Autotech Controls
DM7 Resolver Decoder with InterBus-S Interface (P/N DM7-01T00-IBS)
Instruction & Operation Manual

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MAN-DM7-IBS
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DM7 Programmable Resolver Decoder with InterBus-S Interface P/N DM7-01T00-IBS

Single Turn, Single Channel

Principle of operation

The DM7 series resolver to digital decoder provides an absolute encoder system in conjunction with any one of the Autotech's single turn resolvers. As shown in the diagram on the next page, the resolver rotor winding is excited from a reference sinusoidal generator inside the DM7 unit. The analog output signals from the resolver stator windings, after signal conditioning in the buffer amplifiers are decoded to digital format in the ratiometric tracking converter. The zero offset entered from the front panel keypad is continuously added to this digital value. The offsetted digital data is scaled, converted to the digital format as selected from the keypad and displayed on the front panel of the unit. The position information is also made available in a parallel format for external devices, such as PLC.'s remote displays, etc.

InterBus-S Interface

This DM7 Decoder has been adapted for connection to an InterBus-S Bus.

Programmable full scale offset for easy set up

The resolver can be mounted on the machine without any concern for mechanically aligning the resolver zero to the machine zero. Once resolver is coupled to the machine shaft, the only thing you have to do is to bring the machine to a known position, say home position, and set an offset number from the front panel keypad until the display reads zero position. This is especially useful during initial start up in that it reduces the set up time. The offset can also be used to compensate for any machine wear.

Programmable resolution;20-4096 counts per turn

The programmble scale factor feature provides you the flexibility of selecting the resolution in the field. Now you do not have to worry about defining the resolution at the time of ordering the unit. The scale factor can be programmed from the front panel and can be any number between 19 and 4095 resulting in resolution of 20 to 4096 counts per turn. This feature allows you to scale the position to desired engineering units (inches, mm, etc.) if required.

Front panel selectable output formats — BCD, binary or gray code

The DM7 is an extremely versatile resolver to digital decoder. Now you do not have to define the ouput format at the time of ordering the unit. Depending upon your application, the output format such as BCD, Natural Binary or Gray code can simply be selected from the front panel keypad. This means one unit for various applications.

Self diagnostics with fault output

The DM7 is provided with an internal self check circuit that continuously monitors if the microprocessor is not in reset, input 120 VAC power, DC power supplies, and resolver cable. In case a fault occurs in any one of the above critical functions, the unit goes into fault mode. During the fault mode all InterBus-S outputs are disabled automatically.

Highly noise immune circuitry

Ratiometric tracking converter technique employed for resolver to digital decoding provides the best protection against electrical noise generated by power line transients and varying ground potentials. This decoding method is inherently immune to temperature changes and line frequency variations. The optical isolation adds an additional layer of protection against electrical noise and enhances the environmental integrity of the system.

Built in tachometer

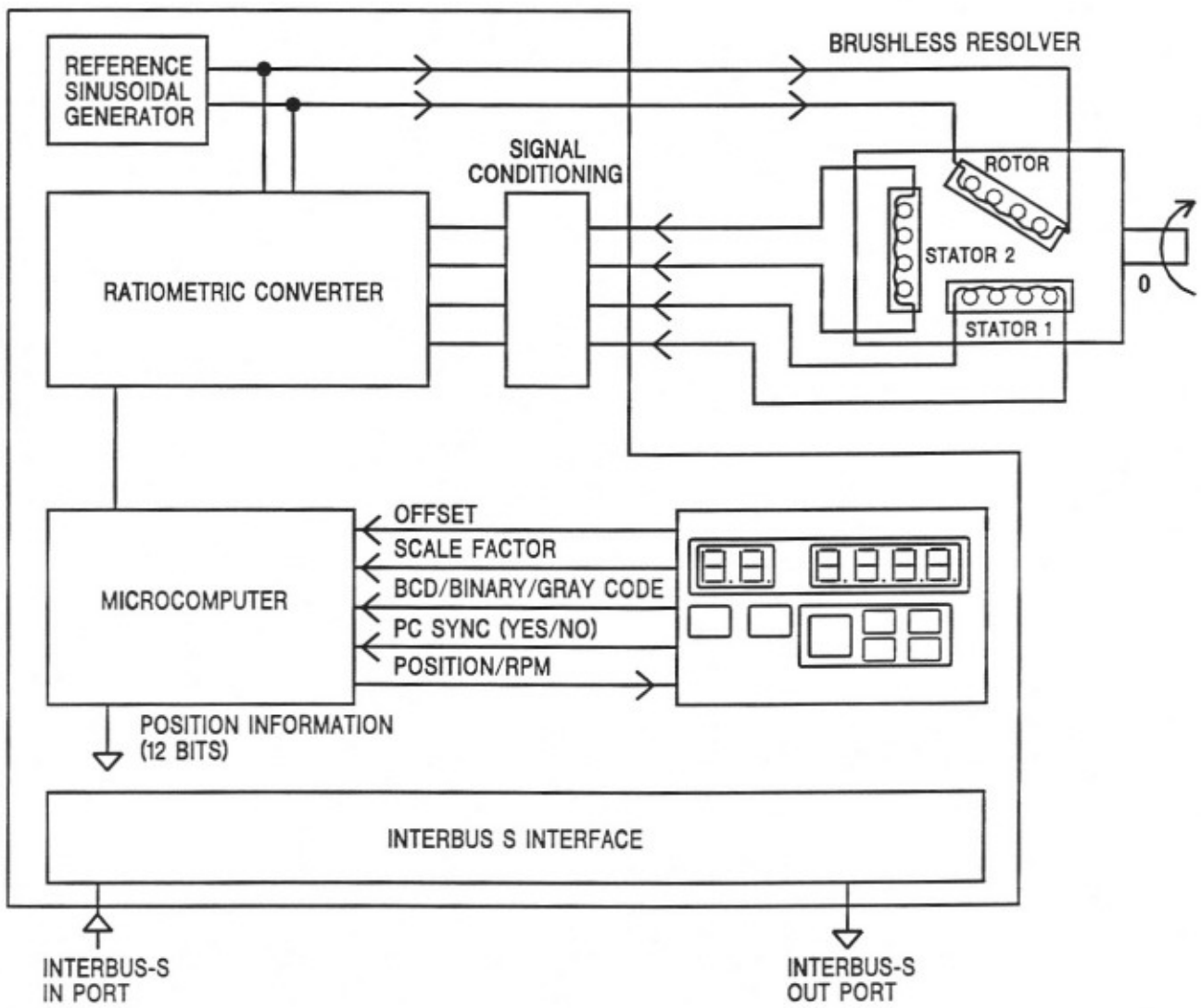
The shaft RPM is continuously displayed on the front panel. Two additional outputs, one overspeed and the other under speed are provided as a front panel indicator only.

Program security

A supervisory input is needed to make any changes to the program to protect against unauthorized tampering.

Rugged and reliable resolver as position transducer

The DM7 series of resolver decoder combines the ruggedness of a resolver and reliability of an advanced solid state control. The rugged heavy duty NEMA 13 IP54 resolver can be mounted on a machine in any hostile industrial environments such as mechanical shock vibrations, extreme humidity and temperature changes, oil mist, coolants, solvents etc. and the resolver to digital decoder can be mounted up to 2500 feet away in a control panel.



Installation and Operation

1. Introduction

A functional block diagram of Autotech's DM7 Programmable Resolver Decoder with IBS interface is shown on the preceding page.

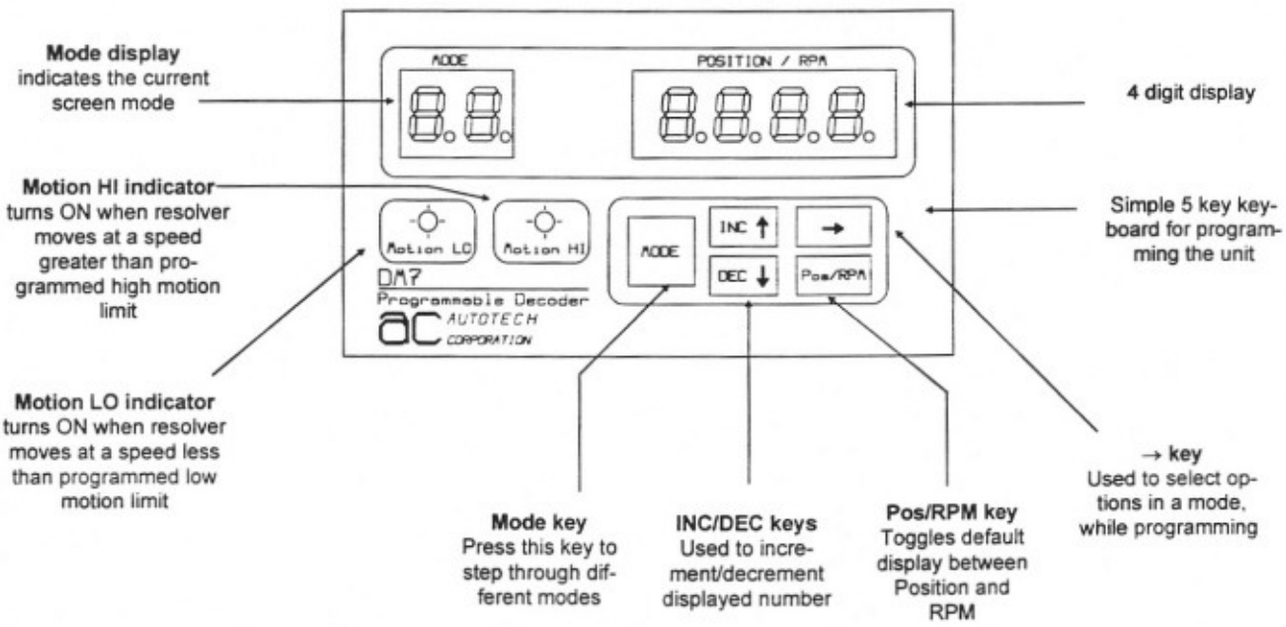
As shown, the DM7-IBS accepts an input from a single turn resolver (such as Autotech's RL100, E6R, E7R & E8R series of resolvers, etc.) and decodes it to give a scaled 12 bit digital position signal, giving a resolution of 4096 counts per turn. The decoded resolver position information is displayed on the front panel of the unit and is available to be read on the InterBus S port.. The format of position output is front panel keyboard selectable as BCD, Gray code or natural binary format.

The high and low limits of the motion are programmable. The overspeed indicator is on true when the resolver speed is more than the programmed high limit, and underspeed indicator is on when the resolver speed is below the programmed low motion limit.

The scale factor (desired counts per turn minus one) is programmable from 20 to 4095 to match the display and position to any output desired units in this range. For example, a scale factor of 359 may be selected to display resolver position in degrees, and a scale factor of 3599 will display the position in tenths of a degree. A static offset value may be programmed in the unit to electronically align resolver zero with machine zero.

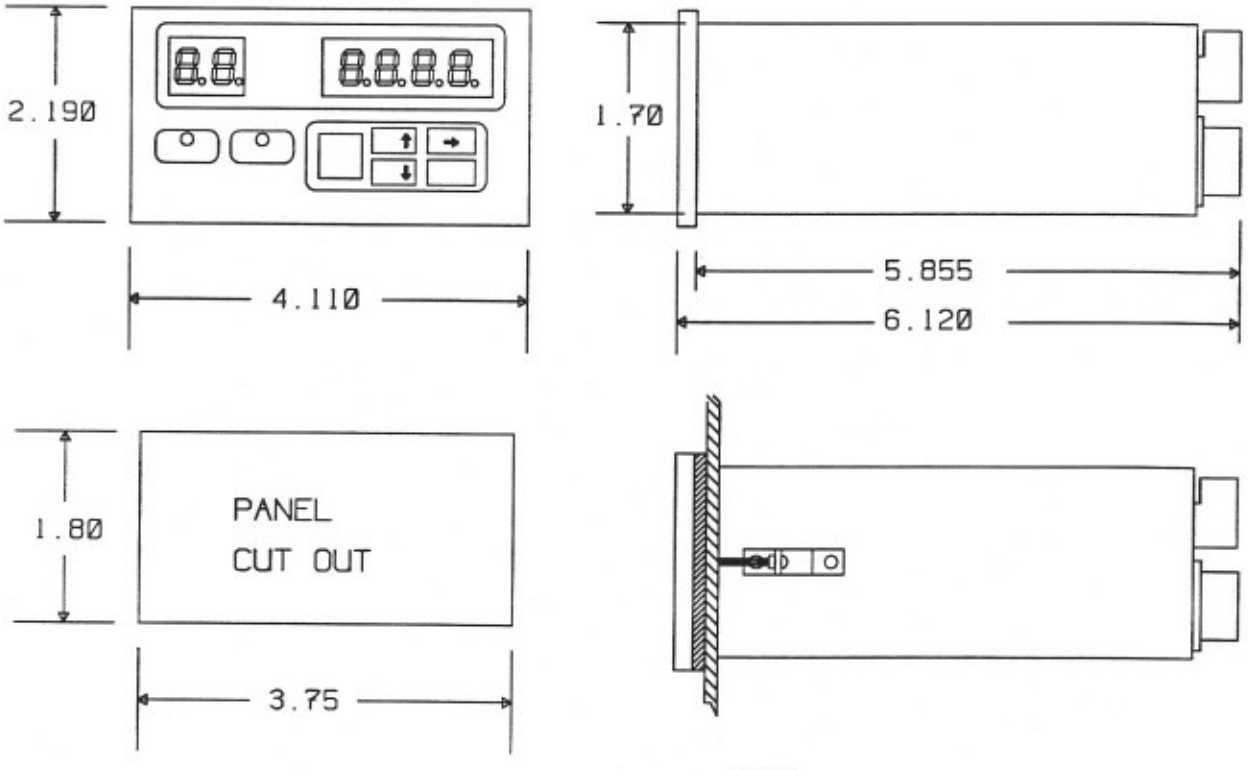
The DM7-01T00-IBS can only be ordered with IBS output. It is packaged in a 1/8 DIN size enclosure, and has a NEMA 12 rating.

2. Front Panel



3. Mounting Dimensions

The figure below provides mounting dimensions of the DM7. The unit is housed in a 1/8 DIN panel mount case, and requires a rectangular panel cutout only (no mounting screw holes are required). Slide the unit in through the panel opening with gasket, insert the two right-angle mounting brackets into the openings on either side of the DM7 housing and slide brackets 1/4-inch towards the back of the unit to secure the brackets to the housing. Tighten the pair of screws on the right-angle brackets to hold the unit into the panel. **DO NOT OVER-TIGHTEN (80 inch-oz torque maximum!)**



Note:
Allow a minimum of 2.75 inches for DB connector

4. Rear View and Wiring Diagram

Subminiature-D9 Connector Male Sub-D9 Remote Bus In	
Pin	**Function**
1	DO1
2	DI1
3	GND1
4	NC
5	NC
6	/DO1
7	/DI1
8	NC
9	NC

Subminiature-D9 Connector Female Sub-D9 Remote Bus Out	
Pin	**Function**
1	DO2
2	DI2
3	GND
4	NC
5	GND (Jump to Pin #3)
6	/DO2
7	/DI2
8	NC
9	/ RBST

CBL-10T22-xxxx Cable		
Wire Color	**Resolver Terminal**	
Green- Black Green	R1 R2	twisted pair
Yellow-Black Yellow	S1 S3	twisted pair
Blue-Black Blue	S2 S4	twisted pair
Note: To change the resolver ascending count direction, reverse S1 and S3 connections		

Notes on grounding and shielding: (Failure to observe any of these requirements may cause unpredictable operation and will void warranty)

1. All logic level wiring (including resolver and external power supply) must be done using overall foil shielded cables, with shields and equipment grounded as per above drawing. See How to Order section for suitable cables offered by Autotech.

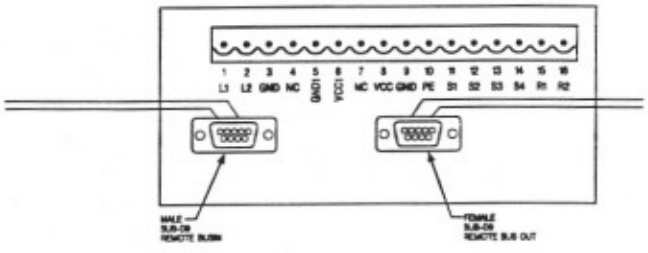
2. Resolver shielded cable must consist of twisted pairs, and the twisted pairs must be wired as per wiring as per wiring instructions. See How to Order section for a suitable resolver cable offered by Autotech. It is recommended that the esolver shielded cable be run in its own separate conduit.

3. All ground planes on which the DM7 and all external equipment are mounted must be held to the same RF potential, by good metallic connections to building frames, conduit or wiring trays.

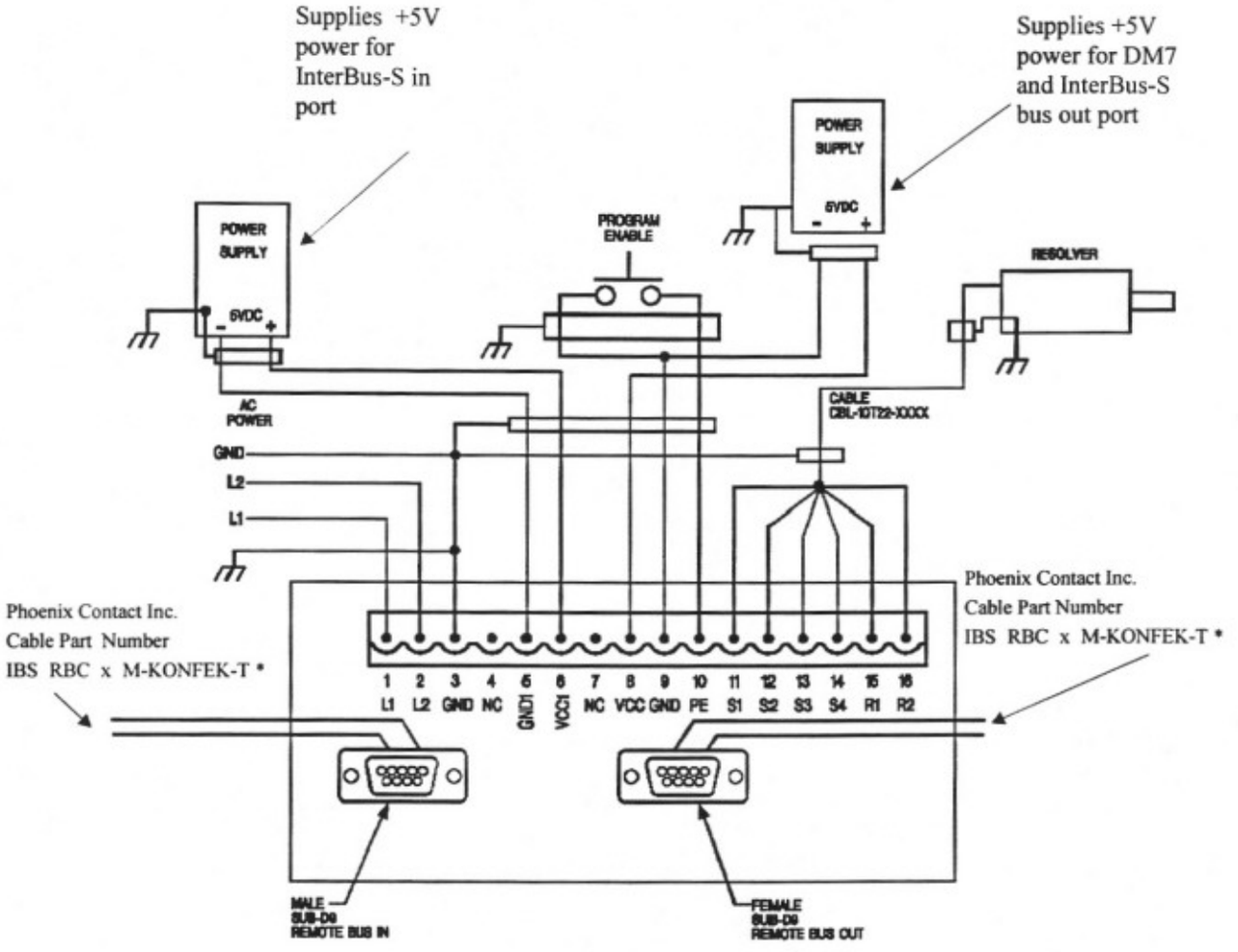
4. All shielded cable must be kept at a minimum distance of 2 inches from all high voltage or inductive wiring.

5. All shielded cable must be kept at a minimum distance of 12 inches from all motor wiring controlled by AC or DC drives.

4.1 DM7-01T00-IBS InterBus-S Interface (Rear Connectors)



4.2 DM7-01T00-IBS System Wiring Schematic



***When ordering Phoenix Contact cable, substitute length in meters for the "X" in the part number (or use other Interbus-S compatible cable).**

NOTE: Two separate 5V power supplies are needed to maintain isolation between the Interbus-S IN and OUT ports.

5. Programming

Programming the DM7 requires entering of following values/options for the unit:

- **Scale Factor**: desired counts per revolution minus one.
- **Offset**: constant to be added to the true resolver position, used to align machine zero with resolver zero.
- **Motion Hi limit:** the overspeed output is energized when resolver turns at a speed greater than this speed.
- **Motion Lo limit:** the under speed output is energized when resolver turns at a speed less than this speed.
- **Output type option:** BCD, Gray or Binary
- **PC synchronization option:** yes or no.

The five keys on the front panel are used in following manner:

MODE	Used to step through different programming screen. The two 7-segment LEDs indicate the current screen or mode.
INC ↑ / DEC ↓	The INC/DEC keys are used to increase/decrease numerical entries, such as scale factor offset, etc.
→	Used to display and select options for output type and PC sync screens.
POS/RPM	Used to toggle the default display between Position and RPM display. Pressing this key any time returns display to Pos/RPM

Note:
The program enable input must be True to allow programming of the unit.

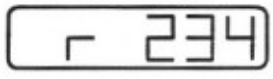
5.1 Default Display:

The DM7 normally displays the position (true resolver position + offset), or RPM of the resolver. The display may be toggled between these two by pressing Pos/RPM key. The Pos/RPM key may be pressed to bring up the default display at any time. Also, if there is no key pressed for one minute, the unit returns to its default display. The position display is as follows:

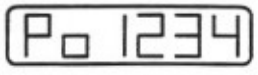
After a short time "Po" blanks out. The RPM display is as follows:

The INC, DEC keys are ignored in this mode.

5.2 Scale Factor Programming:



5.3 Offset Programming

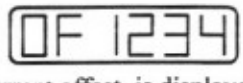
Press MODE to display 

Current scale factor is displayed

Use INC ↑ or DEC ↓ to increase or decrease the displayed number until desired scale factor is displayed

Please note:

- Scale factor = desired counts per turn - 1
- Scale factor programming is inhibited when resolver is moving

Press MODE to display 

Current offset is displayed

Use INC ↑ or DEC ↓ to increase or decrease the displayed number until desired offset is displayed

Please note

- Default position display = true resolver position + offset

Thus offset may be used to electronically align resolver to machine zero. The offset should be less than the scale factor.

5.4 Motion High Limit Programming:

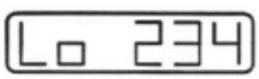
Press [MODE] to display 

Current Motion High Limit is displayed.

Use [INC ↑] or [DEC ↓] to increase or decrease the displayed number until desired Motion High Limit is displayed.

Please note that the overspeed output is energized when resolver rotates at a speed greater than this limit.

5.5 Motion Low Limit Programming:

Press [MODE] to display 

Current Motion Low Limit is displayed

Use [INC ↑] or [DEC ↓] to increase or decrease the displayed number until desired Motion Low Limit is displayed

Please note: the underspeed output is true when resolver rotates at a speed lower than this limit

5.6 Decimal Point Programming:

While displaying Pos/RPM, press

[→] to move decimal point to desired location.

Please note that decimal point is arbitrary, and not used in any computation.

5.7 Output Type Selection: *Note: Selection is inhibited when resolver is moving.*

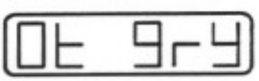
Press [MODE] to display 

i.e. "Ot" in left two digits, and right three digits will display the Current Output type programmed in the unit which may be bcd (for BCD), bin (for Binary), or gry (for Gray code)

Press [→] until desired option is displayed; the options are as followed:

for BCD output format

for Binary output format



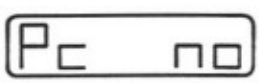
for Gray code output format

Press [MODE] to save the displayed output type, and to select PC synchronization option

5.8 PC Synchronization option selection:

This option must be set to NO. ***Note: Selection is inhibited when resolver is moving.***

If not already displayed,

press [MODE] to display 

i.e. "Pc" in left two digits, and right three digits will display the Current PC synchronization option programmed in the unit, which may be yes or no.

Press [→] till desired the NO option is displayed.

Press [MODE] to save the displayed option, and to return to Pos/RPM mode

Specifications

Input Power:

AC: 105 to 135 VAC, 7 VA

DC: Vcc, Vcc1 5V ± 7.5%, 160 mA

Outputs:

IBS Output

Position Output Format:

Front panel selectable BCD, Gray code, Binary

Inputs :

Program Enable

NOTE:

The output data generated by the DM7 module is sampled asynchronously by the Interbus-S Interface within the unit. Therefore, there is a small possibility that the position data presented by the DM7 IBS module could have been changing when the Interbus-S Interface read it, resulting in an erroneous reading. That reading could be any combination of the bits from two successive reads of the position. Use of the grey code output option should limit the error to one count.

If your application cannot use the grey code output format and the position data is critical to the operation of equipment, it is recommended that the position data read from the DM7 IBS data be qualified by some means before it is used. One possible way to qualify the data would be to wait for two successive reads with the same position.

How to Order

1. Programmable Resolver Decoder Model DM7-IBS

Order Part Number DM7-01T00-IBS for the resolver-to-digital decoder with Interbus-S interface, programmable output format (gray code, BCD, binary) and resolution (20-4096 counts per turn)

Type of Unit:	Basic unit with AC power input
Input Power:	117V AC, 60 Hz
Type of Output:	IBS Output

2. Position Transducer

Model DM7-IBS requires Autotech's single turn resolvers (such as RL100, E1R, E7R & E8R or E9R series of resolvers) as a position transducers. Consult section on Position transducer for ordering information on transducers, cables, couplings, and mounting brackets, etc.