Autotech Controls
M7350 Programmable
Resolver Decoder Function Modules

(ASY-M7350-010 and ASY-M7350-030 Single-Turn and ASY-M7350-020 Multi-Turn)

Instruction & Operation Manual

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1. Introduction

ASY-M7350-010/020/030

The M7350-010 Resolver Decoder Function Module is an intelligent, 10-bit, single-turn resolver decoder module, and the M7350-020 Resolver Decoder Function Module is a multi-turn, dual position resolver decoder module.The M7350-030 is a single-turn resolver decoder for an ElectroCam resolver. All are members of Autotech Controls' CBus family of products and can be used in any of the CBusModules to interface to PLCs and AVG's PowerPanel.

The M7350 Modules communicate with the programmable logic controller (PLC) through input and output registers. The -010 and -030 Modules' input registers allow you to read the resolver's shaft position, velocity (speed) and I/O status. The output registers allow you to program scale factor, offset, and high and low motion limit parameters from the PLC. The -020 Module's input registers read coarse position, fine position, and I/O status. The output registers allow you to change coarse offset and fine offset.

The M7350 Modules communicate with AVG's multifunction PowerPanel through 2048 16-bit registers. These registers can be user mapped to monitor and configure the decoder functions. AVG's *u*WIN® software allows the user to interface the data from the module into user defined graphic screens.

The -010 and -030 Modules offer Motion Detection, Broken Wire Detection, Diagnostic Fault Bit, and Direction Bit Detection through an I/O status word. The -020 Module offers the same, except for the motion detection.

Powerful, Easy to Learn, Man–Machine Interface

Autotech's human factors engineering has made it possible to program all module functions through the PowerPanel or PLC interface module.

Broken Wire Detector

The Broken Wire I/O Status Bit is normally energized when the M7350 Modules are operating normally and the resolver wiring is intact. If one or more of the resolver wires are broken or disconnected, the I/O status bit will de-energize.

Built-In Tachometer and Motion Detector

In the -010 and -030 Modules, the built-in tachometer and motion detector are updated over 68 times per second to provide fast, accurate indication and detection of rotary motion. The motion detector is programmed to energize the motion I/O status bit when the machine's RPM is between the low and high motion limits.

Programmable Scale Factor/ ProgrammableOffset

In the -010 and -030 Modules, the scale factor is programmable 16–999 counts/revolution. Offset is programmable from 0 to Scale Factor Value.

In the -020 Module, the offset is programmable from 0–127 counts/revolution coarse and from 0–1023 counts/revolution fine.

Decimal Address: 132

Single-Turn Resolver Decoder
ASY-M7350-010 I/O Status (16 Bit)

MSD															LSD
X	X	X	X	X	X	MB	BW	X	X	X	X	DF	X	DB	X

X = Not Used
DB = Direction Bit
0 = Clockwise (CW)
1 = Counterclockwise (CCW)
DF = Diagnostic Fault Bit
0 = Fault, 1 = No Fault
BW = Broken Wire Detection
0 = Fault, 1 = No Fault
MB = Motion Bit
0 = Motion Fault, 1 = No Fault
Bit = 1 or On whenever resolver RPM is between programmed motion limits

MSD = Most significant digit
LSD = Least significant digit

Decimal Address: 132

Multi-Turn Resolver Decoder
ASY-M7350-020 I/O Status (16 Bit)

MSD															LSD
X	X	X	X	X	X	X	BW	X	X	X	X	DF	X	DB	X

X = Not Used
DB = Direction Bit
0 = Clockwise (CW)
1 = Counterclockwise (CCW)
DF = Diagnostic Fault Bit
0 = Fault, 1 = No Fault
BW = Broken Wire Detection
0 = Fault, 1 = No Fault

2. Specifications

Input Power: 24 VDC @ 100 mA

Operating Temperature: -10 to +130° F (-23 to +55° F)

Position Output Format: BINARY

Single-turn Resolution: 20 to 1000 counts/turn
Multi-turn Resolution:

Programmable Scale Factor (ASY-M7350-010 and -030): 16 to 999 counts/revolution

Programmable Offset (ASY-M7350-010 and -030): Programmable from 0 to Scale Factor value

Programmable Offset (ASY-M7350-020): Programmable from 0–127 (coarse) and 0–1023 (fine)

Update Time:
ASY-M7350-010 0.6 msec
ASY-M7350-030 0.6 msec
ASY-M7350-020 0.9 msec

Motion Detector (ASY-M7350-010 and -030): Low and High Motion Limit, Programmable from 0 to 1999 RPM. Normally On whenever the resolver RPM is between programmed motion limits.

Direction: CW (clockwise) or CCW (counterclockwise) indication. On if CCW, Off is CW

Fault: Normally On; Off if broken resolver wire or M7350 internal fault is detected.

3. Module Functions

M7350-010and -030 Single-Turn Resolver Decoder

Table 1. Single-Turn Decoder Functions

Parameter	Definition	Range
Scale Factor	Maximum number of counts per revolution, minus 1 (i.e., 999 Scale Factor gives 1000 counts/revolutions).	16 to 999 Default: 359 to work in degrees
Base Offset	Counts to be added to resolver position. It is used to align resolver zero to machine zero.	0 to Scale Factor Default: 0
Motion Limits, High & Low	Motion output energizes if resolver RPM is within these limits.	0 to 1999

M7350-020 Multi-Turn Resolver Decoder

Table 2. Multi-Turn Decoder Functions

Parameter	Definition	Range
Coarse Position Offset	Offset from resolver zero	0 to 127
Fine Position Offset	Offset from resolver zero	0 to 1023

4. Memory Map

M7350-010 and -030 Single-Turn Resolver Decoder

Decm	Hex	Type	Description
128	0080	Read Only	**RPM**
130	0082	Read Only	**Position**
132	0084	Read Only	**I/O Status (16Bits)**
258	0102	Read/Write	**Scale Factor**
260	0104	Read/Write	**Offset**
262	0106	Read/Write	**High Motion Limit**
264	0108	Read/Write	**Low Motion Limit**

M7350-020 Multi-Turn Resolver Decoder

Decm	Hex	Type	Description
128	0080	Read Only	**Coarse Position**
130	0082	Read Only	**Fine Position**
132	0084	Read Only	**I/O Status (16Bits)**
260	0104	Read/Write	**Coarse Offset**
262	0106	Read/Write	**Fine Offset**

5. Wiring

Pinout Table

Because the M7350 modules can be plugged into a variety of Function Module Interfaces (for various PLCs and PowerPanels) the pinout cannot be specified in this manual.

Instead, tables 3 and 4 reflect the functional inputs that the M7350-010, M7350-020 and M7350-030 provide to CBus signal numbers. To determine which terminal on the Function Module Interface corresponds to a given function in the M7350:

a. Read the CBus Signal number from the table in this manual for that function.

b. Look up that number in the table provided in the applicable Function Module Interface Manual. That table will list the terminal pinout of the Function Module Interface vs the CBus Signal numbers.

To make this comparison even easier, the tables for Function Modules and Function Module Interfaces are published in the same size and order. This allows you to simply place them side by side and match up function and pinout at a glance.

Table 3. Single-Turn Decoder Functional Inputs

CBus Signal Number	M7350-010 and M7350-030 Function Single-Turn Decoder
1	R1
2	R2
3	S3
4	S2
5	S1
6	S4
7	NC
8	NC
9	NC
10	NC
11	Vs- (customer supplied power return)
12	Vs+ (customer supplied power)
13	NC
14	NC
15	NC
16	NC
17	NC
18	NC
19	NC
20	NC
21	NC
22	NC
23	NC
24	NC
25	NC
26	NC
27	NC
28	NC
29	NC
30	NC
31	NC
32	NC

Table 4. Multi-Turn Decoder Functional Inputs

CBus Signal Number	M7350-020 Function Multi-Turn Decoder
1	R1
2	R2
3	FS3 Fine Resolver
4	FS2 Fine Resolver
5	FS1 Fine Resolver
6	FS4 Fine Resolver
7	CS3 Coarse Resolver
8	CS2 Coarse Resolver
9	CS1 Coarse Resolver
10	CS4 Coarse Resolver
11	Vs- (customer supplied power return)
12	Vs+ (customer supplied power)
13	NC
14	NC
14	NC
15	NC
16	NC
17	NC
18	NC
19	NC
20	NC
21	NC
22	NC
23	NC
24	NC
25	NC
26	NC
27	NC
28	NC
29	CS4 Coarse Resolver
30	CS1 Coarse Resolver
31	CS2 Coarse Resolver
32	CS3 Coarse Resolver

Wiring Diagram for ASY-M7350-010 and -030 Single-Turn Resolver Decoder

See your Function Module Interface manual for translation of CBus signal numbers to connector pins.

Table 5. Single-Turn Decoder Wiring

RESOLVER WIRING				
CBUS Signal Number	Designation	Wire Color CBL-10T22-xxxx	Resolver Terminal #	MS Connector Pin
6	S4	Blue	6	A
3	S3	Yellow	5	C
4	S2	Black/Blue	4	B
5	S1	Black/Yellow	3	D
1	R1	Black/Green	1	F
2	R2	Green	2	E
	Shield		Green Screw	G
Note: To change direction of count, reverse S1 and S3 connections.				

Wiring Diagrams for ASY-M7350-020 Multi-Turn Resolver Decoder

Table 6. Fine Resolver Wiring

FINE RESOLVER WIRING				
CBUS Signal Number	Designation	Wire Color CBL-RL210-xxxx	Resolver Terminal #	MS Connector Pin
6	FS4	Blue	10	M
3	FS3	Red	9	L
4	FS2	Black/Blue	8	K
5	FS1	Black/Red	7	H
1	R1	Black/Green	1	A
2	R2	Green	2	B
Note: To change direction of count, reverse S1 and S3 connections. Black/White indicates black wire with white stripes.				

Table 7. Coarse Resolver Wiring

COARSE RESOLVER WIRING				
CBUS Signal Number	Designation	Wire Color CBL-RL210-xxxx	Resolver Terminal #	MS Connection Pin
10 and 29	CS4	White	6	F
7 and 32	CS3	Yellow	5	E
8 and 31	CS2	Black/White	4	D
9 and 30	CS1	Black/Yellow	3	C
	Shield		GND (Green Screw)	S
Note: To change direction of count, reverse S1 and S3 connections. Black/White indicates black wire with white stripes.				

6. Processor Programming

Programming the module from the processor involves sending the module a set of commands. Each command tells the module to perform a single action. As an example, a single action may be storing a new value for a parameter.

The module is fully programmable from the processor. The processor programs the module by sending commands through the output Registers assigned to the modules' slot. The module replies to the program command by sending status information back to the processor through the input Registers. These commands along with the published Memory Map give a PLC programmer complete access to the module.

7. Reading the Status

Reading the status of the M7350 Resolver Decoder Modules are dependent upon the type of programmable logic controller used. The following description is specific to the M7350 used with the Modicon A120 BusModule.

The M7350 module reports status information back to the processor through three Input Registers (immediate I/O of this module) assigned to it when the Traffic Cop was configured.

The three Registers for the M7350-010 and -030 provide:

3xxxx: RPM
3xxxx: Position
3xxxx: I/O Status Word
3xxxx: not used

The three Registers for the M7350-020 provide:

3xxxx: Coarse Position
3xxxx: Fine Position
3xxxx: I/O Status Word
3xxxx: not used

8. Troubleshooting

Table 8. Troubleshooting Table

Symptoms	Possible Causes
Unable to program unit parameters (Scale Factor, Offset, etc.)	1. Is the voltage level at the customer VS+/VS- input correct? 2. Is the machine moving? Programming of several parameters (i.e.,Scale Factor) is disabled if the resolver is turning faster than 3 RPM.
Program memory is changing by itself.	Have proper grounding and shielding practices been applied?
Position and RPM readings are incorrect.	1. Is the resolver correctly wired? Follow the steps below for a quick check. a. turn power off to M7350 unit b. measure with following with an ohm meter: -- (R1 to R2) = 15 to 50 ohms -- (S1 to S3) = 50 to 150 ohms -- (S4 to S2) = 50 to 150 ohms
Broken wire bit in I/O status word.	1. Is the resolver cable properly grounded and shielded? Supply (VS+, VS-) less than 20 VDC? 2. Is resolver wiring correct? Follow instructions for ohming out resolver wiring above.
Mechanical Zero drifts.	1. Is the mechanical Resolver linkage loose? 2. Has the offset value been changed?
If all fails.	Call the local distributor or (630)668-3900 for service.

9. How to Order

Function Module

ASY-M7350-010 ..... programmable single-turn resolver decoder module
ASY-M7350-020 ..... programmable multi-turn resolver decoder module
ASY-M7350-030 ..... programmable single-turn resolver decoder module for Electro-Cam resolvers

Compatible Position Transducers

The M7350-010 Resolver Decoder requires a single-turn or single-turn geared series, such as Autotech's RL100, E1R, E7R, E8R or E9R series of resolvers. Please see appropriate Position Transducer Manual for complete ordering information on position transducers, cables, and appropriate accessories.

The M7350-020 Resolver Decoder requires a dual resolver such as SAC-RL210-G128.

The M7350-030 Resolver Decoder requires a single-turn Electro-Cam

Cable *(See appropriate Position Transducer Manual for ordering cable)*

For M7350-010 and -030:

CBL-10T22-Cxxx ..... 22AWG, 10 conductor (5 twisted pairs) overall foil shielded cable, without connector. "xxx" length must be ordered as 010, 020, 050 feet and increments of 50 feet (i.e. 100, 150, etc.) (2500 ft. max.)

CBL-10T22-Mxxx .... 22 AWG, 10 conductor (5 twisted pairs) overall foil shielded cable, with 10 pin MS connector (ECM-10REC-ITT) on one end. "xxx" length must be ordered as 010, 020, 050 feet and increments of 50 feet.

For M7350-020:

CBL-RL210-Mxxx.... 22 AWG, 10 conductor (5 twisted pairs) overall foil shielded cable, with 19 pin MS connector (ECM-19REC-ITT) on one end. "xxx" length must be ordered as 010, 020, 050 feet and increments of 50 feet.

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