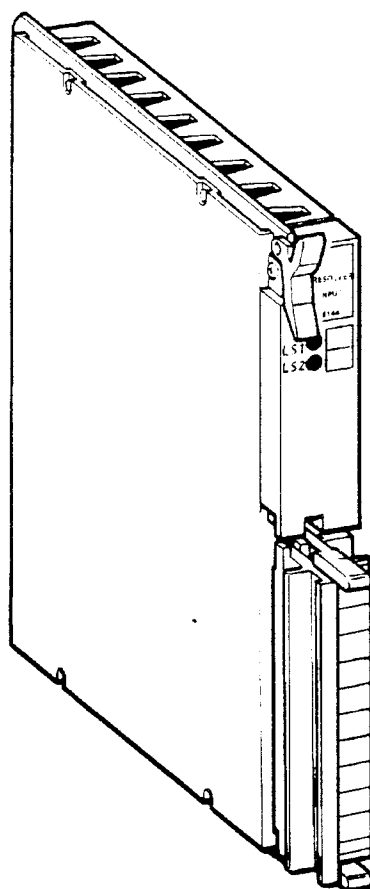


RESOLVER INPUT MODULE

8144



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1. INTRODUCTION

The Resolver Input Module is a Compact input module which interfaces between a resolver and the Basic I/O Highway of a GEM 80 Controller. It is suitable for position control where the resolver is directly coupled to a motor (without reduction gearbox) or indirectly coupled (with reduction gearbox).

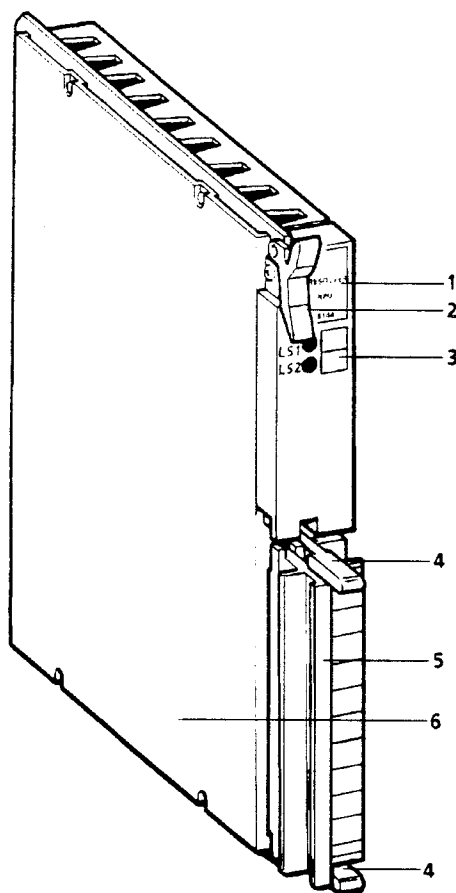
The module includes resolver excitation for either brushless or slipring designs. The inputs from the stator terminals of the resolver are converted within the module to a 12-bit number, giving a resolution within one revolution of 5.27' of arc (equivalent to 1/4096 of a revolution). In addition, logic counts the number of revolutions the resolver has turned from datum.

The module has three terminals for connection of two zeroing (datum) limit switches. The twelve bits representing the number of revolutions turned are zeroed when the limit switches are set in a certain pattern. The twelve bits representing the fraction of a revolution remain unchanged.

The module locates in a subrack prepared to accept Basic I/O modules and occupies a single subrack slot (**important: see Application Notes**).

The module is suitable for resolvers rotating at up to 4000 revolutions per minute and counts automatically, the number of revolutions the resolver has turned from datum. The revolution count is zeroed independently of the host controller.

Plant cabling is terminated via a removable coded connector on the front of the module. No external supply is required as the module is powered from the I/O subrack.



1. Colour code and type number.
2. Ejection handle.
3. Limit switch indication.
4. Plant connector retaining clips.
5. Plant Connector.
6. Moulded enclosure.

Figure 1.1 8144 Resolver Input Module

2. SPECIFICATION

Resolver excitation	: Sinewave, 2.5kHz, maximum of 15mA	Operating Method	: Null seeking, tracking closed loop.
Resolver Inputs	: Two separate pairs of input terminals for sine and cosine windings.		: Data available to the Basic I/O is updated every 1/4096 of a revolution.
	: Transformer coupled for noise immunity.	Linearity	: +/- 4 bits (+/- 21 arc minutes).
Zeroing	: Three terminals (two signal, one common) allow revolution count to be zeroed.	Repeatability to a specific point within a revolution.	: +/- 2 bits (+/- 10.5 arc minutes).
	: Opto-isolated.	Power Supplies	: +15V @550mA from the I/O subrack.
	: Signal level 18 to 30V dc.		

3. OPERATION

3.1. Resolver Types.

A range of standard modules is available for use with the resolvers listed in Section 6, Ordering Codes. However, other resolvers can be accommodated but require type testing by GEC Industrial Controls.

As a general guideline to the selection of resolvers, the important factors are:

- (a) the transformer ratio (rotor to stator) should be 2:1 (0.5) and be within a tolerance of $\pm 5\%$
- (b) the phase shift should be less than 10 degrees (lag or lead).
- (c) the null voltage must be less than 15mV.
- (d) the resolver must be able to operate at an excitation frequency of 2.5kHz (most resolver can operate over a wide range of frequency; usually 400Hz to 10kHz).

If you wish to use a non-standard resolver you must arrange with GEM 80 Customer Support for the resolver to be type tested. Additional costs may be involved for this facility. The resolver **MUST** be sent to GEC at least 2 months before you place an order.

3.2 Interface with host controller.

Two A-table locations are used to transfer the resolver position to the host controller. The two A-table locations are composed as follows:

lower word (eg A0)

: R R R R F F F F F F F F

upper word (eg A1)

: X X X X D C B A S R R R R R R R

where F = fraction of a revolution (12 bits in total).

R = number of revolutions from datum (11 bits in total).

S = sign bit for number of revolutions from datum

A = direction of travel (1 bit).

B = limit switch 1 (1 bit).

C = limit switch 2 (1 bit).

D = "zeroed" or datum (1 bit).

X = not used (may float to any state).

Note 1 : the direction of travel bit (bit A) is dynamic. This means that it indicates the direction of travel the resolver was turning just before the host controller read the position from the module. If the resolver slowly comes to a halt, because of the mechanical linkage, bit A may indicate a direction of travel opposite to the previous scan.

Note 2 : the "zeroed" or datum bit (bit D) is set when limit switch 1 is OFF (bit B) and limit switch 2 is ON (bit C). This datum bit is arranged so that the host controller only reads it ON once per activation. Therefore, once the limit switches have caused the revolution count to be zeroed, on the next host controller read of the module bit D will be set ON (logic 1). On all subsequent host controller reading of data from the module, until the limit switches again indicate datum, bit D will be set OFF (logic 0). See section 4.3 of these Application Notes: Limit Switch Operation.

4. APPLICATION NOTES

4.1 Ladder Diagram Example

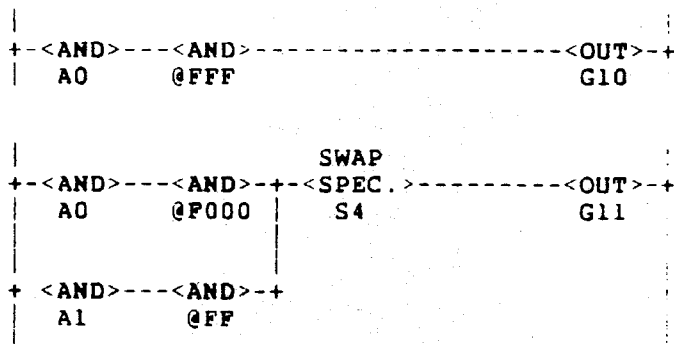


Figure 4.1 Ladder Diagram Example

Figure 4.1 shows a typical ladder diagram. The example shown assumes that the module occupies addresses A0 and A1.

In this example G10 will always be positive and will vary between 0 and 4095. G11 will vary between +32752 and -32768 and increment in steps of 16. The revolution count is a pure binary count, so if the number of revolutions reaches +32752 (@7FF0) and continues in a positive direction the count will overflow; the next count given would be -32768 (@8000).

4.2 Mounting

This module "occupies" two A-table locations and can therefore be considered as a 32-bit module. However, to ensure that the fraction of a revolution and full revolution values read from the module are sampled at the same instant in time, it does NOT decode the Basic I/O addresses in the same manner as other 32-bit modules within the GEM 80 range.

The Resolver module can be installed in any I/O subrack in the GEM 80 range (for example: 8869, 8859, 8867, 8857 or 8866). The module takes its base address from the decoder setting for the slot it occupies. Although the module only occupies a single slot, the adjacent three slots in the group of four controlled by the decoder switch cannot be used by any 8-bit Compact I/O modules. However, 16 or 32-bit Compact I/O modules can be fitted in these adjacent slots provided they can be allocated addresses not used by the Resolver Module.

4.3 Limit Switch Operation.

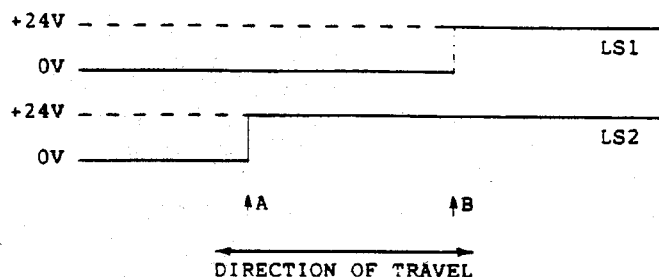


Figure 4.3 Limit Switches

- (i) when both LS1 and LS2 are at 0V, reset of the revolution count occurs when LS2 switches to +24V; point A.
- (ii) when both LS1 and LS2 are at +24V, reset of the revolution count occurs when LS1 switches to 0V; point B.

4.4 Powering Up.

For up to 2 seconds after powering-up, the fraction of a revolution value will constantly be changing as the module calculates the position. (This is a feature the tracking type resolver converter).

WARNING

ON MODULE POWER-UP, ALWAYS DRIVE THE RESOLVER INTO DATUM TO RESET THE COUNT. THE REVOLUTION COUNT IS NOT CLEARED ON POWER-UP AND CAN THEREFORE ASSUME ANY VALUE.

5. INSTALLATION

5.1 Mechanical Coding.

- Subrack : remove the coding peg from position 12 and position 18 (when fitted).
- Plant connector : three coding keys are required to be inserted before fitting to the module.
 Keys 1 & 2 (8144) - between positions 1&2 and 6&7.
 Key 3 (Resolver) - as shown in Table 5.1

Table 5.1 Resolver Key Coding

	Resolver	Coding Key 3 Posn.
		Between Posn.
Moore Reed	11-RS207	2 and 3
Moore Reed	35-RS106	4 and 5
Tandem	M94 60 210	4 and 5
Precilec	26V20RN USPE-03	4 and 5
Eucron	73-299-310	9 and 10
Eucron	73-299-312	7 and 8
Eucron	73-299-817	8 and 9

5.2 Wiring.

Resolver signals must be treated as being in the same segregation group as analog signals. Cabling must be individually screened twisted pairs within an overall screened cable. Low capacitive cables (e.g. Belden Type 8723) should be used to minimise linearity errors.

The connection marked 'SCN' on the module plant connector must NOT be used. To avoid earth loops it is important that the screen of each of the individual twisted pairs is brought down separately to a clean earth (system signal earth), as shown in Figure 5.1.

These connections should be run separately from the connections to the other signal ground terminations or safety earth wiring and use, as a minimum 1.5mm² insulated wire.

For further details of segregation requirements for cables, refer to the Section entitled INSTALLATION in the GEM 80 Controller Technical Manual.

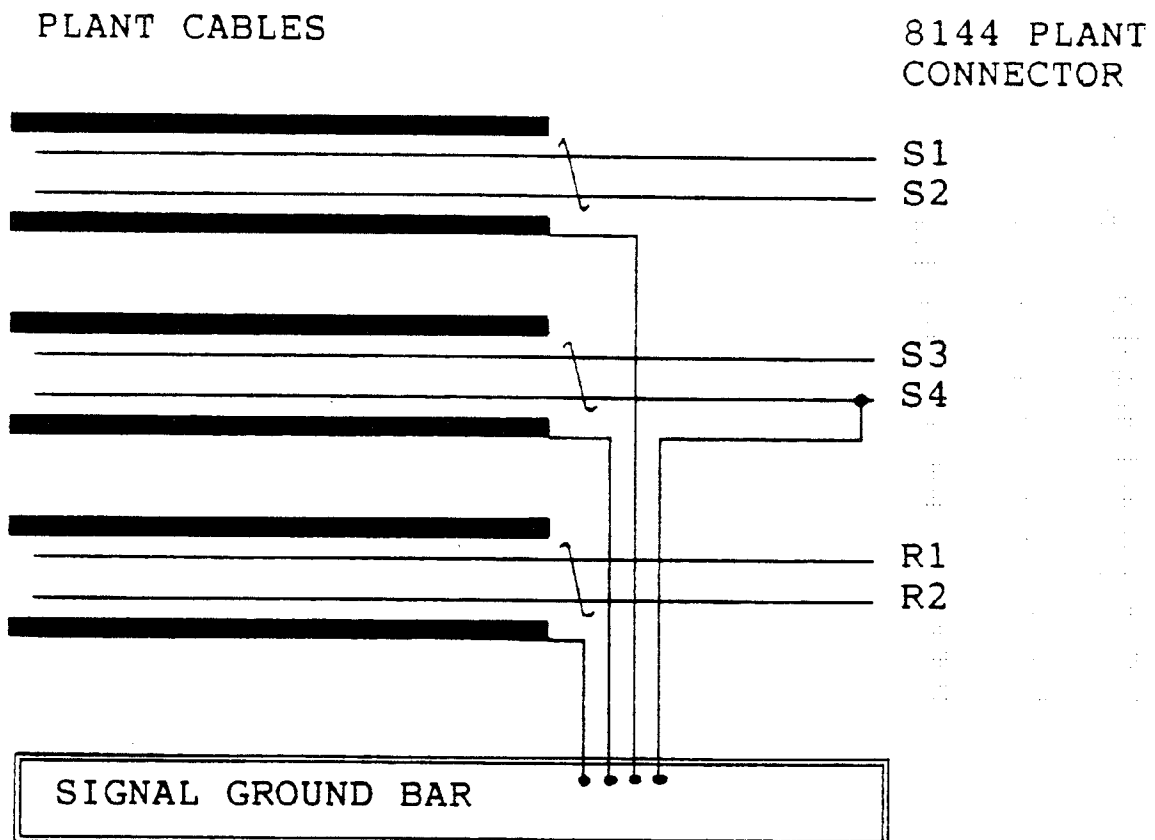


Figure 5.1 Typical Wiring Arrangement

RESOLVER INPUT MODULE 8144

6. ORDERING CODES.

The Resolver Input Module Kit Order Code is dependent on both the resolver type and the I/O structure of the host controller.

The kit comprises:

1 Module	8144-4XXX
1 Plant connector	8890-4038

Table 6.1 shows the Ordering Codes for Basic I/O systems. Table 6.2 shows the Ordering Codes for Verification I/O and Remote I/O systems.

Table 6.1 Host controllers with Concentrated or Basic I/O only.

Resolver		Kit Ordering Code	Module Ordering Code
Moore Reed	11-RS207	8144-4501	8144-4502
Moore Reed	35-RS106	8144-4503	8144-4504
Tandem	M94 60 210	8144-4503	8144-4504
Precilec	26V20RN USPE-03	8144-4503	8144-4504
Eucron	73-299-310	8144-4505	8144-4506
Eucron	73-299-312	8144-4507	8144-4508
Eucron	73-299-817	8144-4509	8144-4510

Table 6.2 Host controller with Verification I/O or any Remote I/O Systems

Resolver		Kit Ordering Code	Module Ordering Code
Moore Reed	11-RS207	8144-4601	8144-4602
Moore Reed	35-RS106	8144-4603	8144-4604
Tandem	M94 60 210	8144-4603	8144-4604
Precilec	26V20RN USPE-03	8144-4603	8144-4604
Eucron	73-299-310	8144-4605	8144-4606
Eucron	73-299-312	8144-4607	8144-4608
Eucron	73-299-817	8144-4609	8144-4610

Refer to GEM 80 Customer Services Department for advice on the compatibility of Resolvers other than those listed above or for replacements for previously supplied modules in the 8144-4001 to 8144-4499 range.

7. 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 Department
Tel. 0782 783511 Ext. 2651 or 2574
International Code 44 782 783511



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