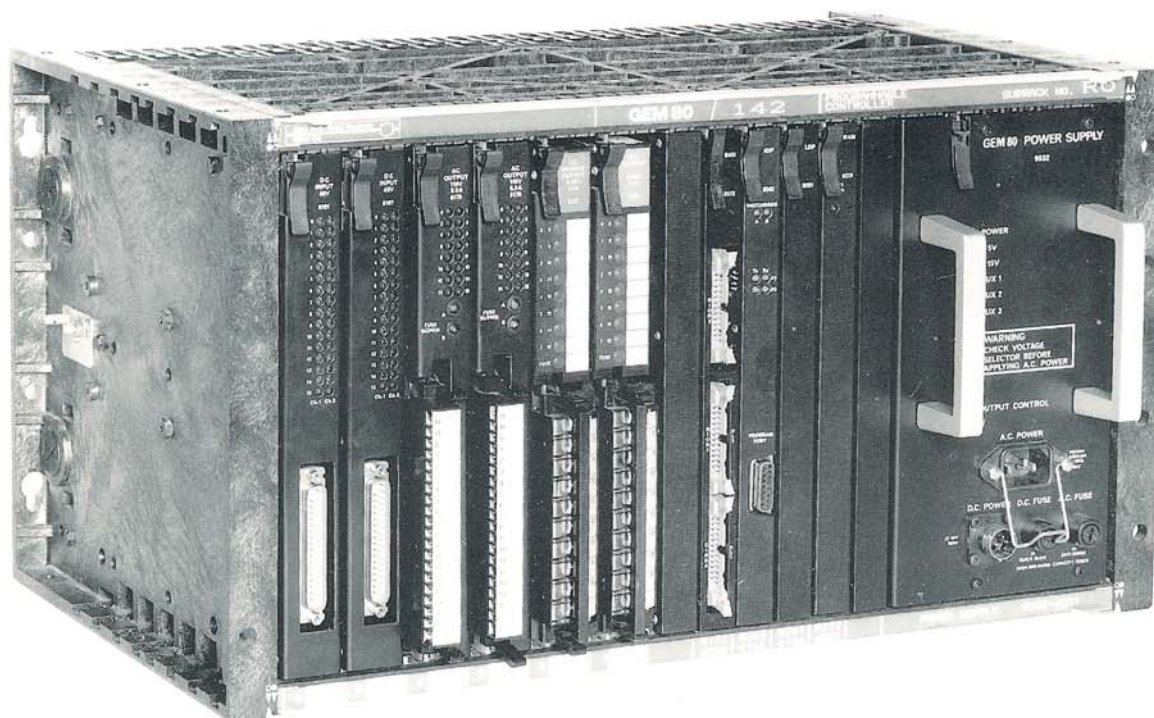




GEM 80/141 and 142 Controllers



DESCRIPTION

Introduction

The GEM 80/141 and 142 controllers are designed for industrial applications controlling and supervising plant and process. The GEM 80 family has been used successfully throughout the world in many industries including Food, Automotive, Oil and Steel, Mining, Electricity Generation and Water Treatment to name but a few.

The GEM 80/141 and 142 are single subrack controllers fully compatible with the rest of the GEM 80 family, using the same control language and I/O structure.

Standing alone, these controllers can provide analog and digital control plus report generation. The flexible structure allows interface to a variety of plant equipment whilst the comprehensive instruction set covers most requirements.

In distributed systems, the availability of multidrop serial links make the controllers ideally suited for centrally supervised or co-ordinated operations.

Input/Output

The GEM 80/141 uses a Basic I/O highway and the GEM 80/142 uses a Concentrated I/O highway. They are both bi-directional medium speed parallel highway used for transferring data between a host controller and the Basic I/O modules.

The GEM 80/141 and /142 both offer 512 digital I/O or 32 analog I/O or a combination of both up to the maximum point count, the GEM 80 142 being expandable up to 2048 digital I/O or up to 128 analog I/O or a combination of both up to the maximum point count. For every analog I/O used, the maximum available digital I/O is reduced by 16 points.

The analog values that the GEM 80/141 and 142 can handle are within the range +32767 to -32768.

Specification Summary

	GEM 80/141	GEM 80/142
Memory 64K 128K 192K 256K	5,000 Instructions + 4,000 Data Tables 10,000 Instructions + 8,000 Data Tables 15,000 Instructions + 14,000 Data Tables 20,000 Instructions + 20,000 Data Tables	
I/O Capacity	32 Words(512 I/O Points)	128 Words(2048 I/O Points)
Communications	Two serial link ports for point to point communications or a multidrop link (a maximum of 4 controllers). The signalling rate is user selectable from 110 up to 9600 bits per second.	
Program Format Execution Time	GEM 80 Ladder Diagram 5mS/1000 Instructions	
Power Input	110 or 220/240V 50 or 60 Hz (single phase) or 22/85V dc	
Temperature	Operating 0 to 60°C Storage -20 to 70°C	
Environment and Tests	GEM 80 Standard	
Mounting	19 inch (483mm) rack	

Communications

The GEM 80/141 and 142, in common with the rest of the GEM 80 family, both operate a communication protocol known as Extended Simple Protocol (ESP).

Two ports are available at PL2 on the upper backplane and are connected using a 26-way ribbon cable. This connection is used for either point-to-point or multidrop communications. The link formats are RS422 but by using converter units from the GEM 80 range other formats can be catered for, including fibre optic links.

Signalling rates are user adjustable between 110 and 9600 bits per second and are selected by preset data written into the P-tables for the ports.

A third serial link connection is available at the D-type connector on the front panel of the I/O Processor module. This connection is for the use of a System Programmer and is not configurable.

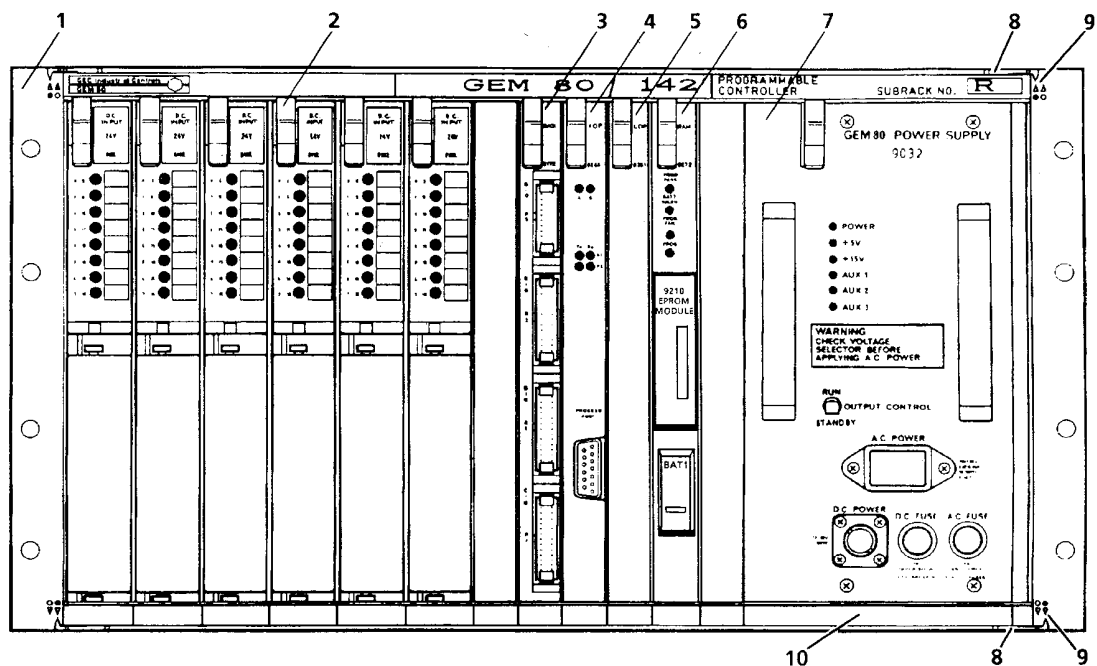
Memory Options

The GEM 80/141 and 142 are available in four memory options, 64K, 128K, 192K and 256K. It is possible to increase the memory size of the 64K, 128K and 192K options to a maximum of 256K by adding or exchanging memory modules.

Programming

The GEM 80/141 and 142 use the well established user friendly GEM 80 Ladder Diagram Language. Both the controllers include an extremely comprehensive set of pre-written software covering:

- relay replacement
- four function maths
- timers
- counters
- sequencers
- logic functions
- closed loop control
- group, array and analog signal handling
- B.C.D. handling
- block instructions
- serial port input/output functions



- | | |
|---------------------------------------|-----------------------|
| 1 Moulded subrack | 6 Memory Module |
| 2 Space for up to 6 Basic I/O Modules | 7 Power Supply Module |
| 3 Basic I/O Interface Module | 8 Locking Strip |
| 4 I/O Processor Module | 9 Locking Indicator |
| 5 Ladder Processor Module | 10 Module Label |

Subrack Arrangement

Construction

The GEM 80/141 and 142 controllers consist of plug-in modules mounted in a subrack that has been manufactured from flame retardant material to UL94-V0. The subrack is constructed from "clip-together" mouldings with "clip-on" backplanes and has been designed to facilitate either front or rear mounting.

A retention mechanism has been built into the subrack to provide module security in high shock or vibration applications.

A subrack spacer/wiring tray, part number 8891-4064, is available as an optional extra. It fits on to either the bottom or top of a subrack to provide a 2U (88.5mm) space between subracks.

Features

- Automatic self test and watchdog system
- On-line programming changes
- Remote programming from serial links
- Large range of built-in pre-written software routines
- Flexible data table sizes
- Built-in clock for time and date

Instruction Set

Relay Replacement Functions:		
-] [-		Normally open contact
-]/[-		Normally closed contact
-()-		Coil
DELAY		Time Delay
COUNT		Counter
SEQR		Sequencer
Logic Functions:		
AND	-	Logic AND
ANDGRP	T24	Logical AND of two words
OR	-	Logic OR
XOR	-	Logic Exclusive OR
ORGRP	T25	Logical OR of two words
XORGRP	T26	Exclusive OR of two words
Maths Functions:		
ADD	-	Addition
ADDARRAY	T12	Array addition
SUB	-	Subtraction
SUBARRAY	T13	Array Subtraction
MULT	T10	Value multiplication
MULARAY	T14	Array multiplication
DIV	T11	Value division
DIVARRAY	T15	Array division
LINCOLN	S11	Linear equation calculation
CONARRAY	S10	Linear conversion of array
SQRT	S12	Square Root
Signal Processing:		
DBOUNCE	S0	Signal transient filter
FGEN	S30	Function generator
DEDBAND	S31	Unity gain with dead band
LIMIT	S32	High and low limit
RAMP	S33	Ramp signal (rate dependent)
ANALAG	S37	First order time constant
Closed Loop Control:		
PIDABS	S34	PID loop absolute output
PIDINC	S35	PID loop incremental output
INCOUT	S36	Incremental output
Binary Tests:		
HISTATE	S3	Highest bit number set to 1
BITSON	S26	Total number of bits set
CMPGRP	T21	1st difference between words
GETBIT	T22	Test individual bits of word
Binary Manipulation:		
SWAP	S4	Swap 1/2 locations
INVERT	-	Invert
INVGRP	S25	Invert each bit of word
SHIFT	S27	Left and right word shift
ROTATE	S28	Left and right word rotation
PUTBIT	T23	Set and reset bits of word

Numerical Tests:		
COMPARE	T0	Compare X and Y, output if:
EQ	T1	X equals Y;
NE	T2	X not equal Y;
GT	T3	X greater than Y;
LT	T4	X less than Y;
GE	T5	X greater than or equal Y;
LE	T6	X less than or equal Y.
Numerical Manipulation:		
NEGATE	S5	Change sign of number
ABS	S6	Absolute value of input
NONZERO	S7	Output if input is non-zero
Block Instructions:		
START OF		
BLOCK		Enclose
		conditionally
END OF		executed
BLOCK		rungs
Data Moving:		
LOCATE	S20	Locate data table address
MOVE	T20	Move data between addresses
STORE	T30	First in first out store
Code Conversion:		
BCDIN	S1	Convert B.C.D to binary
BCDOUT	S2	Convert binary to B.C.D
Serial Port Control:		
PRITEXT	S38	Output text to serial port
PRINT	T38	Output user defined message
CHARIN	T39	Store text from serial port
Output Function:		
OUT	-	End of rung output
OUTPUT	S8	Intermediate rung output

Instruction Capacity

	Nominal Memory Size			
	64K	128K	192K	256K
Number of Instructions (with 5000 data tables)	5000	10000	15000	20000
Number of Instructions (with 10000 data tables)	2350	9850	16250	21680
Number of bytes available for both data tables and instructions	32K	62K	94K	126K
Maximum number of instructions based on average compiled code size	5000	10000	15000	20000

OR

64K : 4000 instructions + 4000 data tables
5000 instructions + 4700 data tables
128K : 10000 instructions + 8000 data tables
192K : 15000 instructions + 14000 data tables
256K : 20000 instructions + 20000 data tables

Memory Allocation (bytes)

	Nominal Memory Size			
	64K	128K	192K	256K
Source code + data tables	29400	59400	59400	59400
Extension space for source codes	—	—	32500	65000
Compiled code (excluding 4/500 bytes per page overhead)	30000	65000	97500	130100
Mailboxes + internal use	4K	4K	4K	4K

Subrack Specification

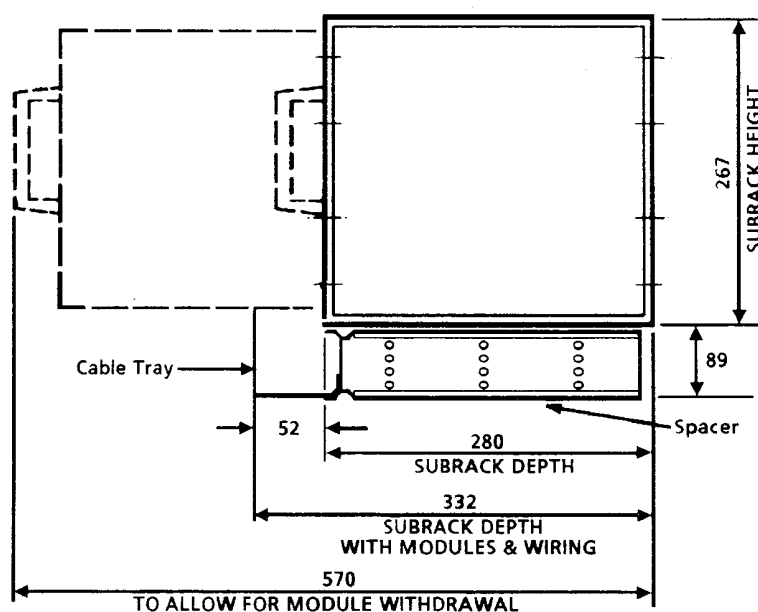
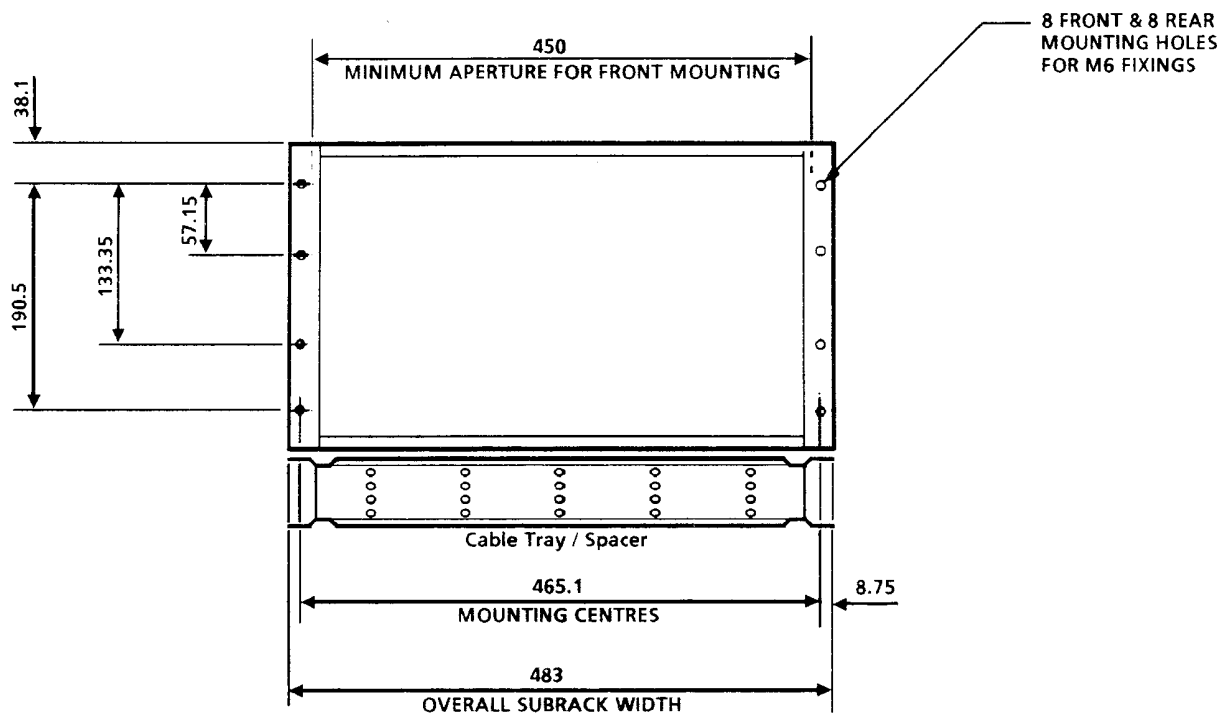
267mm high × 483mm wide × 320 mm deep (332mm with spacer/wiring tray fitted). Depth includes modules with front connectors fitted. Allow an additional 15mm for plantside wiring.

The 6U subrack conforms to IEC297 (1975) – Dimensions of Panels and Racks.

The optional spacer/wiring tray increases the height of a single subrack by 2U (88.5mm).

Mounting

The subrack has a very simple mounting procedure which utilises the side plate front or rear flange for fixing purposes. Both front and rear flanges each have four fixing holes. Under normal circumstances, only the top and bottom holes will be required to secure the subrack assembly. However, in conditions of extreme shock or vibration, it may be necessary to use the other two holes as well. To aid rear mounting, the top hole of each rear flange is "keyhole" shaped.



Subrack Dimensions

Site Requirements

Environment

The following environmental conditions apply for GEM 80 controllers:

- Temperature : 0 to 60°C operating
 : -20 to 70°C storage
- Humidity : 5% to 95% RH
 non-condensing

GEM 80 equipment should not be installed in corrosive atmospheres (e.g. Benzine, acidic fumes, etc.) without special precautions being taken.

Power Supply

The controllers operate on d.c. supplies of between 22 and 85V d.c. non-isolated negative earth only, or single phase a.c. supplies of nominal 110V or 220/240V 50/60Hz

If any doubt exists regarding the adequacy of the a.c. supply, it may be advisable to fit a line conditioner (ferro-resonant CVT) in the feed to the controller. (See GEM 80 Power Supply Requirements User Information T428 for details.)

The larger plant-side power supplies require 3 phase a.c. inputs - 380/415/550V 50/60Hz. (See 8720/21 Product Data Sheet T219 for full details.)

Small plant-side power supplies require single phase a.c. inputs - 110V or 220/240V 50/60Hz. (See 8712 Product Data Sheet T218 for further details.)

ADDITIONAL INFORMATION

Further information and help on GEM 80 products or applications can be obtained from;

- Your local GEM 80 representative,
- or GEM 80 Customer Services Dept.
Tel. 0782 783511. Ext. 2651 or 2574.

ORDER CODES

Model	I/O Processor 8263- 415*	Ladder Processor 8261- 415*	I/O Processor 8263- 416*	Ladder Processor 8261- 416*	Basic I/O Interface 8172- 4003	Power Supply Module 9032- 4001	System Number
GEM 80/141	1	1	0	0	1	1	8870-4269
GEM 80/142	0	0	1	1	1	1	8870-4270

* Determined during manufacture. When ordering spare modules, replace the asterisk with the final digit of the original module order number.

RAM/EPROM	Order Number
64K	8272-4001
128K	8272-4002
192K	8272-4003
256K	8272-4004

The standard GEM 80/141 & 142 does not include a memory module. This must be specified by the user to grade the size of each controller. The order codes for the four different memory modules are shown in the table on the left.

Ribbon Cables

Cable Type	Length Between Socket 1 and 2	Length Between Sockets 2 and 3, 3 and 4	Number of Sockets	Ordering Code
Basic I/O (26-way)	1.25m	1.0m	4	8890-4611
	2.0m	1.0m	4	8890-4612
	3.0m	1.0m	4	8890-4613
	4.0m	1.0m	4	8890-4614
Power Supply (20-Way)	As Required	As Required	2	8890-4615
			3	8890-4616
			4	8890-4617
			5	8890-4618

Optional Equipment

Flatpacked Basic I/O subrack for Power module and 8 Basic I/O modules	8857-4006
Flatpacked Basic I/O subrack for 12 Basic I/O modules	8859-4003
Power Supply module (110V/220V a.c. isolated and 24/48V d.c. non-isolated, negative earth inputs)	9032-4001
Basic I/O Expander module for GEM 80/142 only	(Existing systems) 8173-4003 (New systems) 9284-4002

(One or more of these modules is required to utilise the extra 1536 I/O points over and above the 512 I/O points of the 8172 module, supplied as standard with the system, and should be mounted in 8859 subracks.)

EPROM sub-module 256K	9210-4001
Coronet Local Area Network interface	8193-4001
RS422 to 20mA current loop serial interface (non-isolated)	8924-0000
RS422 to RS485 serial interface	8587-4003
RS422 to RS232 serial interface with handshaking (isolated)	9009-0000
Fibre Optic interface unit (This module converts the 8924-0000 20mA output to a fibre optic signal.)	8927-0000

Basic I/O Modules

As the range of Basic I/O modules is continually being expanded, please contact GEM 80 Customer Services Department to discuss your requirements.

Serial Link Equipment

Please contact Customer Services Department.



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