILM-93	8025-225
8 Way Universal Input Card, 12V d.c. Sink or Source	8U/I-90	8025-150
8 Way Universal Input Card, 24V d.c. Sink or Source	8U/I-91	8025-191
8 Way Universal Input Card, 50V d.c. Sink or Source	8U/I-92	8025-212
8 Way Universal Input Card, 110V d.c. Sink or Source	8U/I-93	8025-226
8 Way Universal Input Card, 220V d.c. Sink or Source	8U/I-94	8025-234
8 Way Universal Input Card, 110V a.c. 50/60Hz	8U/I-95	8025-241
8 Way Universal Input Card, 240V a.c. 50/60Hz	8U/I-96	8025-243
8 Way Universal Input Card, 24V d.c. (PLC) Sink or Source	8U/I-97	8025-245
8 Way Universal Input Card, 24V a.c. 50/60Hz	8U/I-98	8025-247
8 Way Universal Input Card, 6V d.c. Sink or Source	8U/I-99	8025-250
Alarm Interface Card, System Cascade (RS232 Port)	ALIN-96A	8025-231
Alarm Interface Card, System Cascade (RS422 Port)	ALIN-97A	8025-236
Address Card, 24V or 50V Systems	ADD-90A	8025-518
Keyswitch Module, Edit Keyswitch	KSM-92	8025-288
8 Way Analogue Input Card, Isolated 4-20mA	8-IAM-90	8025-500
8 Way Thermocouple Input Card	8-TC-90	2703-005
8 Way RTD Input Card	8RTD-90	8025-595
Extender Card (For Diagnostic / Test purposes)	EXC-90	8025-109
Front Panel Assembly, 8I/O Cards	FP-8I/O	8025-112
Front Panel Assembly, 16/I Cards	FP-16/I	8025-113
Front Panel Assembly, 16/O Cards (Standard)	FP-16/O	8025-115
Front Panel Assembly, I/R Cards	FP-I/R	8025-130
Front Panel Assembly, 8RR Cards	FP-8RR	8025-118
Front Panel Assembly, 5PR Cards	FP-5PR	8025-110
Front Panel Assembly, REG-90A/91A	FP-REG-90A	8025-116
Front Panel Assembly, REG-92A/97A	FP-REG-92A	8025-117
Front Panel Assembly, ILM Cards	FP-ILM	8025-111
Front Panel Assembly, U/I Cards (DC)	FP-U/I-DC	8025-127
Front Panel Assembly, U/I Cards (AC)	FP-U/I-AC	8025-126
Front Panel Assembly, 16/O-92/93	FP-16/O-93	8025-535
Blanking Panels, Standard 6E (I/O Slots)	BP-90	8030-081
Blanking Panels, Small 5E (CPU Slot)	BP-91	8030-083
Blanking Panels, Large 7E (slot 23)	BP-92	8030-084
Blanking Panels, Filler 1E	--	8030-143

9.2 POWER SUPPLY UNITS

DESCRIPTION	CODE	PART No:
Mains Input - 24V d.c. Output - 4Amp (No relays)	PSU-90	8025-033
Mains Input - 24V d.c. Output - 10Amp (No relays)	PSU-91	8025-034
Mains Input - 24V d.c. Output - 10Amp (2 relays)	PRR24SD50	8025-032

The above units are moving towards becoming obsolete and will be replaced by the following enhanced range.

Mains Input - 24V d.c. Output - 5 Amp	AN6160	8025-528
Mains Input - 24V d.c. Output - 10 Amp	AN6161	8025-529
48V d.c. Input - 24V d.c. Output - 5 Amp	AN6162	8025-530
125V d.c. Input - 24V d.c. Output - 5 Amp	AN6163	8025-531
250V d.c. Input - 24V d.c. Output - 5 Amp	AN6164	8025-532

An optional relay unit is available for above units -

Optional Relay Module (add suffix /R3 to above codes)	8025-527

Power Supply Units, not covered by above range can be supplied - Consult ROCHESTER.

9.3 SUPPLY FILTERS

DESCRIPTION	CODE	PART No:
250V max / DC to 400Hz / 10Amp	SF-90	4864-028
250V max / DC to 400Hz / 20Amp	SF-91	4864-026

9.4 DISPLAY FASCIAS

Display - Low Cost, 03 Series, No Controls, 4 Wide	03-MLS4/-	--
Display - Low Cost, 03 Series, With Controls, 4 Wide	03-MLCS4/-	--
Display - Low Cost, 03 Series, No Controls, 8 Wide	03-MLS8/-	--
Display - Low Cost, 03 Series, With Controls, 8 Wide	03-MLCS8/-	--
Display - 03 Series, Hardwired, Any Size	03-MS/Width x Height	
Display - AN6150 Series (See Separate Brochure)	AN6150---	--
Display - SLC30 and 40 Series	SLC30/40	_

Displays not covered by above range, and mimic panels can also be supplied - Consult ROCHESTER.

9.5 LAMP SEQUENCES

DESCRIPTION	ROCHESTER SEQUENCE TABLE CODE:	ISA SEQUENCE CODE:
Auto Reset, Non-Locking, Non First-Up	M1	A4
Auto Reset, Locking, Non First-Up	M2	A
Manual Reset, Non-Locking, Non First-Up	M3	M4
Manual Reset, Locking, Non First-Up	M4	M

Auto Reset, Locking, Single Flash First-Up	M5	F1A
Manual Reset, Locking, Single Flash First-Up	M6	F1M
Auto Reset, Locking, Dual Flash First-Up	M7	_
Manual Reset, Locking Dual Flash First-Up	M8	_
Group Lamp (Any Sequence)	M9	_
Horn Cancel (Any Sequence)	M10	Option 1
Manual Reset with Slow Flash on Fault Clear	M11	R
Manual Reset with Reflash (or Recall)	M12	_
Manual Reset with Reflash and Slow Flash on Fault Clear	M11/12	R
Auto-Reset, Locking with Intermittent Flash First-Up	M13	F3A

The Rochester sequences cover all of the ISA Basic and FIRST OUT sequences and most of the associated options.
Rochester provide sequences which are not identified by the ISA Tables.
Other Special Sequences are available - Consult ROCHESTER.

9.6 SOFTWARE SEQUENCE TABLES

A combination of two of the following software tables are installed on the PROGRAM PROM(S) in the CPU and coded on the EPROM Label. These are used to achieve the above range of lamp sequences. Full details are included in the SYSTEM 90 Programming and Editing Manual.

DESCRIPTION	SOFTWARE TABLE CODE
Single Flash First-Up	F1
Single Flash First-Up with Slow Flash on Clear (After Accept)	F1S
Single Flash First-Up with Subsequent Horn	F2
Dual Flash First-Up	F2S
Intermittent Flash First-Up	F3
Reflash (or Recall)	RV (or R)
Reflash with Slow Flash on Clear (after Accept)	RS

Other special software tables are available - Consult ROCHESTER.

9.7 CONTROL SWITCH FUNCTIONS

FUNCTION	CODE
Accept (or Acknowledge)	A
First Up Accept (used on Seq. M7/M8 only)	FUA
Horn Cancel (or Silence)	HC (or SIL)
Lamp Test	LT
Group Lamp Test	GLT
Function Test	FT
Reset	R
Group Inhibit	GI
First Out Reset (used on Seq. M13 only)	FOR

9.8 OPERATING MODES

DESCRIPTION	CODE

Automatic Reset	AR
Manual Reset	MR
Normally Open (When Healthy)	NO
Normally Closed (When Healthy)	NC
Locking (or Latching)	L
Non Locking (or Non-Latching)	NL

9.9 RELAYS AND RELAY OPERATING MODES

DESCRIPTION	**CODE**
Reed relay (as in 8RR or 16RR)	RR
Power relay (as in 5PR)	PR
Relay Mode - Alarm on to Alarm **C**lear - **S**tandard	CS
Relay Mode - Alarm on to Alarm **C**lear - **F**ailsafe	CF
Relay Mode - Alarm on to **A**ccept - **S**tandard	AS
Relay Mode - Alarm on to **A**ccept - **F**ailsafe	AF
Relay Mode - Alarm on to **R**eset - **S**tandard	RS
Relay Mode - Alarm on to **R**eset - **F**ailsafe	RF