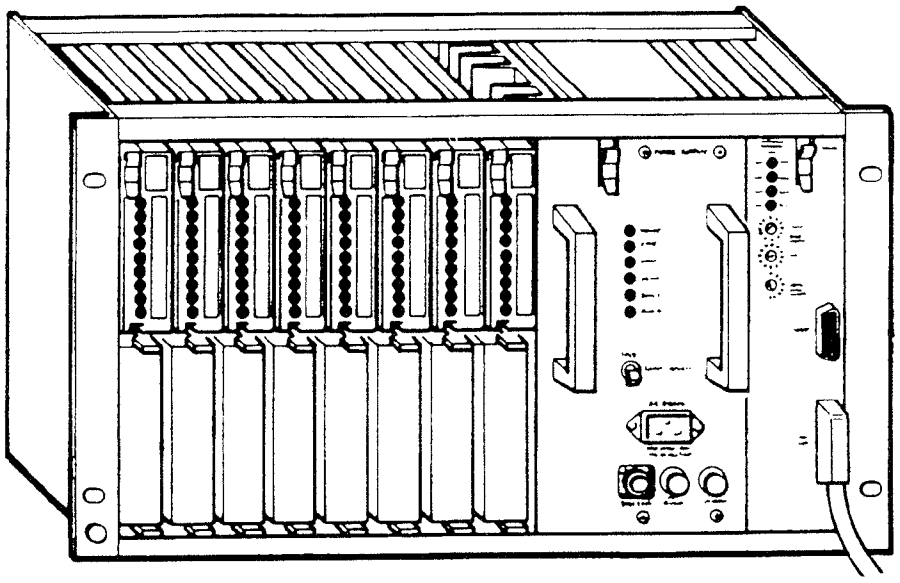
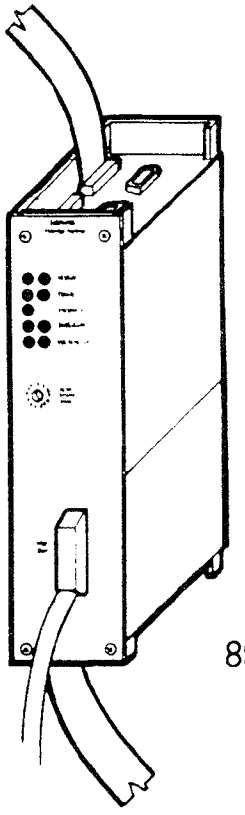
ALSTOM

Remote I/O System **8981/2 and 8863**



8863



8981/2

GEM80 USER INFORMATION

This page left intentionally blank.

1. INTRODUCTION

The Remote I/O System is designed for GEM 80 applications where control of plant remote from the host Controller is required. Basic I/O Modules can be installed up to 3 kilometres from the host Controller.

The system comprises an 8981/2 Remote I/O Controller and up to 32 Remote I/O Interface Modules. Mounted in its own metal case the Remote I/O Controller draws power from the Power Module via the Concentrated I/O Ribbon Cable. The Concentrated I/O Ribbon Cable is a flat cable of 26 wires, formed as a ribbon which is used to connect an I/O Processor to Basic I/O Expanders or, as in this case, the Remote I/O Controller.

The Remote I/O Interface Module is fitted into a 19 inch subrack containing an 8132 Power Module with up to eight Compact I/O modules. The power module in the subrack can be supplied from either an a.c. or d.c. source. A maximum of 2048 I/O points can be handled by the Remote I/O Controller with each Interface Module capable of operating between a minimum of 64 and a maximum of 512 I/O points.

The parallel data normally transmitted along the Concentrated I/O Ribbon is converted into serial data by the Remote I/O Controller for transmission to the Interface Modules and subsequent connection to the Compact I/O Modules.

This User Information sheet gives details of the operation of a typical system with examples of the addressing modes used.

For installations where two GEM 80 Controllers are employed, with one Controller controlling the plant and the other powered up and acting as a hot standby, the 8982 Remote I/O Changeover Controller must be used. See Section 8 for details of the Remote I/O Changeover Unit.

2. SPECIFICATION

2.1 8981 Remote I/O Controller

I/O capacity	: up to 2048
No of remote stations	: up to 32
Maximum distance of remote station	: up to 3 kilometres
Power supply	: 1.75A at 15V d.c. (derived from GEM 80 Controller through the Concentrated I/O Highway)
Self test & watchdog	: the Controller includes built in self test and trips the internal watchdog on self test failure
Dimensions	: 272 x 238.5 x 67.1mm
Weight	: 1.5kg

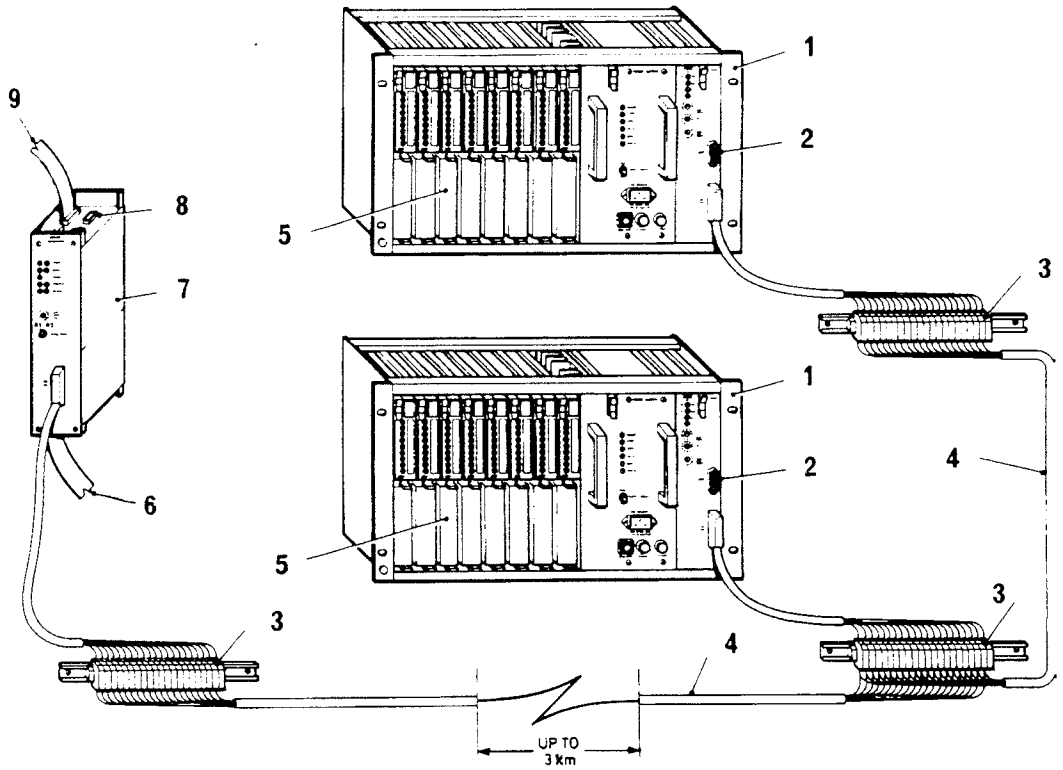
2.2 8174 Remote I/O Interface Module in Subrack with 8132 Power Module

I/O capacity	: from 64 to 512 points
Self test & watchdog	: includes self test and trips GEM 80 watchdog on self test failure
Power supply	: ac : 88 to 132V or 176 to 264V ac : 45 to 63Hz : 40 to 100W : peak inrush 25A at 250V (decay time constant 4ms) : peak inrush 50A at 110V (decay time constant 4ms)
	: dc : 22 to 85V : 40 to 100W : peak inrush 1.8A per volt (decay time constant 4ms) : suitable for operation from current limited source : negative earth only
Dimension of subrack	: 267 x 483 x 300mm 19" (483mm) rack mounting
Weight of subrack	: 20kg excluding Compact I/O modules

3. HARDWARE LAYOUT

3.1 Interconnections

Figure 3.1 shows the connections between the 8981/2 Remote I/O Controller and two subracks containing 8174 Remote I/O Interface Modules. A feature of this system is that the interface modules can be sited up to 3 kilometres from the remote controller and the cost of cabling is reduced by the serial nature of the connection. The connections to the terminal rail provide a simple means of 'daisy chaining' additional interface modules. The addressing rules are explained in Section 4.

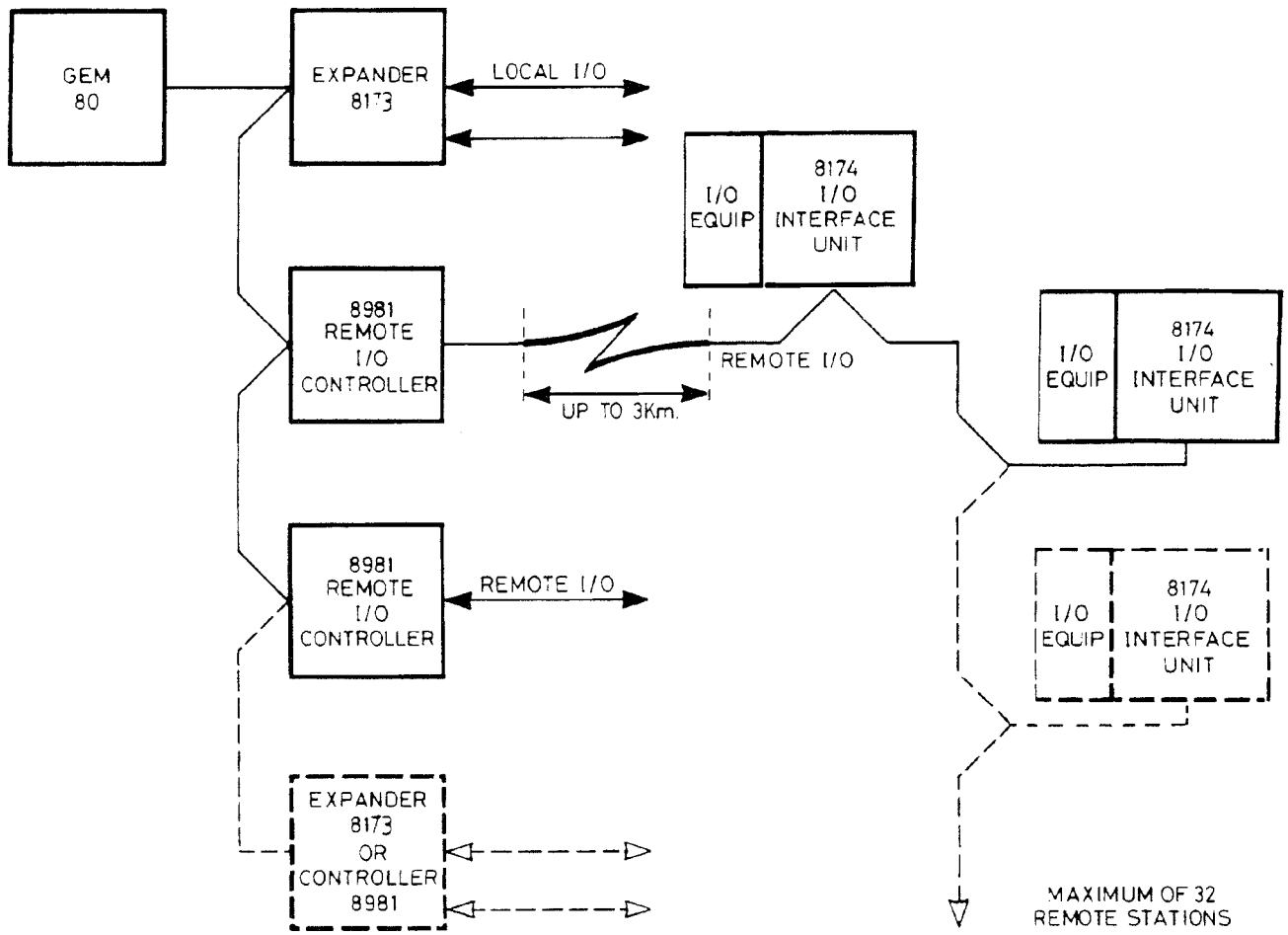


1. Subrack containing an 8174 Remote I/O Interface Module, an 8132 Power Module and up to eight Compact I/O Modules.
2. Remote Programming Port (15-way 'D' Connector).
3. Terminal Rail.
4. Data/programming Link Cable.
5. Compact I/O Modules.
6. Serial Link Cable (PL.5).
7. Remote I/O Controller 8981.
8. Auxiliary Power Supply Input (PL.3).
9. Concentrated I/O Ribbon (PL.1).

Figure 3.1 - Typical Interconnection Layout

3.2 Configuration

Figure 3.2 shows a block diagram of a typical configuration. Note the use of an 8173 I/O Expander Unit, employed where a system requires a mixture of local and remote I/O points. Remember that the use of each expander unit reduces the I/O points available for remote use by 512 points.



Notes:-

1. Remote stations can be located up to 3km from the GEM 80 Programmable Controller.
2. The 8981 Module can interface up to 2048 I/O Points and up to 32 remote stations.
3. To allow a mixture of remote and local I/O to be handled, the remote controller can operate in conjunction with 8173 Expander Modules.

Figure 3.2 - Typical Configuration

4. OPERATION

4.1 Introduction

Connection from the GEM 80 Controller to the 8981 is via the Concentrated I/O ribbon cable. After conversion to a serial link the data, along with programming information and the watchdog connections, is carried by a 12-core cable to successive interface modules.

4.1.1 8981/8982 Remote I/O Controller

Start up	: performs comprehensive self test
	: starts operating cycle
Operating cycle	: as the GEM 80 Controller sets output data, the 8981/8982 writes it to memory
	: transmits output data contained in memory to each Remote I/O Interface in turn
	: instructs each Remote I/O Interface in turn to transmit input data
	: reads inputs of Remote I/O Interfaces into memory
	: outputs input data from memory to the GEM 80 Controller next time the location is scanned
Cycle time	: as GEM 80 Controller
	: serial I/O data read/write time is 1ms per 64 I/O locations
Repetition interval	: free running
Fault shutdown	: causes Basic I/O Highway failure.

The 8981/8982 performs self tests when first switched on and tests all data received from Remote Interface Modules. Any self test fault will trip the watchdogs in the host controller and the fault will be indicated there as a Basic I/O Highway failure. Running tests are carried out on a regular basis and any failure to test the inbuilt watchdog circuits will trip watchdog immediately.

4.1.2 8174 Remote I/O Interface

The unit performs a repetitive cycle by scanning inputs and setting outputs. Input data is transmitted to the 8981/8982 and outputs are set according to data received from the 8981/8982.

Start up	: performs a comprehensive self test
	: starts the operating cycle
	: closes the watchdog interlock.
Operating cycle	: scans inputs into data tables
	: scans outputs from data tables
	: services watchdog at regular intervals
Cycle time	: 2.0ms - 0.4ms per 16 bit I/O allocated
	: serial I/O data read/write time is 1ms per 64 I/O allocated
Repetition interval	: free running
Fault shutdown	: opens watchdog contact
	: ceases scanning I/O
restart after shutdown	: initiated by power off/on switch externally; or by operating power module switch shutdown/run
	: I/O data tables cleared to zero on power up.

The Remote I/O Interface Module performs self tests when power is applied and also on data received from the 8981/8982 Remote I/O Controller. The watchdog relays are automatically picked up on satisfactory completion of the start-up tests.

Faults which immediately trip watchdog	: power supply break after ride-through time
	: power module failure
	: 8174 module failure
	: fault interfacing with data transfer on Basic I/O Highway
Faults which trip watchdog when detected by running tests	: failure to store or recall data : host GEM 80 Controller watchdog trip
Faults from which recovery is automatic	: power supply re-applied after a break
	: host GEM 80 Controller watchdog reset.

4.2 Use with Expanders

Where a mixture of remote and local I/O points are included in the system, a combination of 8173 I/O Expander units and 8981/8982 I/O Controllers are used. For each I/O Expander employed, the remote I/O capability is reduced by 512 points. The maximum combination of I/O Expanders and Remote I/O Controllers is therefore limited to 4 units per Concentrated I/O Highway. See Figure 3.2 for the method of connection of a typical system.

4.3 Operating Times

The overall time for the transition of data from the GEM 80 Controller through the 8981/8982 Remote I/O Controller to the Remote I/O Interface is built up as follows:

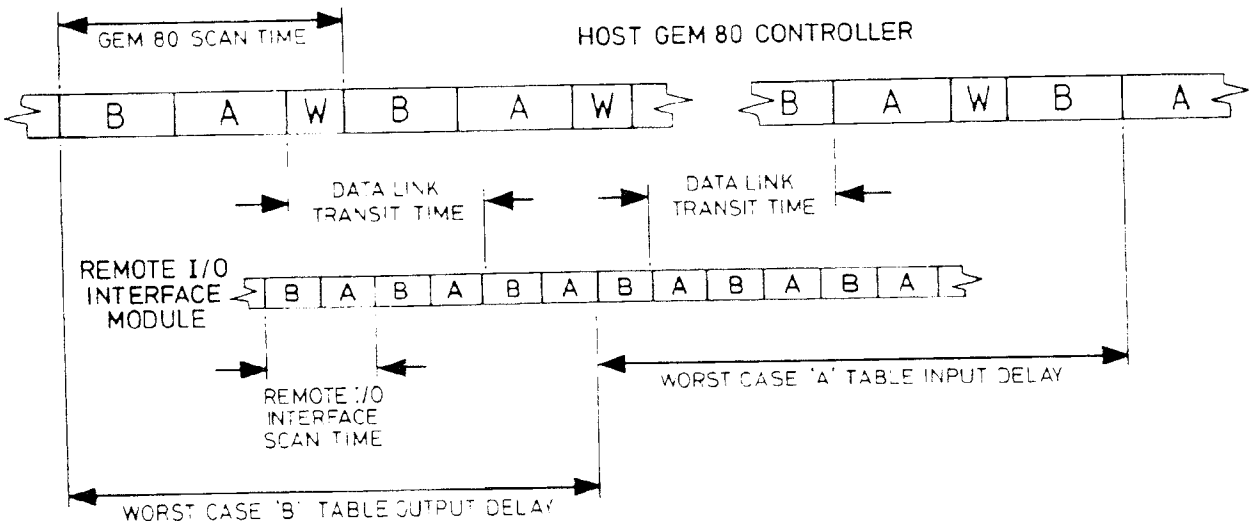
Host controller scan time
I/O Data Link time (worst case)
Remote I/O Interface scan time

The host controller scan time is fixed by the program size and the total I/O connected.

The Remote I/O Interface scan time is fixed by the quantity of I/O connected to it.

The I/O Data Link time is therefore the only variable in the overall scan time. This time can be reduced by distributing the Remote Interfaces between additional Remote Controllers. Each I/O Data Link in such a configuration can be considered as being in parallel with all other I/O Data links.

Figure 4.1 shows the relationship between the scan times of the the host Controller and the Remote I/O Interface Module.



KEY:

A = A tables being scanned

B = B Tables being scanned

W = Wait time at the end of I/O scan for ladder processor (usually zero)

Figure 4.1 - Worst Case Data Table Transmit Times

4.4 Addressing

4.4.1 8981/8982 Remote I/O Controller

Because more than one Remote I/O Controller can be connected to a Concentrated I/O Ribbon you have to set each Controller for the addresses it is concerned with.

The 'Block Size' rotary switch (SW3) on the front panel of the unit performs this function and indicates which block or blocks of 512 I/O are being catered for.

Table 4.1 shows the addresses on the four Basic I/O Ribbons which form the Basic I/O Highway. Note that the Master I/O Processor (MIOP) covers addresses 0-255 (4096 I/O points), and the Slave I/O Processor (SIOP) covers addresses 256-511 (4096 I/O points). Since the Remote I/O Controller can only handle 2048 I/O points, it follows that only one Concentrated I/O Ribbon can be fitted at any one time. SW4 on the front panel is set to cover either the lower or upper addresses. i.e. Set to R1 for the lower addresses and R2 for the upper addresses.

Table 4.1 - Block Size Settings

	ADDRESS					
	RIBBON A	0-31	32-63	64-95	96-127	MASTER I/O
	RIBBON B	128-159	160-191	192-223	224-255	PROCESSOR
	RIBBON C	256-287	288-319	320-351	352-383	SLAVE I/O
SW3 SETTING	RIBBON D	384-415	416-447	448-479	480-511	PROCESSOR
0		-	-	-	-	
1		X	-	-	-	
2		-	X	-	-	
3		X	X	-	-	
4		-	-	X	-	
5		X	-	X	-	
6		-	X	X	-	
7		X	X	X	-	
8		-	-	-	X	
9		X	-	-	X	
10		-	X	-	X	
11		X	X	-	X	
12		-	-	X	X	
13		X	-	X	X	
14		-	X	X	X	
15		X	X	X	X	

4.4.2 8174 Remote I/O Interface

At each Remote I/O location it is necessary to define the address limits applicable to that location. This is achieved by the 3 rotary switches mounted on the front panel of the module. SW1,SW2, and SW3.

SW1 and SW2 define the lowest (i.e. BASE ADDRESS) available at the particular Remote I/O location (see Table 4.2).

SW3 defines the number of addresses (i.e. RACK SIZE) allocated at that location (see Table 4.3). When setting switches SW1, SW2 and SW3 the following addressing rules must be observed.

Addressing rules

(1) for any given location the minimum number of I/O points which can be allocated is 64 (4 addresses).

(2) I/O points are allocated in blocks of 64 (4 addresses).

(3) for any given location the maximum number of I/O points are 512 (32 addresses).

(4) addresses must be contiguous from one location to the next.

Table 4.2 Settings for SW1 and SW2

		BASE ADDRESS			
		MASTER I/O PROCESSOR		SLAVE I/O PROCESSOR	
SW1 SETTING	SW2 SETTING	RIBBON A	RIBBON B	RIBBON C	RIBBON D
0	0	0	128	256	384
1	0	4	132	260	388
2	0	8	136	264	392
3	0	12	140	268	396
4	0	16	144	272	400
5	0	20	148	276	404
6	0	24	152	280	408
7	0	28	156	284	412
8	0	32	160	288	416
9	0	36	164	292	420
0	1	40	168	296	424
1	1	44	172	300	428
2	1	48	176	304	432
3	1	52	180	308	436
4	1	56	184	312	440
5	1	60	188	316	444
6	1	64	192	320	448
7	1	68	196	324	452
8	1	72	200	328	456
9	1	76	204	332	460
0	2	80	208	336	464
1	2	84	212	340	468
2	2	88	216	344	472
3	2	92	220	348	476
4	2	96	224	352	480
5	2	100	228	356	484
6	2	104	232	360	488
7	2	108	236	364	492
8	2	112	240	368	496
9	2	116	244	372	500
0	3	120	248	376	504
1	3	124	252	380	508

Table 4.3 Settings for SW3

RACK SIZE		
SETTING SW3	QUANTITY OF ADDRESSES AVAILABLE	NUMBER OF I/O ADDRESSED
0	NIL	NIL
1	4	64
2	8	128
3	12	192
4	16	256
5	20	320
6	24	384
7	28	448
8	32	512
9	NIL	NIL
A	NIL	NIL
B	NIL	NIL
C	NIL	NIL
D	NIL	NIL
E	NIL	NIL
F	NIL	NIL

4.4.3 Example of Remote Addressing

Consider 3 Remote I/O locations at which the following I/O needs to be fitted:

Location 1 = 11 points
Location 2 = 265 points
Location 3 = 80 points

Using the addressing rules, Table 4.4 which follows, shows the method of calculating and allocating base addresses. Note that the locations of the Remote I/O Interfaces need not be contiguous. It is acceptable to cable from the Remote I/O Controller to the Remote I/O Interface in Location 2, then Location 1, followed by Location 3.

(1) In Location 1, the number of I/O points to be addressed is 11. The quantity of addresses to be used therefore is 1 (16 bits or I/O points). But the minimum number of addresses that can be allocated to one Remote I/O Interface is 4 (4 X 16 bits or I/O points). The settings for SW1 and SW2 are therefore 0,0 to cater for Base Address 0 with SW3 set at 1.

(2) Location 2 needs 265 I/O points to be addressed. The quantity of addresses used in this case is 17, (16 X 16) + 9. Remembering that addresses are allocated in blocks of 4, this means that 20 addresses must be allocated to this location. The settings for SW1 and SW2 being 1,0 to cater for Base Address 4 with SW3 set at 5.

(3) Location 3 needs 80 I/O points to be addressed. The quantity of addresses used will therefore 5, (16 X 5) exactly. Again, addresses must be allocated in blocks of 4 so we need 8 addresses for this location. The settings for SW1 and SW2 are therefore 6,0 to cater for Base Address 24 with SW3 set at 2.

Table 4.4 I/O Points with allocated addresses

LOCATION	No. OF I/O POINTS	QTY ADDRESSES USED	QTY ADDRESSES ALLOCATED	BASE ADDRESS SW1,SW2	RACK SIZE SW3
1	11	1	4	0(0,0)	1
2	265	17	20	4(1,0)	5
3	80	5	8	24(6,0)	2

4.5 Serial Port

4.5.1 Remote Programming.

Although the Remote I/O System is not in itself programmable, provision is made to connect a serial port so that remote programming can be performed. To enable this facility the serial link ribbon cable of the host controller must be connected to the 8981. PL6 on the 8981 is used for this purpose. Port 1 would then be dedicated for remote programming.

Connection to this port is via the 15 way 'D' Connector on the front panel of the 8174. (See Figure 3.1). The programming port will support the GEM 80 System Programmer types 8922, 9022 and 8940.

4.6 Fault Tables

A fault (F) table exists in the memory of the host GEM 80 Programmable Controller for each group of 4 addresses on the Remote I/O System. This table can be used for detecting failures at any of the remote stations. The F tables assigned to this function are shown in Table 4.5. Any of these data tables being non zero indicates a faulty remote station and/or a communication failure. If you are using a 350 series Controller, the F-tables are from F47 to F78 for the Master I/O Processor and F79 to F110 for the Slave I/P Processor.

Table 4.5. Fault Table Data Word Locations

MASTER I/O PROCESSOR (RIBBON A and B)		SLAVE I/O PROCESSOR (RIBBON C and D)	
FAULT TABLE	I/O ADDRESSES	FAULT TABLE	I/O ADDRESSES
F45-F48	0-15	F109-F112	256-271
F49-F52	16-31	F113-F116	272-287
F53-F56	32-47	F117-F120	288-303
F57-F60	48-63	F121-F124	304-319
F61-F64	64-79	F125-F128	320-335
F65-F68	80-95	F129-F132	336-351
F69-F72	96-111	F133-F136	352-367
F73-F76	112-127	F137-F140	368-383
F77-F80	128-143	F141-F144	384-399
F81-F84	144-159	F145-F148	400-415
F85-F88	160-175	F149-F152	416-431
F89-F92	176-191	F153-F156	432-447
F93-F96	192-207	F157-F160	448-463
F97-F100	208-223	F161-F164	464-479
F101-F104	224-239	F165-F168	480-495
F105-F108	240-255	F169-F172	496-511

4.7. Programming Considerations

After switching on the host controller, all input data (A Tables) will be read as -1 (FFFF) on the first and second program scans. Thereafter the A table values will reflect the input signals. If this proves to be a problem, the user should enclose his program (or specific parts of his program) in an OBEY BLOCK routine which is activated on the third and all successive scans of the program.

The remote I/O system has the Remote I/O Interface modules scanning their I/O independently of the host GEM 80 Controller. It is therefore possible for the Interface module to read its I/O twice before the host GEM 80 requests the data. This causes a problem only on counter modules which are normally cleared each scan (the user measures the number of counts received between scans). Modified versions of the 8160 counter module and 8991 counter block are available which are not cleared after being scanned and indicate the total number of counts received by the unit.

The ordering codes for these modified versions are:-
8991-4002 and 8160-4003

5. POWER SUPPLIES

5.1 8981/8982 Remote I/O Controller

Power for the unit is derived from the 15V on the Basic I/O Ribbon. The consumption is 1.75A at 15V d.c.

In case the GEM 80 Controller configuration does not have enough power available, provision is made for connection to an auxiliary 15V power source.

The auxiliary supplies are connected through P13 and P14 at the top of the controller. (See Figure 4)

PL3 and PL4 are D type connectors. The pin-out for these D-type plugs is as follows:

Pins 5 and 13 - +15V
Pins 1 and 9 - 0V

This supply should be between +15V and +17V and capable of providing more than 2 amps. There are no fuses on the Remote I/O Controller, therefore the output of the auxiliary power supply must be fuse protected.

Total power consumption of the system configuration must be calculated using the information contained in the Product Data Sheet for each component unit to decide whether auxiliary supplies are necessary.

5.2 8174 Remote I/O Interface

The Remote I/O Interface Module is mounted in a subrack containing an 8132 Power Module. Supplies to the Power Module can be a.c. or d.c. powered. Internal circuitry allows the a.c. and d.c. to be connected and present at the same time.

a.c. Powered	:	88Vto 132V or 176V to 264V
	:	45Hzto 63Hz
	:	40Wto 100W
	:	peak inrush 25A at 250V
	:	peak inrush 50A at 110V (decay time constant 4mS)
	:	transformer isolated
d.c. Battery Powered	:	22V to 85V
	:	40W to 100W
	:	peak current 1.8A per volt (decay time constant 4mS)
	:	suitable for operating from a current limited source.
	:	negative earth only

6. INSTALLATION

6.1 8981/8982 Remote I/O Controller

The unit contains two printed circuit boards within a stand alone metal case measuring 272mm x 238.5mm x 67.1mm. Fixing holes are provided to allow mounting in a position convenient to the user. When deciding on the mounting position, ensure that the Block Size switch (SW3) remains accessible.

Figure 6.1 shows the outline dimensions of the Remote I/O Controller.

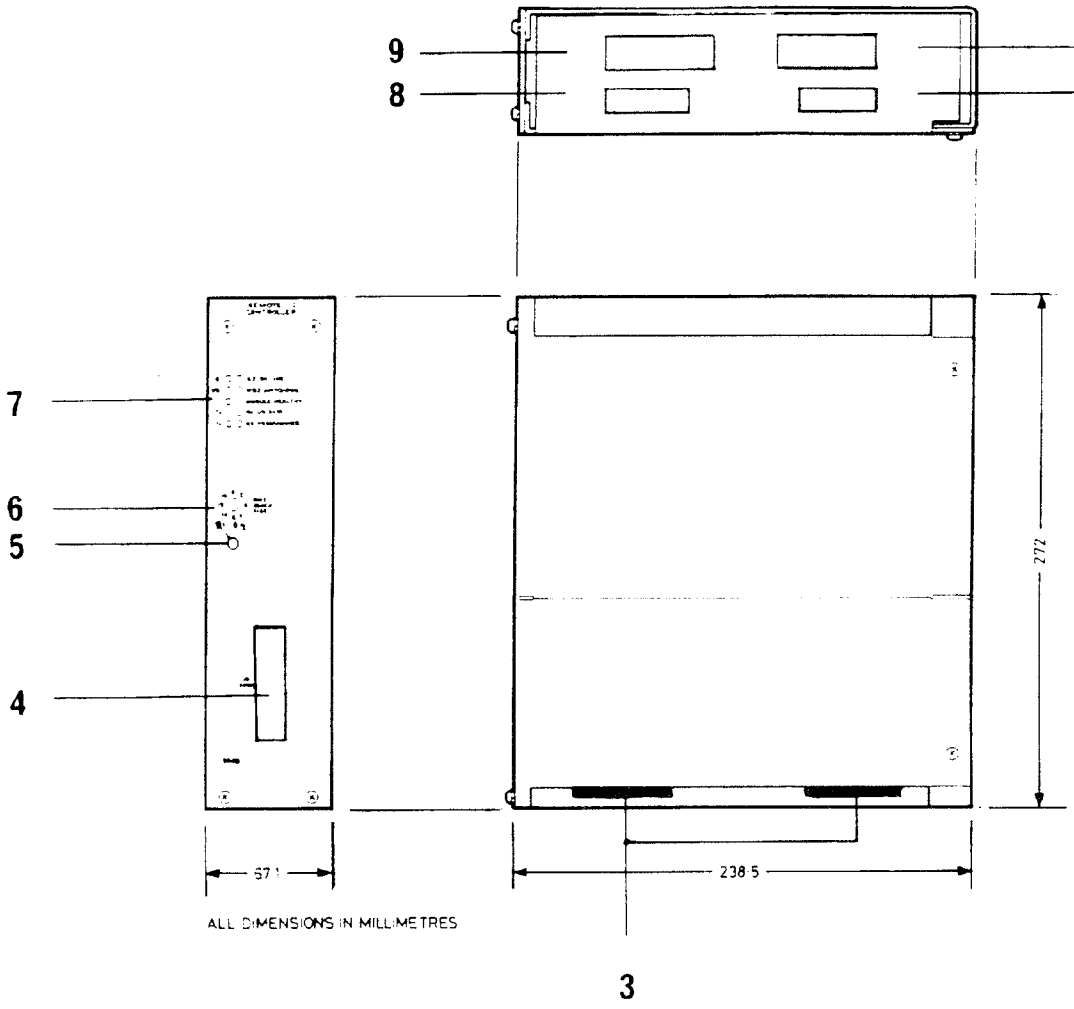
6.2 8174 Remote I/O Interface Module in Subrack with 8132 Power Module.

The 8174 Remote I/O Interface Module is mounted in a 19 inch Subrack containing an 8132 Power Module and space for up to 8 Compact I/O Units.

Power for the unit is drawn from the 8132 Power Module. The requirements are:-

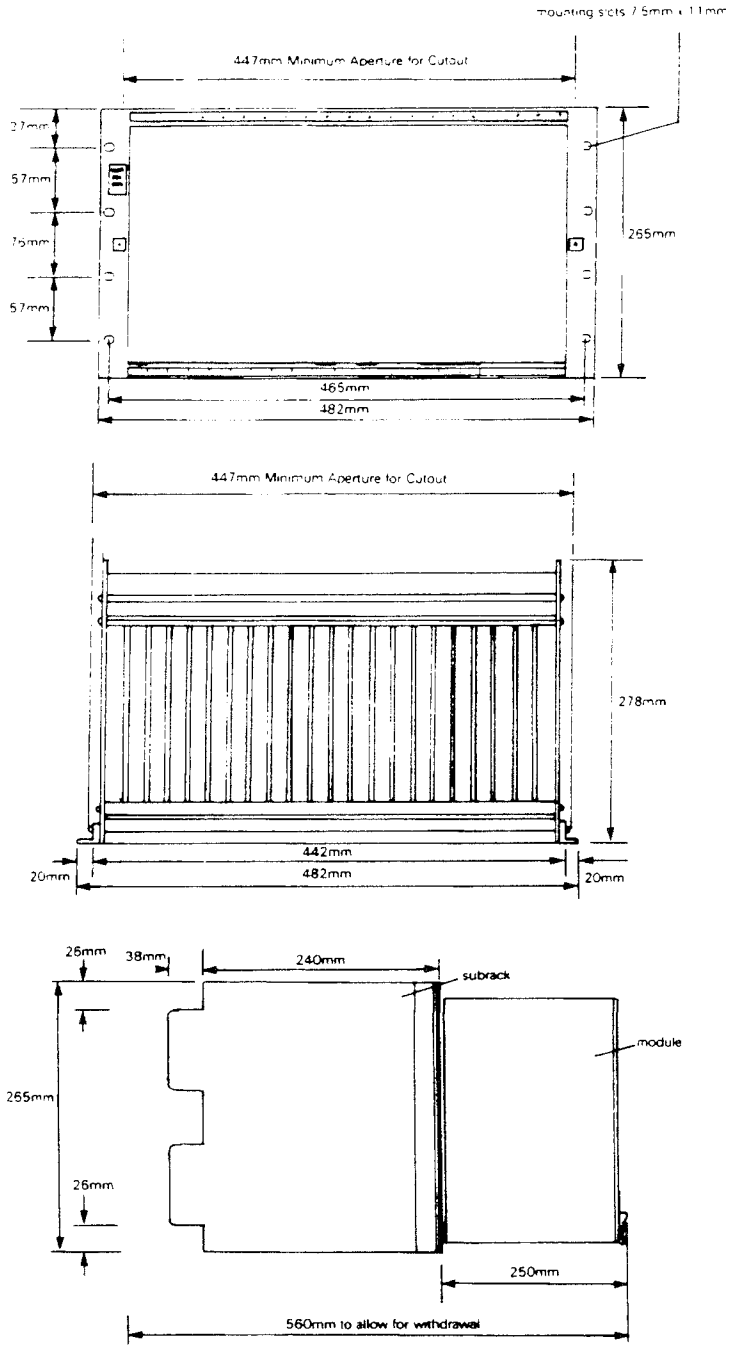
0.75A at +15V and 0.5A at +5V.

Figure 6.2 shows the outline dimensions of the subrack with details of size and position of mounting holes. Designed for front mounting, the subrack may be converted to rear mounting using the rear mounting support angle kit.



1. PL1. Concentrated Basic Highway Ribbon to GEM 80
2. PL3. Auxiliary Power Input
3. PL5/PL6. Serial Link Ribbon to GEM 80
4. SK2. I/O Data Link to Terminal Rail
5. SW4. Ribbon Select Switch
6. SW3. Block Size Switch
7. Status Indicators
8. PL4. Auxiliary Power Input
9. PL2. Concentrated I/O Highway Ribbon to GEM 80

Figure 6.1 Outline dimensions of 8981/8982 Remote I/O Controller



All dimensions in millimetres

Figure 6.2 Outline dimensions of Subrack

7. CONNECTIONS

7.1 Remote I/O Controller

Table 7.1 shows the type and usage of the connectors fitted to this unit. PL1 is used to connect the 8981/8982 to the GEM 80 Controller Concentrated Highway. Note that the ribbon fitted to this Controller can be either Ribbon A, B, C or D from the GEM 80 Controller depending on the range of addresses to be used and whether a Slave I/O Processor is fitted.

SW4 on the front panel of the Remote I/O Controller will indicate which Ribbon is in use. Switch position R1 for Ribbon A or C for the lower addresses of the Master I/O and Slave Processor respectively. Switch position R2 for Ribbon B or D for the higher addresses of the Master I/O and Slave Processor respectively.

Table 7.1 Remote I/O Controller : Connectors

Connector	Type	Function	Notes
PL1	26-way ribbon	Concentrated I/O Highway	1
PL2	26-way ribbon	Concentrated I/O Highway	1,2
PL3	15-way 'D'-type	Auxiliary Power Supply GEM 80 Controller	3,5
PL4	15-way 'D'-type	Auxiliary Power Supply GEM 80 Controller	3,5
PL5	26-way ribbon	Serial link ribbon GEM 80 Controller	
PL6	26-way ribbon	Serial link ribbon GEM 80 Controller	2
SK2	25-way 'D'-type	I/O data link to terminal rail	4

Notes:

1. For Remote I/O the maximum allowable length for this ribbon is 5m.

2. Only used if a dual GEM 80 Controller configuration with automatic changeover is employed.

3. Used as required. Use is dependent on GEM 80 controller power supply loading.

4. See I/O Data connections.

5. Male connector fitted on module.

Table 7.2 shows pin numbers and colour coding for the cable between SK2 on the 8981/8982 and the terminal rail. Note that pin 13 in the 'D' type connection is for mechanical coding purposes.

Table 7.2 8981/8982 Connector - Terminal Rail

'D'-type pin no.	Colour	Terminal Rail No.	Mnemonic	Function
13	mech. coding	-	-	-
2	green	1	RR+	Not used
15	yellow	2	RR-	Not used
14	blue	3	RPS	Not used
		4	SCN	Not used
4	brown	5	TR+	Not used
17	violet	6	TR-	Not used
1	red	7	TPS	Not used
		8	SCN	Screen
3	white	9	RL+	RX+ Programming Port
16	black	10	RL-	RX- Programming Port
		11	SCN	Screen
5	orange	12	TL+	Tx+ Programming Port
18	pink	13	TL-	Tx- Programming Port
		14	SCN	Screen
6	turquoise	15	R1	"daisy chained" *
19	grey	16	R2	"for watchdog" *
		17	SCN	Screen
7	red/blue	18	RD+	Rx+ I/O Data
20	green/red	19	RD-	Rx- I/O Data
8	yellow/red	20	RDS	Not used
		21	SCN	Screen
9	red/black	22	TD+	Tx+ I/O Data
22	red/brown	23	TD-	Tx- I/O Data
21	white/red	24	TDS	Not used
		25	SCN	Screen
12	yellow/green	26	WD+	Watchdog +Ve
25	white/green	27	WD-	Watchdog -Ve
		28	SCN	Overall screen
		29	SCN	Earth connection
10	yellow/blue	30	W1+	GEM 80 1 watchdog +ve
23	white/blue	31	W1-	GEM 80 1 watchdog -ve
11	blue/black	32	W2+	GEM 80 2 watchdog +ve
24	orange/blue	33	W2-	GEM 80 2 watchdog +ve

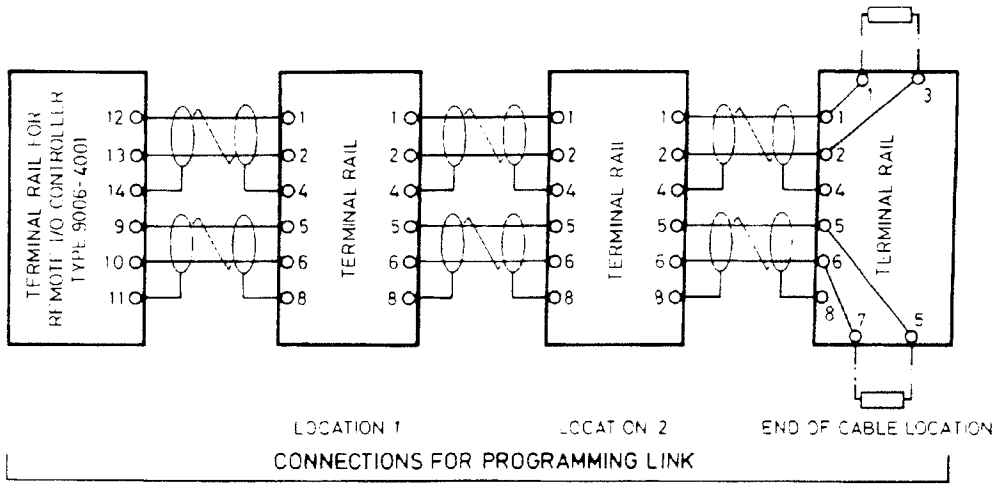
***See paragraph 8.2 for dual configuration.**

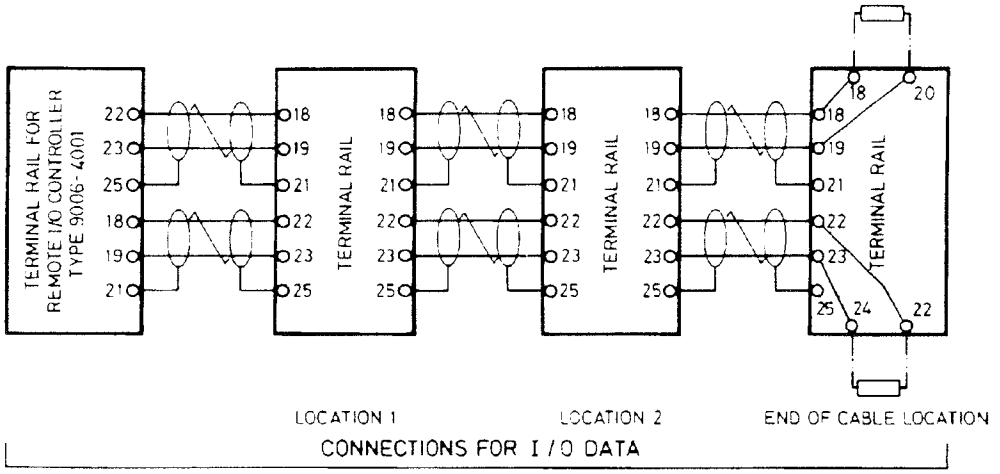
7.2 Data Link Cable Connections

The Terminal rail provides a convenient means of 'daisy chaining' the 12 core data link cable to successive interface modules. The function of the data link cable is to provide the connections for the Programming Link, the Watchdog and the I/O data itself.

Figure 7.1 shows the terminal rail connections from the Remote I/O Controller to each interface location. Use twisted pair, individually screened cable. The conductors should have a characteristic impedance of 100 ohms with a resistance of approximately 25 ohms per metre and a nominal capacitance of 41 picofarads. Belden 9731 is recommended.

Note that the cable must be correctly terminated at the end location to prevent the cables being charged up by the voltage source. Make the appropriate connections on the terminal rail at the end location. The actual termination resistors are located in the Remote I/O Interface module itself.





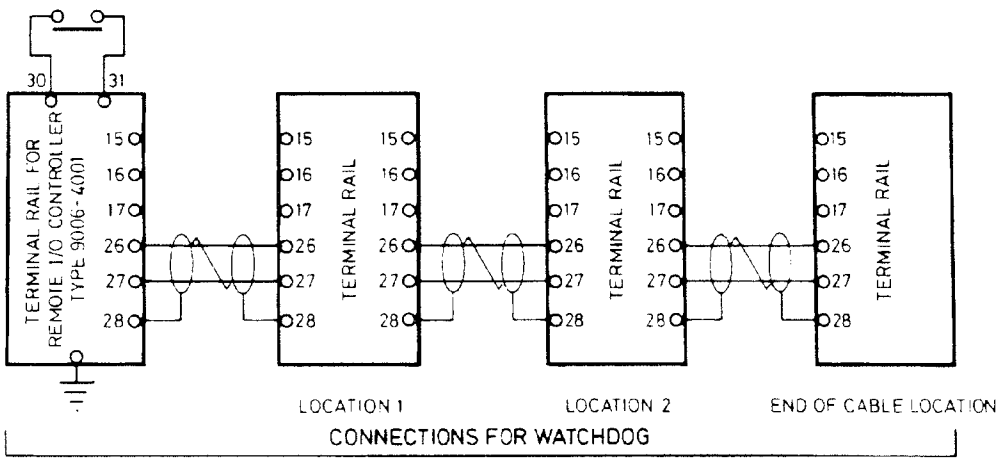


Figure 7.1 Serial Link Cabling.

7.3 8174 Remote I/O Interface

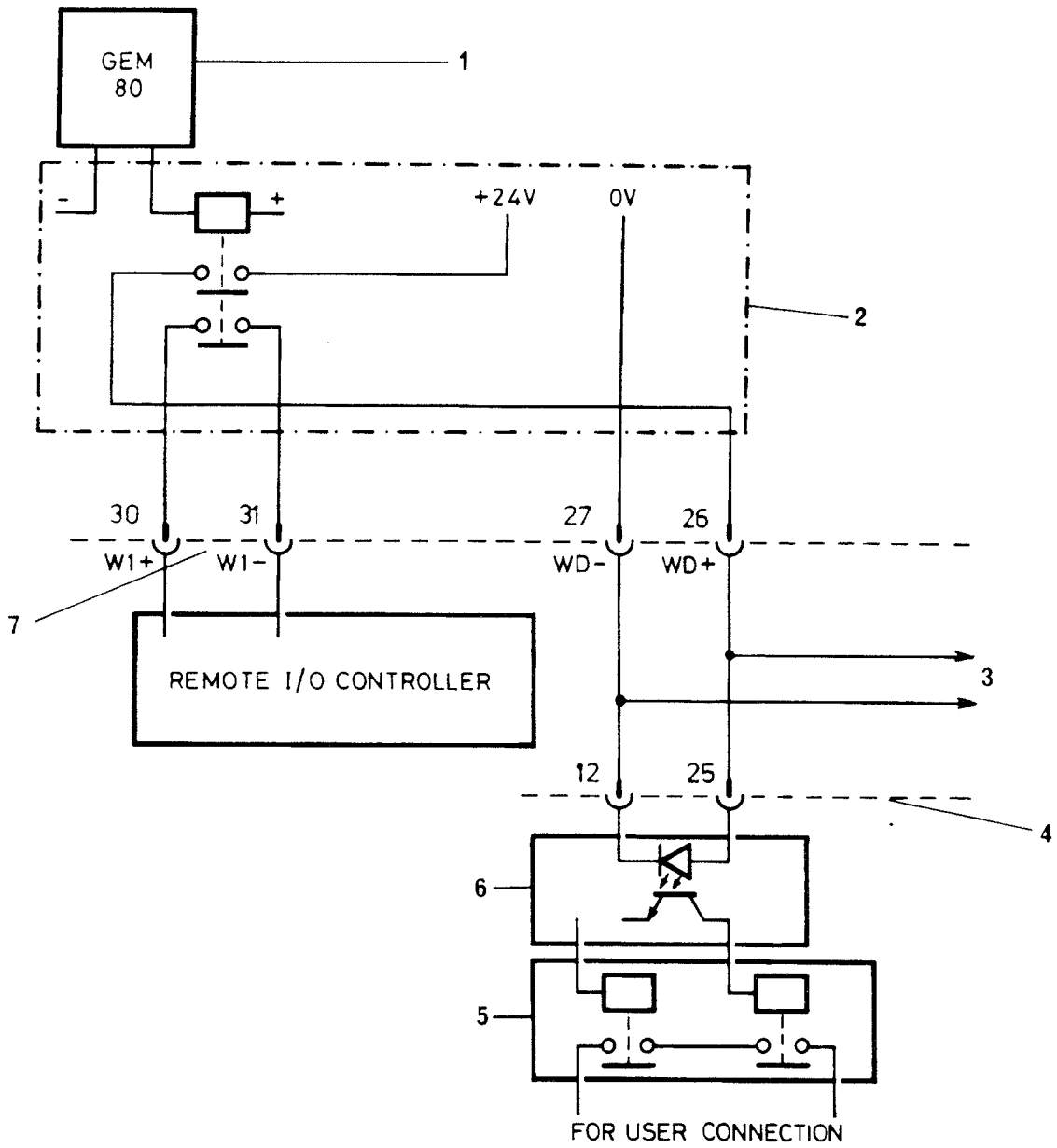
A cable harness links the terminal rail at each location to SK2, a 25 Way 'D' type connector, on the front of the interface unit. Table 7.3 shows the pin out of the 'D' type connector to the corresponding connections on the terminal rail.

Table 7.3 Terminal Rail/8174 Remote I/O Interface

'D' Type Pin No.	Terminal Rail No.	Mnemonic	Function
13	mechanical	coding	
2	1	RR+	RX + Programming Port
15	2	RR-	RX - Programming Port
14	3	RPS	Termination Resistor
	4	SCN	Screen
4	5	TR+	Tx+ Programming Port
17	6	TR-	Tx- Programming Port
1	7	TPS	Termination Resistor
	8	SCN	Screen
3	9	RL+	Not used
16	10	RL-	Not used
	11	SCN	Not used
5	12	TL+	Not used
18	13	TL-	Not used
	14	SCN	Not used
6	15	R1	Not used
19	16	R2	Not used
	17	SCN	Screen
7	18	RD+	Rx + I/O Data
20	19	RD-	Rx - I/O Data
8	20	RDS	Termination Resistor
	21	SCN	Screen
9	22	TD+	Tx + I/O Data
22	23	TD-	Tx - I/O Data
21	24	TDS	Termination Resistor
	25	SCN	Screen
12	26	WD+	GEM 80 watchdog +ve
25	27	WD-	GEM 80 watchdog -ve
	28	SCN	Screen
	29	SCN	Earth connection
10	30	W1+	Not used
23	31	W1-	Not used
11	32	W2+	Not used
24	33	W2-	Not used

7.4 Watchdog Connections

Figure 7.2 shows the watchdog connections in diagrammatic form. The volt free contacts of the GEM 80 Controller's internal watchdog connections are used to provide an energising path for a user supplied relay. This external relay must have at least two separate, normally open contacts. When the GEM 80 is healthy, its watchdog contacts close, energising the external relay. One pair of contacts on the external relay (which must be volt free) provide two connections to the Remote I/O Controller (W1+ and W1-). Another pair of contacts of the external relay provide an input of +24V for the WD+ and WD- connections to the Remote I/O Interfaces.



1. GEM 80 Controller
2. User supplied equipment
3. To other Remote I/O Interfaces
4. Terminal Rail ((8174)
5. 8867 Subrack Backplane
6 8174 Remote I/O Interface
7. Terminal Rail (8981/2)

Figure 7.2 Watchdog Connections

8. 8982 REMOTE I/O CONTROLLER CHANGEOVER UNIT

8.1 Introduction

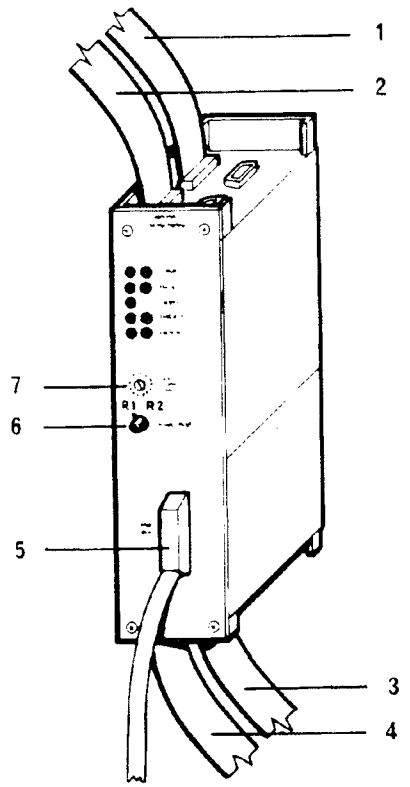
Where two GEM 80 Controllers are used in a dual configuration, the 8982 Remote I/O Controller, in conjuction with the host Controller watchdog connections, provides automatic changeover.

The 8982 Remote I/O Controller Changeover Unit receives a Concentrated I/O Ribbon from each of the GEM 80 Controllers. Figure 8.1 shows the connectors. One of the GEM 80 Controllers is considered to be active and the other acts as hot standby, powered up and ready to operate.

Active Ribbon	: all output data written to the Remote I/O Controller
	: all input data received
Standby Ribbon	: all output data ignored by the Remote I/O Controller
	: all input data received

8.2 Start Up and Changeover Sequence

On first application of power, the Remote I/O Controller will attempt to run from GEM 80 No.1 (PL1). If the watchdog for the GEM 80 Controller No.1 fails to come up, the Remote I/O Controller will switch to the Concentrated Basic I/O Ribbon from GEM 80 No. 2 (provided the watchdog is healthy). Should neither GEM 80 watchdog be healthy, the Remote I/O Controller will monitor both and wait for the first one to become active.



1. Concentrated Basic I/O Ribbon (GEM 80/1)
2. Concentrated Basic I/O Ribbon (GEM 80/2)
3. Serial Link Ribbon (GEM 80/2)
4. Serial Link Ribbon (GEM 80/1)
5. I/O data link.
6. I/O Ribbon Select Switch.
7. Block Size Switch.

Figure 8.1 Remote I/O Controller (Changeover)

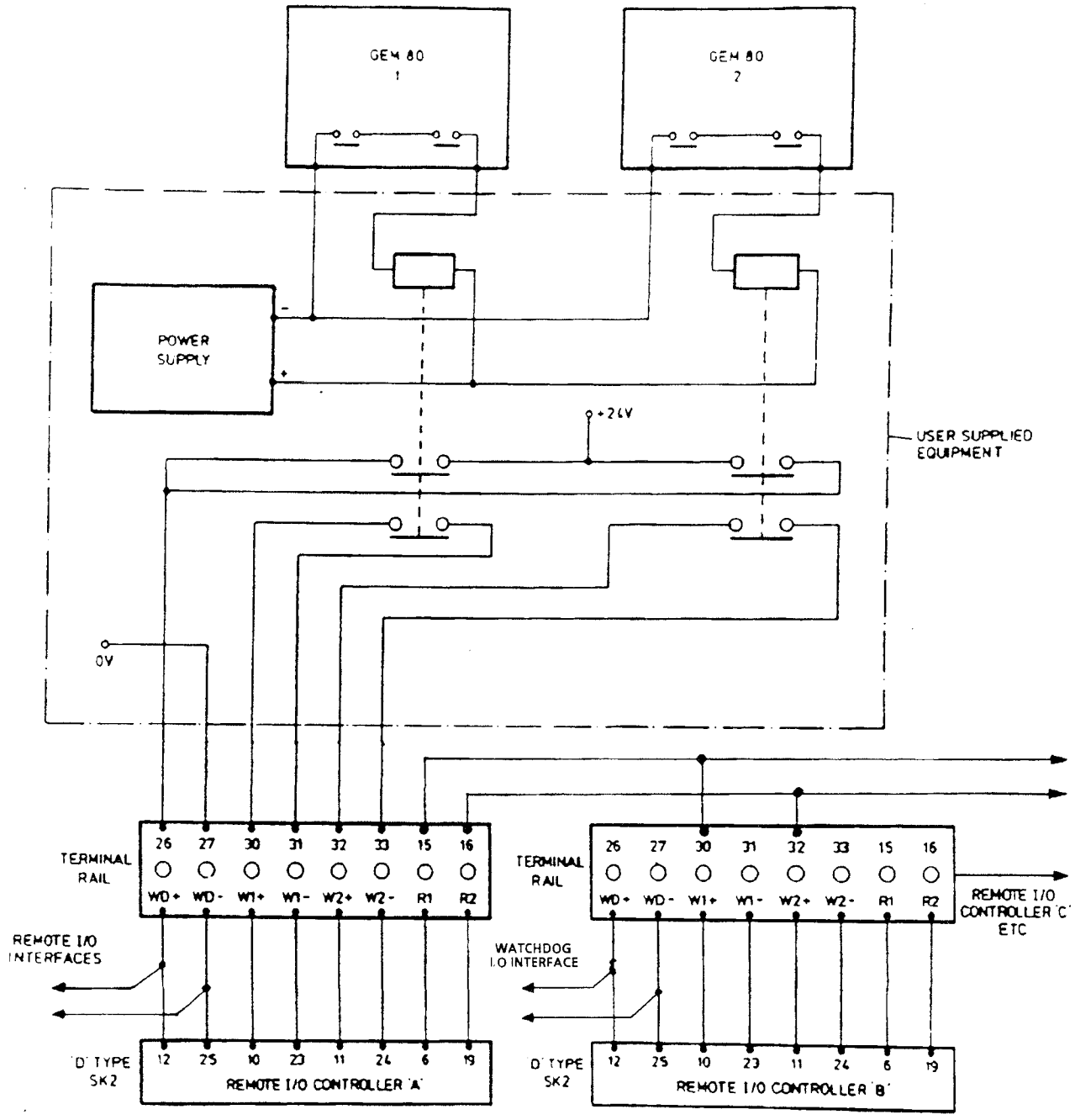


Figure 8.2 Interconnection Between Remote I/O Controllers

8.3 Operation with two or more Remote I/O Controllers.

In a single configuration, where only one GEM 80 Controller is being used, the watchdog connections provide a positive indication to the Remote I/O Controller that the GEM 80 is healthy.

Where two GEM 80 Controllers are used, one as standby and one active, their respective watchdog outputs (W1+,W1- and W2+,W2-) are both connected to the Remote I/O Controller to enable the Remote I/O Controller itself to decide which GEM 80 to use. Priority will be with GEM 80 No 1. (W1+ and W1-)

To prevent the possibility of parallel connected Remote I/O Controllers from attempting to run from different GEM 80 Controllers when both watchdogs are healthy, one Remote I/O Controller is designated as the master and imposes its GEM 80 selection on all the others. This is achieved by routing the watchdog connections through the 'master' I/O Controller to connections R1 and R2 (15 and 16) on the terminal rail. Subsequent or 'slave' Remote I/O Controllers see this input as coming direct from the watchdog circuitry.

Figure 8.2 shows the connections in diagrammatic form. Note that the 'master' Remote I/O Controller is designated CONTROLLER 'A'.

8.4 Programming

Only the active GEM 80 Controller can be edited or monitored using the remote programming facility on the 8174 Remote I/O Interface Unit.(para 4.5.1.). To interrogate the standby GEM 80 Controller, direct connection must be made by the programming unit to Port 0 of that Controller.

9. ORDERING CODES

9.1 Main Equipment

Remote I/O Controller (non-changeover)	: 8981-4003
comprising:-	
Remote I/O Controller Module	: 8981-4004
Cable harness	: 8891-4094
Terminal rail	: 8891-4032
Remote I/O Controller (changeover)	: 8982-4003
comprising:-	
Remote I/O Controller Module	: 8982-4004
Cable harness	: 8891-4094
Terminal rail	: 8891-4032
Remote I/O Interface Subrack	: 8863-4001
comprising:-	
Subrack	: 8867-4003
Power Supply	: 8132-4005
Remote I/O Interface Module	: 8174-4001
Cable harness	: 8891-4094
Terminal rail	: 8891-4032

9.2 Spares

Remote I/O Interface Module.	: 8174-4001
Power Supply	: 8132-4005
Fuse FS1 (DC Input) Size 0 Glass standard 7.5 Amp	: 82020/114
Fuse FS2 (AC Input) Size 0 Glass Anti-surge 2 Amp	: 82021/210
Female plug for AC Input	: 80720/131

9.3 Optional Equipment

Station battery connector and input lead (approx 3 metres) for DC Power input.	: 8891-4072

ADDITIONAL INFORMATION

If you require any further information, or wish to discuss an application in detail, do not hesitate to contact our GEM 80 representative who will be pleased to assist you.

Related information can be found in the following publications:

Product Data Sheet

No T.518 Remote I/O System.

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.

ALSTOM

DRIVES & CONTROLS

Boughton Road, Rugby
Warwickshire, CV21 1BU, UK
Tel: +44 (0) 1788 563625
Fax: +44 (0) 1788 563765

West Avenue, Kidsgrove, Stoke-on-Trent
Staffordshire, ST7 1TW, UK
Tel: +44 (0) 1782 781000
Fax: +44 (0) 1782 781001

9, rue Ampère
91345, Massy Cedex France
Tel: +33 (0) 8 25 02 11 02
Fax: +33 (0)1 60 13 22 60

Culemeyerstraße 1
D-12277 Berlin Germany
Tel: +49 (0) 30 7496 2656
Fax +49 (0) 30 7496 2494