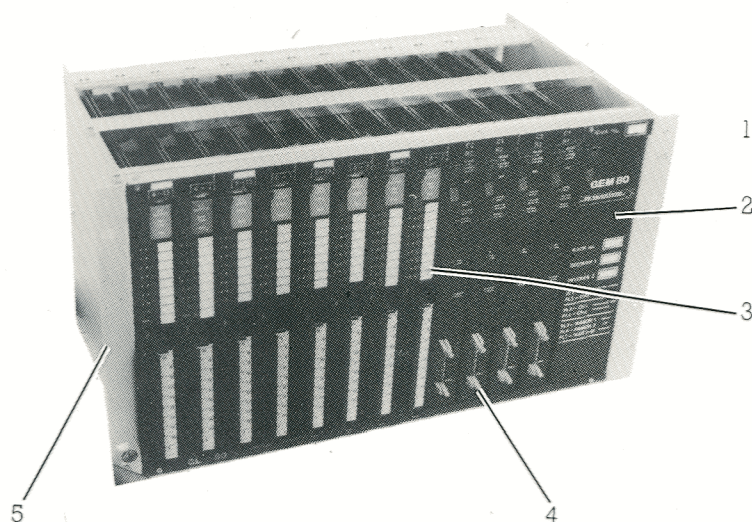




Basic I/O Changeover System

8874/8875



1. Basic I/O Changeover Module 8137
2. Blanking Panel
3. Compact I/O Modules (8 off)
4. Connectors to GEM 80 Controllers
5. Subrack

DESCRIPTION

The basic I/O changeover system is intended to maintain the basic I/O highway in the event of one of two GEM 80 controllers becoming inoperative. The basic I/O changeover system requires two GEM 80 controllers both identical and containing identical user programs. In the event of one controller becoming inoperative the standby can then be brought on line.

The combined reliability of the two controllers and associated basic I/O changeover modules become insignificant compared with the reliability of the I/O module system. The reliability is therefore sensibly maintained at the mean time between failure of the plant I/O.

The subrack backplane carries ribbon cable connectors for terminating the basic I/O ribbon cables from the basic I/O hardware. Connections of external watchdog, changeover status signals and changeover system cross-coupling signals are also made via ribbon cable connectors mounted on the backplane.

Connections from the basic I/O highways of the GEM 80 controllers are made via ribbon cables to the front of the basic I/O changeover modules 8137.

8874 Subrack

The basic I/O changeover system is housed in a 19" Compact I/O subrack. This subrack accommodates up to 12 modules. Four module positions are dedicated to basic I/O changeover modules 8137. Up to eight standard compact I/O modules plug into the remaining positions available in the subrack.

Two address thumbwheel switches are provided on the backplane to select the necessary addressing for the eight compact I/O modules.

8875 Subrack

A 4-slot basic I/O changeover subrack 8875 is also available. This functions as the 8874 less the facility for 8 slots of compact modules.

FEATURES

- Automatic Basic I/O Changeover Control
- Minimum changeover time
- No external power supply required
- Compact I/O subrack mounting
- Manual changeover facility
- Solid state changeover – no relays employed

SPECIFICATION SUMMARY

Changeover Delay	: One controller scan maximum
Power Supply	: Provided from GEM 80 controllers
Mounting Arrangement	: 19 inch 483mm subrack
Weight of subrack without any modules	: 3kg approximately
Operating Temperature	: 0 - 60°C
Storage Temperature	: - 20°C to 70°C
Environment and Tests	: GEM 80 standard

DETAILED SPECIFICATION

Contents	Page No.
1. Hardware Configuration	2
2. Basic I/O Changeover Module 8137	2
3. Basic I/O Changeover Watchdog Termination Panel	3
4. User Connections	4
5. Typical System Configuration	5
6. System Operation	6
7. Subrack Addressing	6
8. System Considerations	6
9. Mounting Details	7
10. Commissioning/Test Switches	7

1. Hardware Configuration

The 8874 subrack is divided into seven sections. The extreme right hand section, covered by a blanking panel, contains ribbon cable connectors and address decoding switches.

The next two sections each accommodate two Basic I/O Changeover Modules (8137). If only one basic I/O ribbon is used, then the two right hand modules are used, (R1C1 and R1C2, Figure 1).

The remaining four sections each accommodate two I/O modules, and serve either a group of 16 input points or 16 output points. Within any section inputs and outputs cannot be mixed.

Figure 1 shows a typical layout for a complete subrack.

		R2		R1			
B3	A2	B1	A0	C2C1	C2C1		
Compact Output Modules	Compact Input Modules	Compact Output Modules	Compact Input Modules	8137 Module 4	8137 Module 3	8137 Module 2	8137 Module 1
						Blanking Panel	

R1 = Ribbon 1
R2 = Ribbon 2
C1 = Controller 1
C2 = Controller 2

Figure 1 - Subrack Layout

Restrictions on the use of the eight I/O slots are detailed in section 3 of the 8868/8869 Compact I/O subrack product data sheet.

The 8875 suback is identical to the 8874 subrack except for the accommodation of I/O modules.

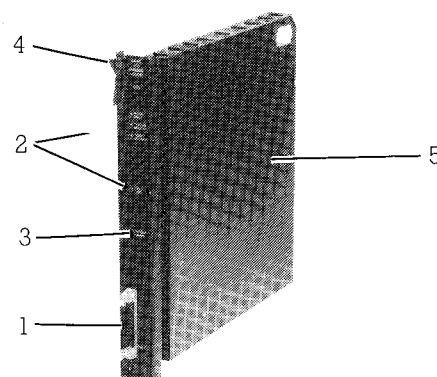
2. Basic I/O Changeover Module 8137

2.1 Introduction

The circuit arrangement of the Basic I/O Changeover Module accommodates the asynchronous timing of the basic I/O scan of each controller.

Each module covers the basic I/O range A0 - A15, B0 - B15 or A16 - A31, B16 - B31 dependent upon which slot in the subrack it occupies.

Figure 2 shows the Basic I/O Changeover Module.



1. Ribbon Connector to GEM 80 Controller
2. Status Lamps
3. Manual Chageover Pushbutton
4. Ejection Handle
5. Moulded Cover

Figure 2 - Basic I/O Changeover Module 8137

Each 8137 module consists of two printed circuit boards. One carrying the memory and associated address decoding circuits, the other carrying the sequencing logic, electronic changeover switches, status indicating lamps, etc.

These printed circuit boards are housed within plastic covers so forming a single width module.

The following status indicating lamps are included on the front panel of each 8137 module.

'WDOG INPUT'	In series with the watchdog input signal to the Basic I/O Changeover Module. Illuminated when watchdog on.
'SYSTEM HEALTHY'	In series with the system healthy output driver. Illuminated when Basic I/O Changeover System is healthy.
'WDOG OUTPUT'	In series with watchdog output driver. Illuminated when watchdog output signal is 'low' impedance.
'ON LINE'	In series with 'On Line' signal output driver. Illuminated when a particular Basic I/O Changeover Module is connecting controller to basic I/O hardware.

2.2 Electrical Specification for Status Signals

Watchdog Input

Input Voltage for ON State	: 12V d.c. minimum : 50V d.c. maximum
Input Current for ON State	: 7mA @ 12V : 12mA @ 50V
Input Voltage for OFF State	: 4.5V maximum
Input Current for OFF State	: 0.7mA maximum
Common Mode Isolation Voltage	: 200 volts maximum

Watchdog and Status Outputs:-

Open Collector Transistor Outputs

Maximum plant side supply volts	: 50V d.c.
Maximum sink current	: 40mA
ON State voltage drop	: 2 volts maximum
Maximum OFF state leakage current	: 1.0mA maximum

Cross Coupling Signals:-

To provide the facility for connecting more than four Basic I/O changeover modules together two further ribbon cable connectors are fitted to the backplane. The signals from the Basic I/O changeover module which drive these lines are rated to allow up to four complete subracks of changeover modules (16 modules total) to be cross coupled.

Specification of 8137:-

Changeover Delay	: One controller scan maximum
Power Consumption per I/O Changeover Module	: 100mA @ 15V from Basic I/O highway
Weight of 8137 Module	: 1kg approx.
Dimensions of 8137 Module	: 223 x 28 x 250 (high x wide x deep)

3. Watchdog Termination Panel 8542

3.1 Introduction

This module has been designed to provide a robust interface between the Basic I/O changeover backplane and the system/cubicle wiring.

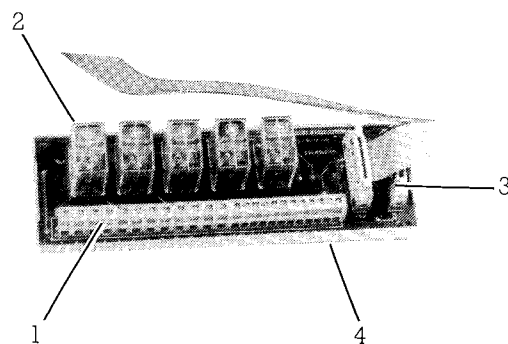
The termination panel 8542 is supplied in a moulded card housing suitable for mounting on DIN rail to DIN 46277 Parts 1 or 3.

Figure 3 shows the Watchdog Termination Panel.

3.2 User Connections

Two ribbon cables (20-way) connect the 8542 termination panel to the Basic I/O changeover backplane.

8542 Ribbon Cable Designation	Basic I/O Changeover Backplane Ribbon Cable Designation
PL1 connects to	PL3
PL2 connects to	PL4



1. Plant Terminals
2. Relays
3. 20-way Ribbon Connectors
4. Moulded Base

Figure 3 - Watchdog Termination Panel 8542

24 screw terminals are provided for connection of controller Watchdog inputs and status output signals. These terminations are suitable for conductor size:

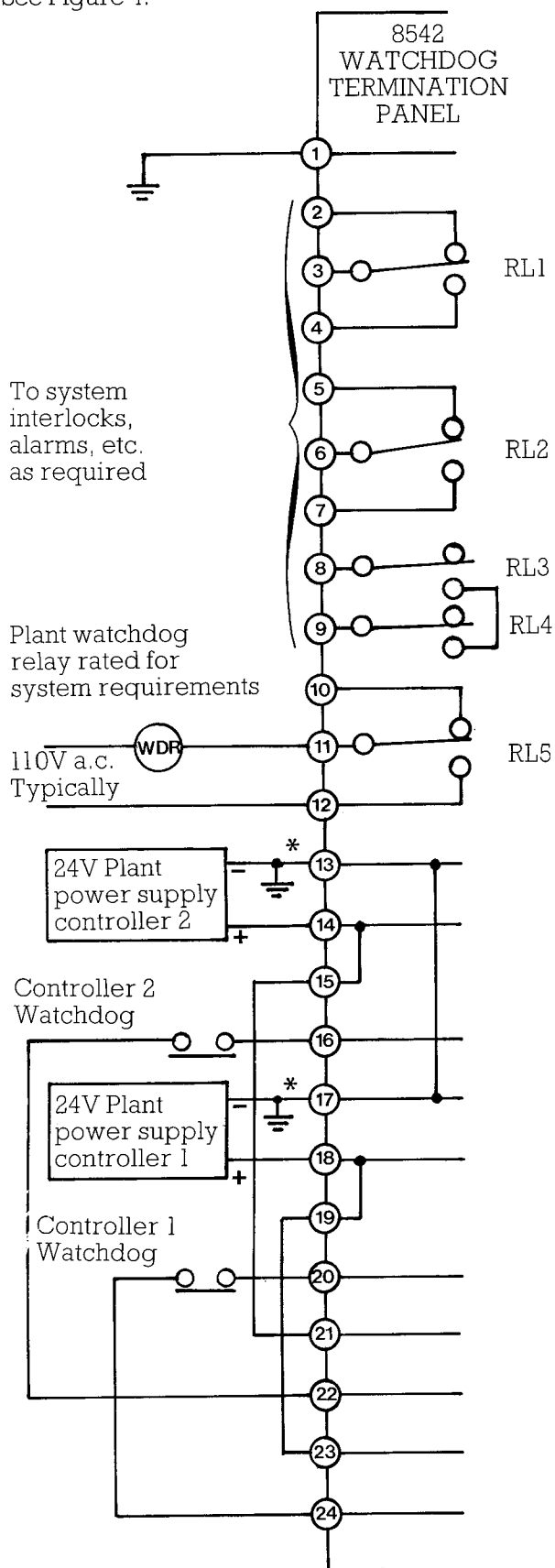
- 0.5 - 2.5mm² flexible or
- 0.5 - 4mm² solid

The connectors have the following function:

Terminal	Function
1	Earth to Relay Frame
2	Relay N.C. Controller 2 'On Line'
3	Output Common Controller 2 'On Line'
4	N.O. Controller 2 'On Line'
5	Relay N.C. Controller 1 'On Line'
6	Output Common Controller 1 'On Line'
7	N.O. Controller 1 'On Line'
8	Relay N.O. System Healthy?
9	Output N.O.
10	Relay N.C. Watchdog Output
11	Output Common Watchdog Output
12	N.O. Watchdog Output
13	Plant Power Supply 0 volts Controller 2
14	Plant Power Supply + 24 volts Controller 2
15	Plant Power Supply to Watchdog Contact Controller 2
16	Watchdog Input from Controller 2
17	Plant Power Supply 0 volts Controller 1
18	Plant Power Supply + 24 volts Controller 1
19	Plant Power Supply to Watchdog Contact Controller 1
20	Watchdog Input from Controller 1
21	Electrical Interlock Controller 2
22	Electrical Interlock Controller 2
23	Electrical Interlock Controller 1
24	Electrical Interlock Controller 1

3.3 Typical Plant Connections

See Figure 4.



*Positive earth option available (8542-4002)

Figure 4 - Typical Plant Connections

3.4 Relay Contact Ratings:-

Resistive Rating	: A.C. 200VA 5A 250 volts
	: D.C. 100W 5A 250 volts
Plant Side Power Supply Rating	
Minimum Input Voltage	: 19 volts
Maximum Input Voltage	: 30 volts
Current Requirement	: 340mA max. (max. 4 of 5 relays energised)

4. User Connections

4.1 Electrical Interlocking

A total of six 4.8mm 'Faston' push-on tab terminals are provided for electrical inter-locking.

'Faston' tabs 1 and 2 being provided for interlocking the 8 slots of basic I/O module.

'Faston' tabs 3 and 5 being provided for interlocking the two I/O changeover modules of controller 1 and tabs 4 and 6 for interlocking the two I/O changeover modules of controller 2.

The electrical interlock facility for the basic I/O changeover modules on tabs 3 - 6 is also connected to the 20-way ribbon cable connectors PL3 and PL4.

Each individual interlock circuit provides a series connection through the modules. The subrack backplane is provided with a link across each module interlock. This link should be removed if a module is to be fitted in that position.

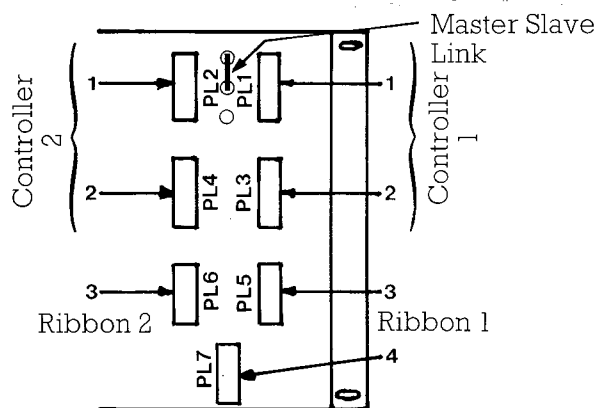
4.2 Watchdog Input and System Status Output Connections

PL3 and PL4 on the basic I/O changeover subrack backplane provide separate connection facilities for the watchdog and related signals of controller 1 and controller 2.

PL3	PL4
1 Controller 1 W/dog Input	No Connection
2 Plant 0 Volts	No Connection
3 No Connection	Controller 2 W/dog Input
4 No Connection	Plant 0 volts
5 Controller 1 Diode or	Controller 2 Diode
6 Plant 0 Volts	Or
7 Mechanical Coding	Plant 0 Volts
8 No Connection	No Connection
9 Controller 1 W/dog Output Collector	Mechanical Coding
10 Controller 1 W/dog Output Emitter	Controller 2 W/dog Output Collector
11 Controller 1 'On Line' Output Collector	Controller 2 W/dog Output Emitter
12 Controller 1 'On Line' Output Emitter	No Connection
13 No Connection	No Connection
14 No Connection	Controller 2 'On Line' Output Collector
15 Controller 1 'System Available' Output Collector	Controller 2 'On Line' Output Emitter
16 Controller 1 'System Available' Output Emitter	Controller 2 'System Available' Output Collector
17 Electrical Interlock Controller 1	Controller 2 'System Available' Output Emitter
18 Electrical Interlock Controller 1	No Connection
19 No Connection	No Connection
20 No Connection	Electrical Interlock Controller 2
	Electrical Interlock Controller 2

4.3 Cross Coupling Connections

PL1 and PL2 on the basic I/O changeover subrack backplane provide separate cross coupling connections for all the signals required to connect up to four basic I/O changeover subracks together.



1. Cross coupling
2. Watchdog input and system status output
3. Basic highway output to I/O
4. Basic highway input to subrack

Figure 5 - Ribbon Cable Connections

For any system the first subrack must have the master/slave gold J Link fitted in the 'master' position. Any further subracks must have this link in the 'slave' position.

5. Typical System Configuration

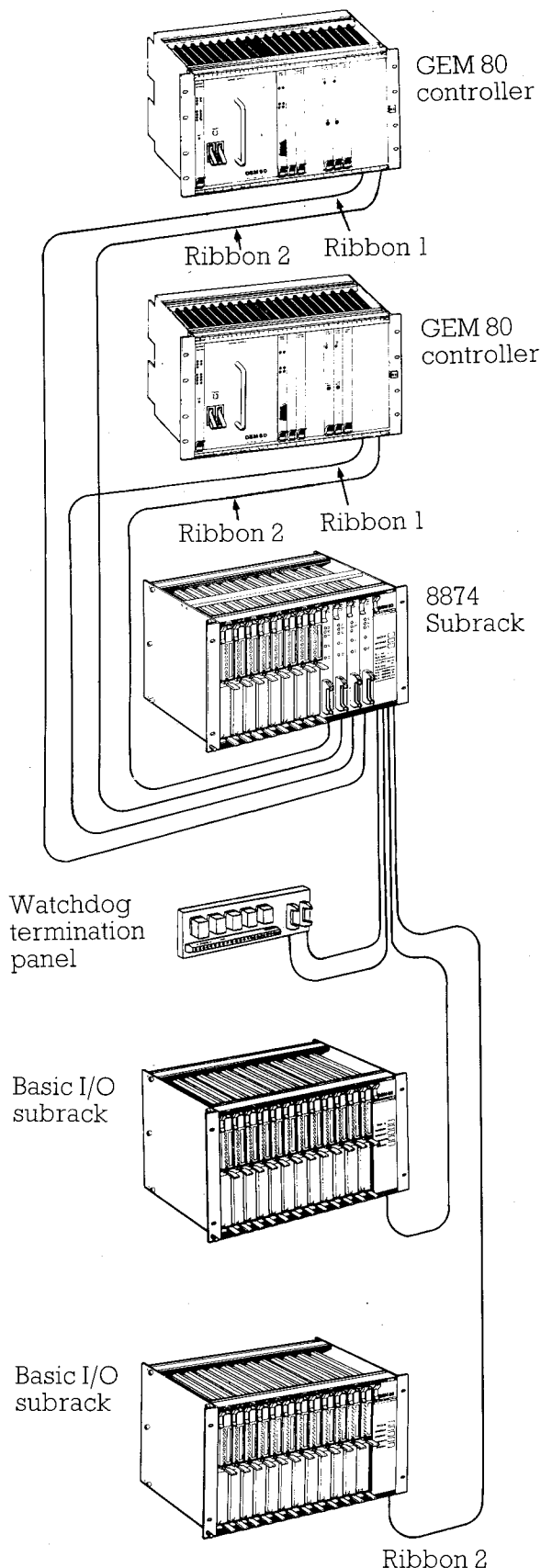


Figure 6 - Typical System

6. System Operation

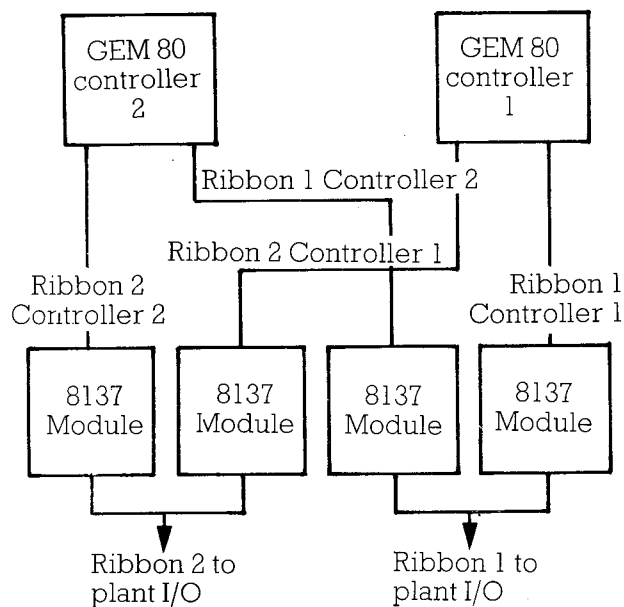


Figure 7 - Block Diagram of Typical System

With the system operating correctly one controller is 'OnLine', monitoring input conditions, executing the user program, and setting the outputs to the required state. The input conditions scanned by the 'On Line' controller are also stored within the memory which forms part of each basic I/O changeover module. When the 'OffLine' controller operates its basic I/O input scanning routine the contents of the basic I/O changeover memory are read. The 'Off Line' controller then executes the user program and operates a basic I/O output scanning routine. These output conditions are ignored.

Should the 'OnLine' controller become inoperative, the previously 'Off Line' controller maintains the operation of the basic I/O highway by reading inputs and setting outputs directly.

Status of each controller is monitored via optically isolated watchdog inputs to each basic I/O changeover module. An LED on the front panel indicates which controller is current 'On Line'.

The controllers may be changed over manually by pressing the changeover button on the right hand module. In multiple subrack systems the controllers may be changed over by preparing the changeover button on the right hand module in the master subrack.

7. Subrack Addressing

This does not apply to 8875 subrack.

The two address decoder switches for the standard compact I/O modules fitted in the four left hand sections of the subrack are mounted behind the removable blanking panel.

Each switch determines the numerical part of the two adjacent section references, and therefore, distinguishes the I/O modules from others connected to the same basic I/O ribbon. The particular ribbon to which the eight compact I/O modules are connected is determined by the user (a ribbon cable connector being provided for this on the subrack backplane).

Figure 7 shows which switch controls the numerical references of two adjacent sections in the subrack.

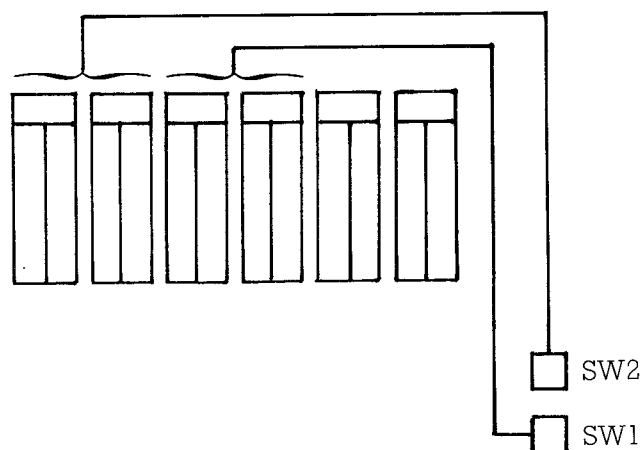


Figure 8 - 8874 Address Decoder Switches

See Product Data Sheet for 8868/8869 for details of decoder switch settings, configuration data and subrack labelling.

8. System Considerations

A. User Program

The asynchronous nature of the scan cycles of the two GEM 80 controllers connected via the basic I/O changeover module mean that various program functions require further consideration when writing ladder diagrams.

i. Counter Function

Any counter relying on an input tied to scan rate may be out of step with the equivalent counter in the other controller.

ii. Three term functions:

PID ABS S34

PID INC S35

Unless additional program rungs are included it is possible for the outputs from rungs in the 'Off Line' controller employing these functions to be in saturation, causing step changes if a change-over occurs.

iii. Ramp Generator S33

Should a changeover take place before the ramp function has reached its final value small step may occur on switch-over.

iv. Analag - S37

Similar to S33 detailed above, a small step occurring on changeover.

B. Hardware

The 8991 1 x 16-bit, 8992 2 x 8-bit counter blocks and 8160 Counter Module should not be connected to the basic I/O highway via the changeover unit.

The controller which is 'On Line' is resetting the counter to zero on every scan and receiving the correct count but it is possible for the 'Off Line' controller to receive invalid data. It will either accumulate too small a count if its scan rate is slower or too high a count if its scan rate is faster.

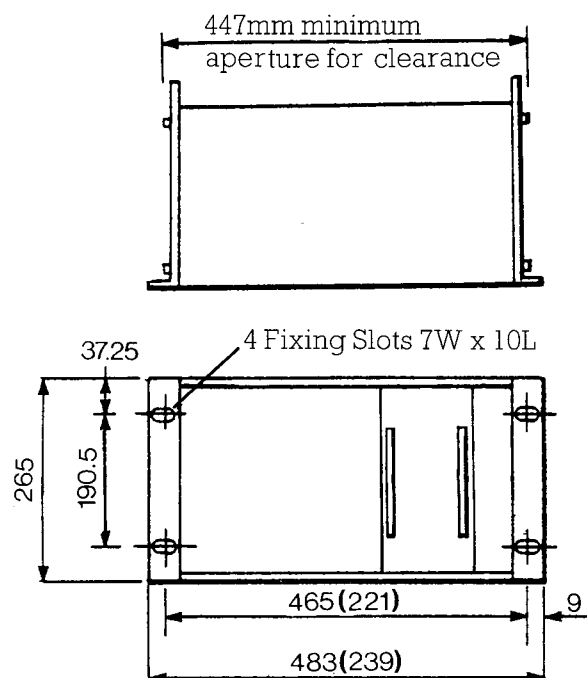
To avoid this problem, a counter block should be provided for each controller. Both counters sharing a common input signal.

To allow for this condition set up switches are provided within the changeover unit to define which address lines will be scanned via the changeover unit.

9. Mounting Details

Subrack 8874 : 19" (483mm) rack mounting
8875 : 9.4" (239mm) rack mounting

Figure 8 shows the subrack outline and position and size of mounting holes. The addition of a support angle kit converts it to a subrack suitable for rear mounting. Position and size of mounting holes are maintained.



Dimensions in parenthesis refer to 8875 subrack.

Figure 9 - Dimensions and Fixing Centres

Figure 9 shows side elevation of a front mounted subrack. Indicating depth of subrack with modules inserted and total depth required for module withdrawal.

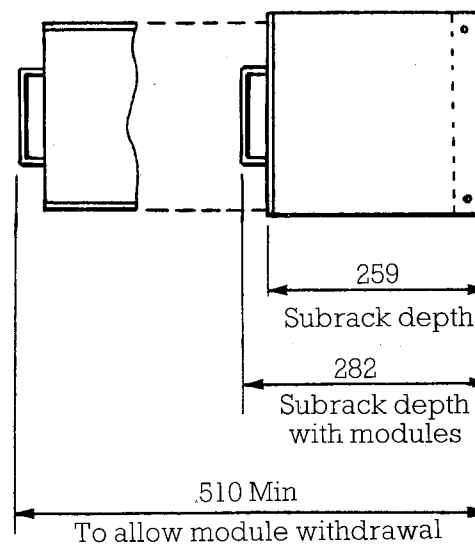


Figure 10 - Side Elevation of Subrack

10. Commissioning/Test Switches

Set up switches are provided on the rear edge of the 8137 module to select which address positions are not covered by the basic I/O changeover system.

This eight way dil rocker switch is accessible without removing the plastic covers.

Setting the dil rocker switch to the OFF position isolates the relevant address from the basic I/O changeover system.

DIL ROCKER SWITCH	BASIC I/O ADDRESS	
	Ribbon 1	Ribbon 2
1	0 & 1	16 & 17
2	2 & 3	18 & 19
3	4 & 5	20 & 21
4	6 & 7	22 & 23
5	8 & 9	24 & 25
6	10 & 11	26 & 27
7	12 & 13	28 & 29
8	14 & 15	30 & 31

Both Basic I/O changeover modules covering one ribbon cable must have the same address selector switch setting.



ORDERING CODES

12-slot Basic I/O Changeover Subrack Assembly	8874-4001
4-slot Basic I/O Changeover Subrack Assembly	8875-4001
Basic I/O Changeover Module	8137-4001
Label set for labelling up to 6 subrack blanking panels	20T0328/01
Label set for labelling up to 3 suback indication strips	
1st ribbon	20T0326/01
2nd ribbon	20T0327/01
Support Angle Kit	8890-4136
Watchdog Termination Panel	8542-4001

GEC Industrial Controls Limited.
Programmable Controllers Division,
Kidsgrove, Stoke-on-Trent,
Staffordshire ST7 1TW, England.
Tel: Kidsgrove (07816) 3511
FAX (Group 3) Kidsgrove (07816) 76329
Telex: 36293 GECICK

Also at:
Mill Road, Rugby,
Warwickshire CV21 1BD.
Tel: Rugby (0788) 2121

Registered at London No. 540682
Holding Company: The General Electric Company p.l.c.,
1 Stanhope Gate, London, W1A 1EH.

Note: The Company's policy is one of continuous development and improvement and, therefore, the right is reserved to supply products which may differ in detail from those described and illustrated in this publication. All our products and materials are sold subject to Conditions of Sale available from us on request.

Publication No. T. 509 Issue 1 4.86
©1986 The General Electric Company p.l.c.