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**Autotech Controls**  
**ModBus Plus Single Resolver**  
**SAC-RL100-MBP**  
**Instruction & Operation Manual**

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**ac AUTOTECH  
CONTROLS**

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# Rotary Position Transducers

## ModBus Plus Resolver SAC-RL100-MBP

### Instruction Manual

#### Resolvers

##### Rugged and Reliable

The resolver is a highly accurate and highly dependable device for absolute position shaft encoding. Resolvers have a reliable track record of applications in aerospace, military, and industry, where they have been used for decades for position sensing. Some of the common applications are radar antenna position sensing, missile guidance systems, NC machine position feedback, automotive stamping presses, 2 piece can-manufacturing presses and packaging machines. The resolver is designed to operate reliably under extremely hostile environments such as continuous mechanical shock, vibration, extreme temperature and humidity changes, oil mist, coolants and solvents.

The resolver is a passive transducer. It is a brushless rotary transformer with one rotor and two stator windings. The stator windings are electrically 90 degrees out of phase with each other. As the shaft rotates, the relative position of the rotor and the stator windings change. Either the rotor or the two stator windings together can be used as the primary of the rotary transformer and the secondary will then produce an analog voltage corresponding to the shaft position.

##### RL100-MBP Resolver

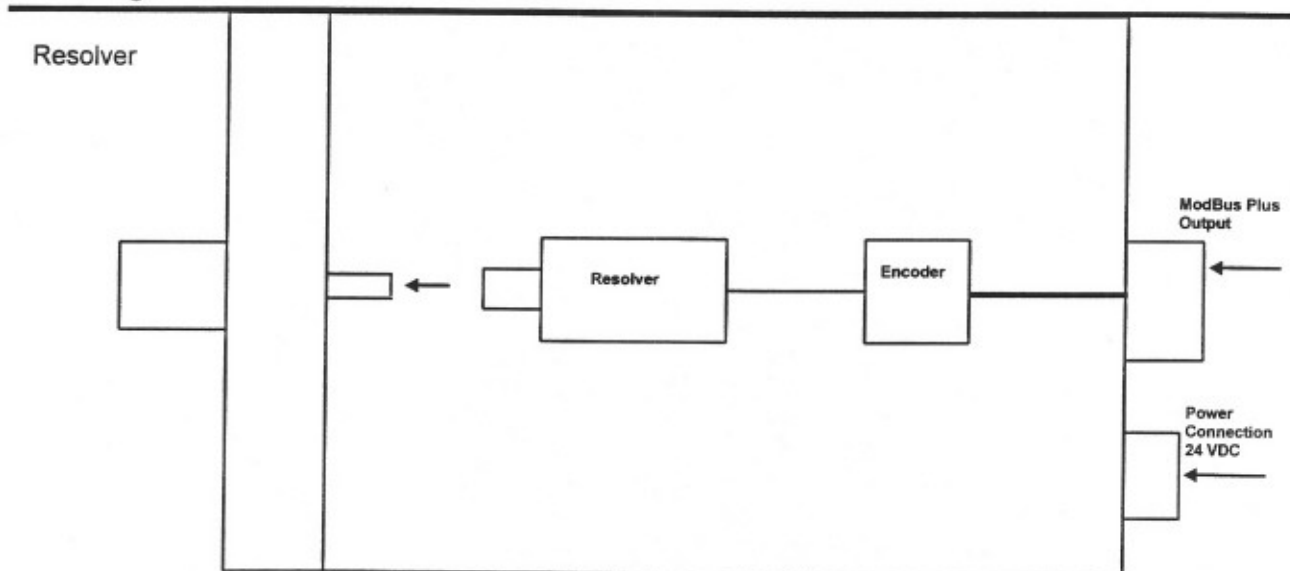
The resolver in the RL100-MBP is connected to a built-in encoder and a ModBus Plus bus interface in order to make its position information available to devices on a ModBus Plus network.

The information is available in "global register" #1 from this unit. It can also be explicitly read from register 40001 in this unit.

Switches on a "DIP" switch are provided to allow selection of the ModBus Plus Node Address of this resolver (1 to 64) and the direction (clockwise/counterclockwise) of rotation of the resolver that is read from the ModBus Plus Port.

A standard pinout 9-pin D connector is provided for connection to the ModBus Plus network. A second connector is provided on the end cap of the unit for the customer supplied power for the encoder and ModBus Plus interface.

#### Block Diagram



# Mounting

Autotech resolvers are designed to operate reliably under extremely hostile environments such as continuous mechanical shock, vibration, extreme temperature and humidity changes, oil mist, coolant and solvents. Still ordinary precautions to prevent damage to bearings of any rotation device should be followed to prolong their life.

1. It is recommended that the Autotech encoder mounting bracket (MMB-EN359-010) be used, wherever possible, for size 40 resolvers (see figure, bottom right).

2. If the resolver is to be axially shaft driven, *be sure that the shafts are aligned. Misaligned shafts can destroy resolver bearings.*

3. If a pulley, coupling or sprocket is mounted to the resolver shaft, **DO NOT** hammer or press on the shaft. **DO NOT** force fit anything onto or off of the resolver shaft.

4. If the resolver is belt-driven or chain-driven, do not overtighten the drive belt or chain. Too much side loading (Radial) can destroy the resolver bearings.

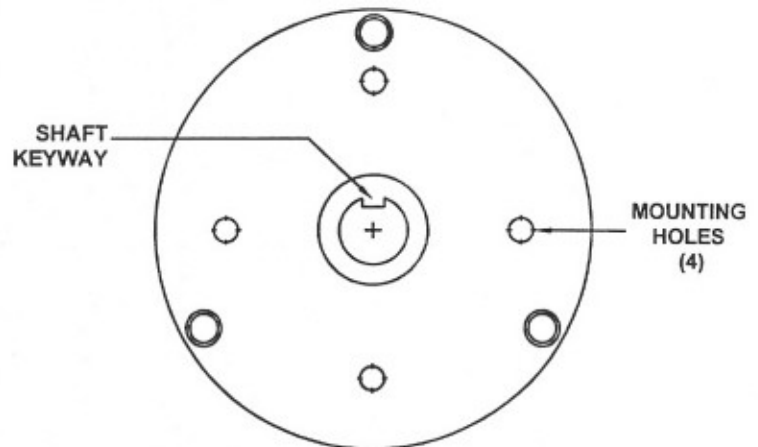
5. To maintain the NEMA 13 rating of the resolver, the following precautions must be taken:

a) Sealing compound must be used when fitting the conduit pipe.

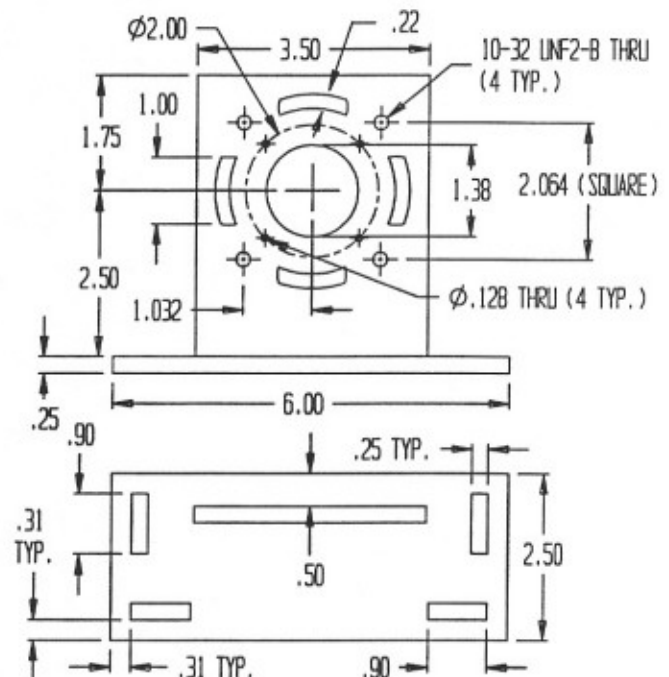
b) The bearing seal must be checked once every six months and replaced if necessary. Lubricating the bearing seal periodically prolongs its life.

6. Zero Reference: For both resolvers, the approximately zero reference may be located by aligning the shaft as shown in the figure, upper right.

## Zero Reference



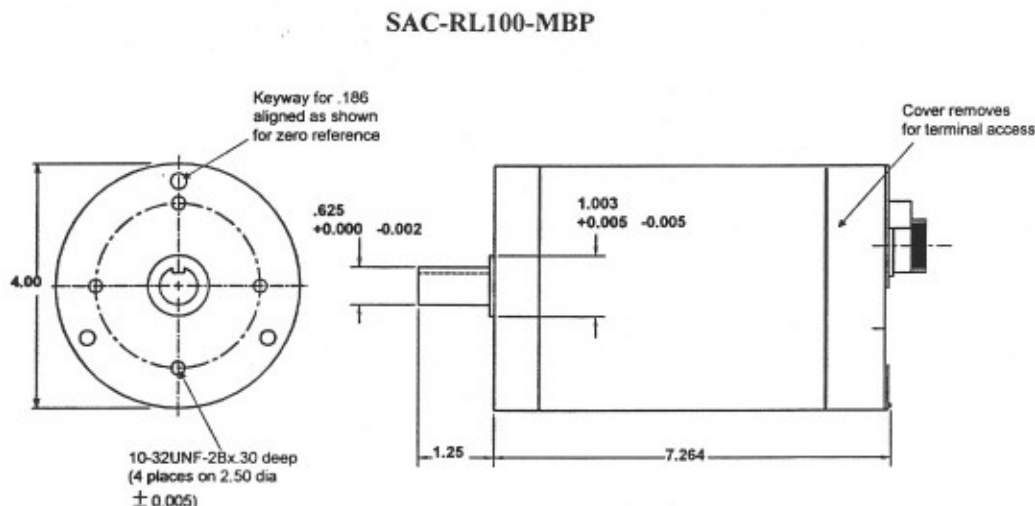
*Size 40 resolvers are at approximately zero when the shaft key way is aligned with mounting hole and conduit fitting.*



**Mounting Bracket  
Size 40 Resolvers**

# Outline Dimensions

The outline dimensions of the ModBus Plus Resolver are shown in the following diagram.



## Wiring

### Grounding and Shielding

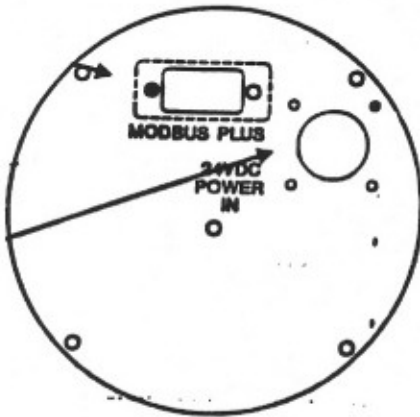
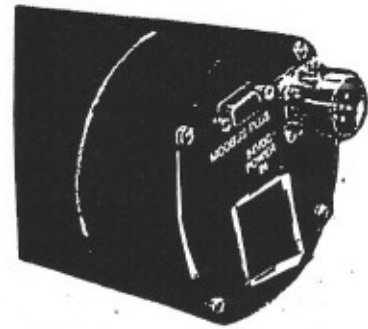
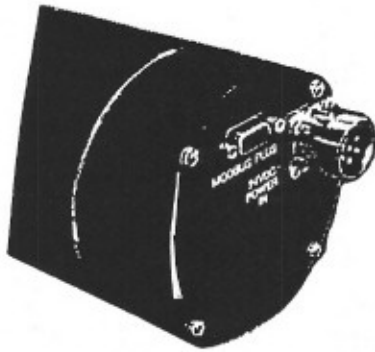
1. Resolver wiring must be done using twisted pairs in cable with an overall foil shield. The twisted pairs must be wired as per wiring instructions. See "How to Order" section for suitable cable offered by Autotech.
2. It is recommended that the shielded resolver cable be routed in its own conduit or cable tray.
3. All shielded resolver cable must be kept at a minimum distance of 2 inches from all high voltage or inductive wiring.
4. All shielded resolver cable must be kept at a minimum distance of 12 inches from all motor wiring controlled by AC or DC drives.
5. All ground planes (chassis grounds) in the total system must be held to the same RF potential by good metallic connections to building frames, conduit or wiring trays.
6. The shield drain wires may be terminated in one of two ways.

- a) Connected to chassis ground at each end and not connected to signal reference at any point in the system.
- b) Connected to signal reference at the decoder only. The shield drain should remain unconnected at the resolver end and the shield should not touch earth ground at any point in its run.

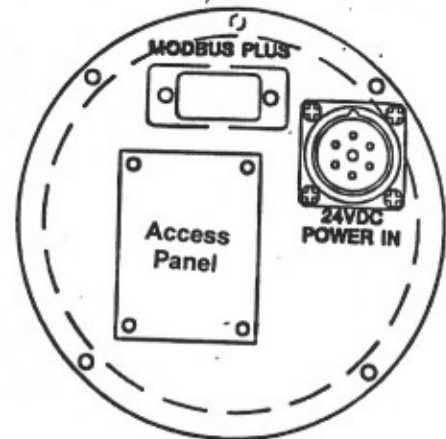
**NOTE:** Resolvers with MS connectors have shield drain wire pre-terminated for method "a)", above.

Method a) is recommended for all Autotech products. In certain circumstances, in unusual EMI conditions, method b) may be necessary after consulting factory.

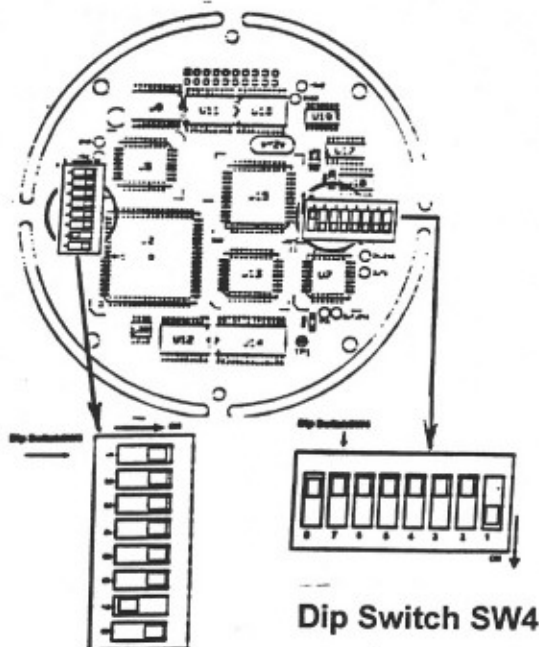
7. ModBus Plus Network Cable: Single twisted shielded pair cable. Modicon 97-9841-XYZ Series or equivalent.



End Connector Plate



Access Panel



Dip Switch SW3

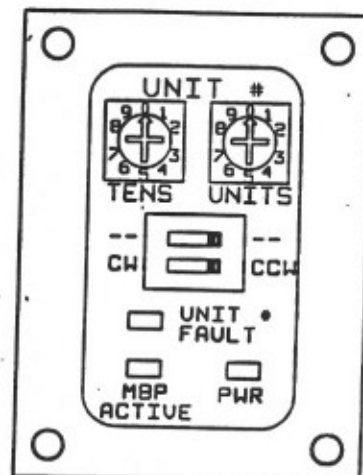
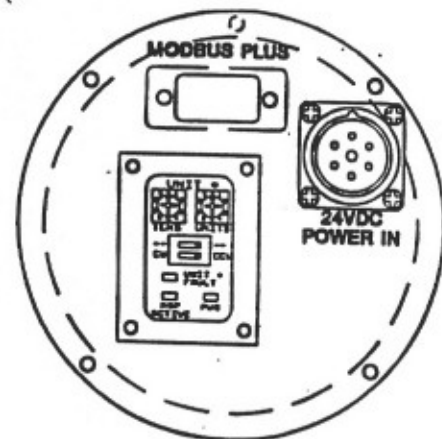
See Setup page 5

Dip Switch SW4

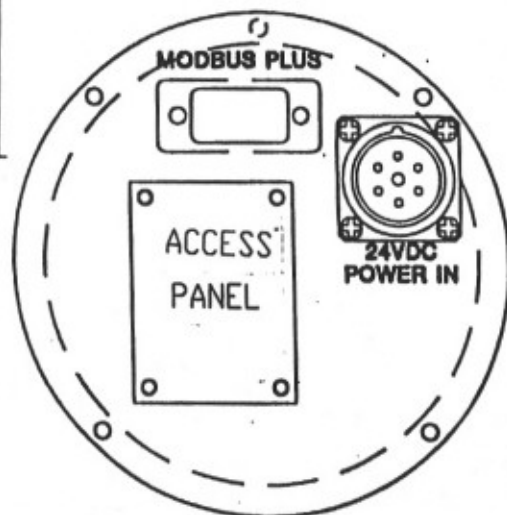
Node Address

RL100-MBP1  
RL210-MBP1

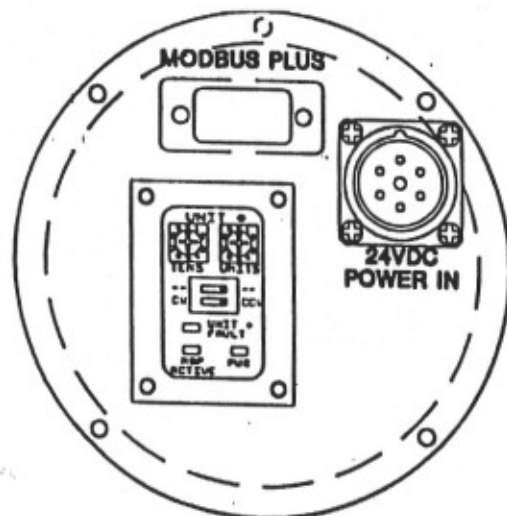
RL220-MBP1



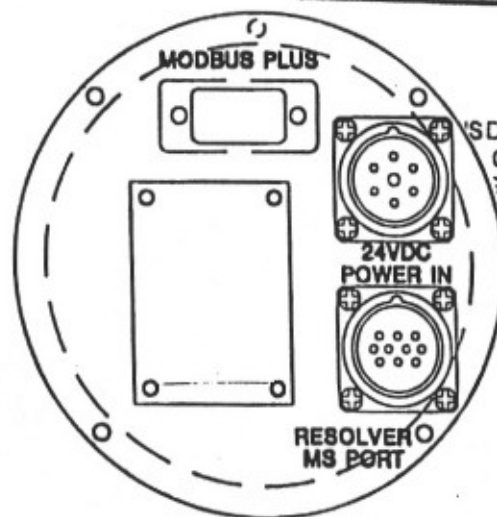
Use Rotary Switch To Set Address



RL210-MBP1



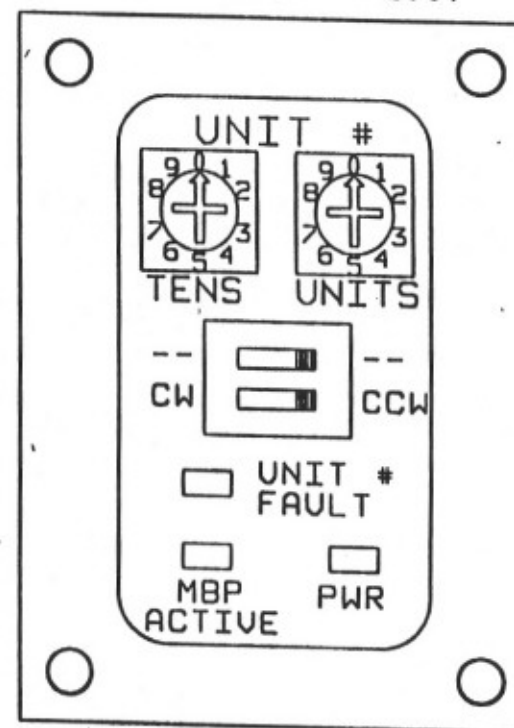
RL100-MBP1



RL220-MBP1

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ENLARGED  
ACCESS PANEL

ADDENDUM  
MBP1

TITLE

Automation  
Bettendorf, IA

**AVG**

DATE	ENG.	SCALE	CK'D.	DATE	APP'D.	DATE	SIZE	DATE OF RELEASE
1-9-01	LB	NONE	Qch	1-9-01	JR	1-10-01		

J.H.

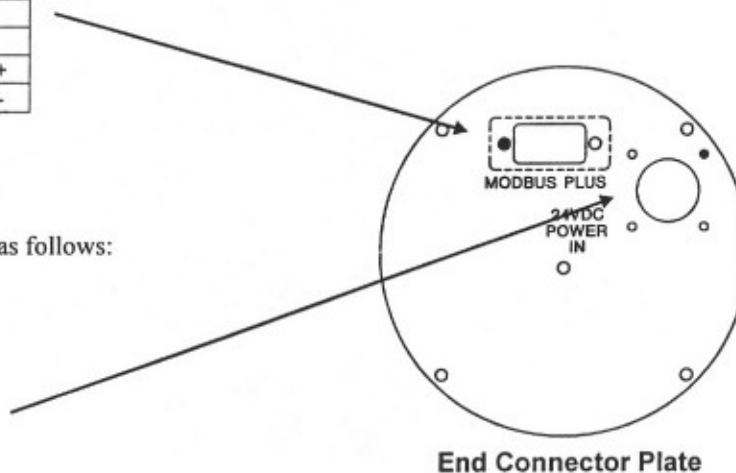
## Wiring for SAC-RL100-MBP Connectors

Wiring Table for ModBus Plus 9-Pin Female D connector	
Pin #	Function
1	Shield
2	Com Data +
3	Com Data -

### Power Connection

The 24 VDC power connector pin-out is as follows:

Wiring Table for DC Power Connector	
Pin #	Function
1	+10 to +30 VDC
2	not used
3	DC common
4	not used
5	Chassis ground
6	not used



The mating connector for this connection is RDE P/N RC-06S1N121700.



# Setup

## DIP Switches

Before operation you will need to set the Node Address and Direction for the resolver. To do this, you must gain access to the Dip Switches (SW3), located inside the unit. To access the circuit board (ASY-RL100-MBP) where the SW3 is located, you will need to perform the following steps:

### CAUTION

Use caution when removing and securing the resolver cover plate. Failure to do so may damage the unit.

1. Remove four screws from end plate.
2. Remove gasket separating circuit board from end plate.
3. Locate SW3 on board. (See figure to right).
4. Set the SW3 Dip Switches to the appropriate ON/OFF positions in accordance with your application needs and the instructions below.

Please note: SW1 and SW2 are used internally and are not located on this circuit board. SW4 is located on this board. Its 8 switches must be set to OFF to allow the unit to operate properly. SW3 is used to set the Node Address and Direction. See figure to your right for location of switch 3.

### Setting the SW3 DIP Switches

#### NODE ADDRESS

The Node Address Range is 1 to 64. The Node Address is set by switch SW3 positions 1 to 6. The value is coded in binary on the switches and is incremented by one to arrive at the address. See the table on the following page for settings for all Node Addresses.

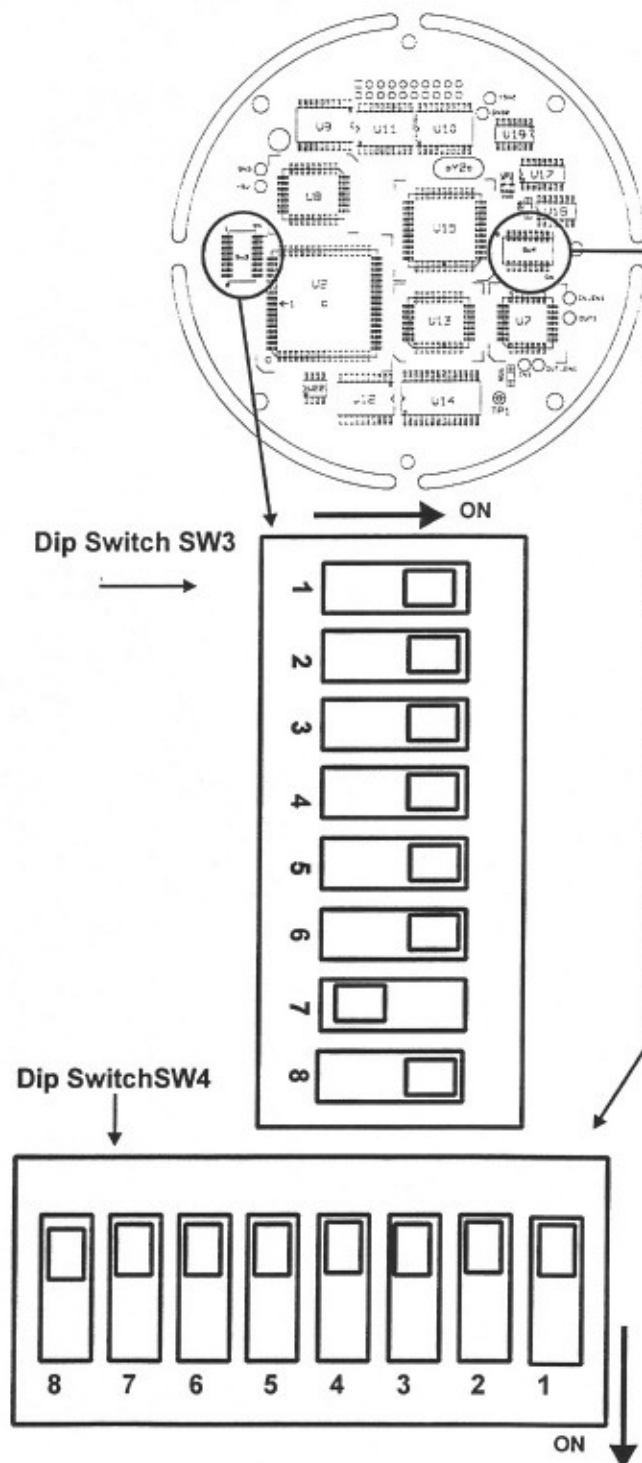
For example, all switches ON = node 1, all switches OFF = node 64, switches 1 and 2 OFF = node 4. To set Node Address = 37: set SW3-1 = ON, SW3-2 = ON, SW3-3 = OFF, SW3-4 = ON, SW3-5 = ON, SW3-6 = OFF.

Position 7 of SW3 (SW3-7) is not used and should be in the OFF position.

#### DIRECTION

Position 8 of switch SW3 (SW3-8) is used to control the direction of the resolver's output count. The OFF position will result in increasing count in the clockwise direction. ON will increase in CCW direction.

ASY-RL100-MBP Circuit Board





## NODE ADDRESS Settings Table

As stated previously, the Node Address Range is 1 through 64. The Node Address is set by switch SW3 position 1 to 6. Please select the corresponding switch position for an appropriate Node Address as shown in the table below.

Node Address	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6
1	On	On	On	On	On	On
2	Off	On	On	On	On	On
3	On	Off	On	On	On	On
4	Off	Off	On	On	On	On
5	On	On	Off	On	On	On
6	Off	On	Off	On	On	On
7	On	Off	Off	On	On	On
8	Off	Off	Off	On	On	On
9	On	On	On	Off	On	On
10	Off	On	On	Off	On	On
11	On	Off	On	Off	On	On
12	Off	Off	On	Off	On	On
13	On	On	Off	Off	On	On
14	Off	On	Off	Off	On	On
15	On	Off	Off	Off	On	On
16	Off	Off	Off	Off	On	On
17	On	On	On	On	Off	On
18	Off	On	On	On	Off	On
19	On	Off	On	On	Off	On
20	Off	Off	On	On	Off	On
21	On	On	Off	On	Off	On
22	Off	On	Off	On	Off	On
23	On	Off	Off	On	Off	On
24	Off	Off	Off	On	Off	On
25	On	On	On	On	Off	On
26	Off	On	On	Off	Off	On
27	On	Off	On	Off	Off	On
28	Off	Off	On	Off	Off	On
29	On	On	Off	Off	Off	On
30	Off	On	Off	Off	Off	On
31	On	Off	Off	Off	Off	On
32	Off	Off	Off	Off	Off	On
33	On	On	On	On	On	Off
34	Off	On	On	On	On	Off
35	On	Off	On	On	On	Off
36	Off	Off	On	On	On	Off
37	On	On	Off	On	On	Off
38	Off	On	Off	On	On	Off
39	On	Off	Off	On	On	Off
40	Off	Off	Off	On	On	Off
41	On	On	On	Off	On	Off
42	Off	On	On	Off	On	Off
43	On	Off	On	Off	On	Off
44	Off	Off	On	Off	On	Off
45	On	On	Off	Off	On	Off
46	Off	On	Off	Off	On	Off
47	On	Off	Off	Off	On	Off
48	Off	Off	Off	Off	On	Off
49	On	On	On	On	Off	Off
50	Off	On	On	On	Off	Off
51	On	Off	On	On	Off	Off

Node Address	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6
52	Off	Off	On	On	Off	Off
53	On	On	Off	On	Off	Off
54	Off	On	Off	On	Off	Off
55	On	Off	Off	On	Off	Off
56	Off	Off	Off	On	Off	Off
57	On	On	On	Off	Off	Off
58	Off	On	On	Off	Off	Off
59	On	Off	On	Off	Off	Off
60	Off	Off	On	Off	Off	Off
61	On	On	Off	Off	Off	Off
62	Off	On	Off	Off	Off	Off
63	On	Off	Off	Off	Off	Off
64	Off	Off	Off	Off	Off	Off

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## Operation

### REGISTER DATA

The resolver data can be read in binary format (range 0 to 359) in register 40001. Register 40002 can be read also. It will always return 0. Register 40003 contains information about the type of device this is and the revision of the software. The most significant 8 bits are the device type. For this product these will be 00000001. The 8 least significant bits are the software revision code, represented as an ASCII code.

### GLOBAL DATA

The resolver data is broadcast in binary format (range 0 to 359) in this node's first global register. The second global register will always be set to 0. The third will contain device type and software revision information as described above.

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## Specifications

Mechanical			
Specification	Condition	SAC-RL100-MBP	Unit
Housing Size		Size 40 (4.0" dia)	
Max. Starting Torque	@ 25° C	8	oz-in
Moment of Inertia		45	gm/cm <sup>2</sup>
Shaft Size		5/8	inch
Max. Shaft Loading	<i>Axial</i>	50	lbs
	<i>Radial</i>	100	lbs
Bearing life	@Max. Mfr. Spec	2x10 <sup>9</sup>	Revolutions
Approx. Weight		6.5	lbs
Environmental			
Shock	for 11 mSec	200	g
Vibrations	10-2000 Hz	20	g
Operating Temperature		0 to 60°	C
Storage Temperature		-40 to +85°	C
Enclosure		NEMA 13	
Electrical			
Power Supply			
Voltage range		10-30	VDC
Input current	@24VDC	300	mA

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## How to Order

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### ModBus Plus Single Resolver

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**SAC-RL100-MBP**      Single resolver package, size 40 housing, 5/8" shaft diameter, heavy duty bearing, NEMA 13 housing

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### Accessories

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#### *Couplings*

**CPL-005/8-5/8**      5/8" to 5/8" flexible coupling

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#### *Mating Connectors*

**ECM-06POS-001**      Connector for Power Supply (RC-06S1N121700)

**ECM-09PIN-002**      9-Pin DB mating

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#### *Mounting Bracket*

**MMB-EN359-010**      Mounting bracket for size 40 resolvers

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## WARRANTY

Autotech Controls warrant their products to be free from defects in materials or workmanship for a period of one year from the date of shipment, provided the products have been installed and used under proper conditions. The defective products must be returned to the factory freight prepaid and must be accompanied by a Return Material Authorization (RMA) number. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

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