# E5N and E8N Series DigiSolvers

## Instruction and Operation Manual

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REV 02 11/01/12

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# The E5N and E8N DigiSolver

## 1 Introduction

**The DigiSolver, a Digital Resolver**
The DigiSolver is a resolver-based encoder, in which the analog signal produced by a brushless resolver is transformed to a digital format by a built-in ratiometric tracking converter. This new concept and the advanced technology of the DigiSolver, with electronic circuitry fully epoxy potted, provides higher accuracy, increased reliability, higher operating speeds, more flexible counts per turn and a smaller size than optical encoders.

**No Optics, Mil-Grade Resolver**
There is no optical coded disc or similar component used in the DigiSolver. A miniature Mil-Grade resolver produces an analog position signal and high-grade electronics molded in epoxy transforms this signal to digital format.

The resolver is a passive transducer, well known for its ruggedness and performance in hostile industrial environments. The DigiSolver combines the ruggedness of a resolver with the reliability of solid-state electronics and is designed to operate reliably under severe environmental conditions, such as mechanical shock, vibrations, temperature and humidity changes, oil mist, coolants and solvents. No broken discs! No disc misalignments! No LED aging!

**High Resolution in Small Compact Housing**
The DigiSolver is available in three configurations:

- Single-Turn: up to 13 bit Binary, Gray Code or BCD in size 40 (E5N Series) or explosion proof house (E8N Series).
- Geared Single-Turn: up to 13 bit Binary, Gray Code or BCD in size 40 (E5N Series) or explosion proof housing (E8N Series) with a wide range of internal gear trains.
- Multi-Turn: 18 bit Binary, size 40 (E5N Series) or explosion proof housing (E8N Series). Internal gear train of 64:1.

**Single- or Multi-Turn Operation**
The DigiSolver is an absolute encoder, that is, it keeps track of the exact shaft position even during power outage or switching off the machine. At power-up, the DigiSolver will pick up the exact shaft position even if the machine moved during the power outage.

In a single-turn operation, the machine cycle is completed during one complete revolution of the transducer shaft, whereas in multi-turn operation the transducer shaft needs to make more than one turn for a complete machine cycle.

**Field Selectable CW or CCW Operation**
The DigiSolver is factory wired for ascending counts with counterclockwise (CCW) shaft rotation. However, the direction of operation can be easily selected in the field by opening up the case and simply reversing the resolver input plug. No wires need to be unsoldered or soldered.

**Ratiometric Resolver-to-Digital Converter**
The Autotech ratiometric tracking converter is practically immune to electrical noise, voltage, frequency and temperature variations, and can track speeds up to 5000 RPM.

**Built-in PC Synchronization**
An optional PC synchronization circuit is provided to ensure reliable data transfer to programmable controllers. The edge-triggered device allows data to be updated every scan, and a variety of outputs (TTL, PNP or NPN) permit interface to virtually all existing programmable controllers.

**Versatile — Choice of Mounting Styles and Enclosures**
To match almost any application, the DigiSolver is available in various mounting styles and housings. The housing size 40 is standard for single-turn units, whereas the multi-turn units are available only in size 40 housing. Size 40 (4.0" dia.), NEMA 13 housing with internal helical coupling and double bearing is designed for heavy duty applications and is available for face mount with end-mounted MS-connector or conduit fitting.

Explosion proof, FM approved, Class I, Division I, Groups B, C, and D unit comes in size 40 (4.0" dia.) housing for both single-turn and multi-turn models.

**Variety of Outputs**
The DigiSolver is available with Binary, Gray Code, BCD or Analog absolute position output formats. A further flexibility to interface to other devices is provided by TTL (5V logic), PNP source transistor (48 VDC @ 100 mA) or NPN sink transistor (48 VDC @ 100 mA) types of outputs. The analog position output can be 0–10 VDC or 4–20 mA signal.

**Velocity, Direction, Count and Reference Outputs**
In addition to the above described position outputs, optional analog velocity (0–10 VDC or 4–20 mA), direction, count

and reference marker outputs are also available. This is especially useful in servo control systems, where position and velocity feedback are required. In such cases, the DigiSolver can replace both the position transducer and the tachometer.

**5 VDC or 8–30 VDC Voltage Range**
The standard models are available, that can operate with a 5 VDC or 8–30 VDC power supply. This wide voltage range provides an increased flexibility in using the DigiSolver in control systems of different voltage levels without requiring an extra power supply. An existing power supply can be used to power the DigiSolver, that is, if a programmable controller operates at 24 VDC, an 8–30 VDC DigiSolver model can be connected to the same power supply, thus cutting down the system cost.

**Flexible Programming of Counts Per Turn**
The advanced R-to-D converter used in the DigiSolver has made it possible to program any number of scaled BCD counts per revolution. The BCD output with counts per turn of 360, 1000 and 3600 is standard, however, the unit can be delivered with custom scaled counts if so desired. Consult the factory for special configurations or higher resolution.

**Multiplexing Capability**
The TTL type output of the DigiSolver is provided with Tristate capability and can be wired "OR." This allows more than one unit to be connected tothe same control and reading one output at a time.

# 2 Specifications

## ELECTRICAL

### Input Power
Voltage: 5 VDC ±5%, or 8-30 VDC
Current: 0.55 Amp - Single-turn; 0.75 Amp - Multi-turn

### Power-on Settling Time
For 130 SEC. after power is turned "ON," the encoder output is frozen as follows: T and N: all zeros; P and C: all ones. After 130 ms, the DigiSolver reads the true position.

## POSITION OUTPUT

### Output Format and Number of Words/Counts:
**a) Single-turn and Geared Single-turn units:**
**Gray Code (G):** 256, 512, 1024, 4096, 8192
**Binary (B):** 1024, 4096, 8192
**BCD (D):** 360, 1000, 3600
(Custom counts available, consult factory)
**Analog (A):** 4–20 mA (sinking or sourcing) or 0–10 VDC output) 0.1% Repeatability, 1% Accuracy of full scale.
*(Consult factory for higher accuracy models.)*
**Built-in Gear Ratios:** 2:1, 3:1, 4:1, 8:1, 12:1, 16:1, 20:1, 24:1, 32:1, 36:1, 40:1, 48:1, 60:1, 64:1, 80:1, 100:1
**b) Multi-turn units:**
18 bit Binary over 64 turns, 12 bit per revolution, 6 bits for 64 turns. 15 bit BCD or Gray Code over 32 turns, 10 bits per revolution, 5 bits for 32 turns, built-in gear train of 64:1 or 32:1

## OUTPUT DRIVERS

**T: Tristate (Multiplexing)** TTL (74LS 645), high true logic
*Logic True*: 2 V @ 15 mA, 20 mA leakage when tristated
*Logic False:* 0.35 V @ 24 mA, 0.4 mA leakage when tristated
*Mux Input:* Low active, TTL level
**P: Source Transistor**, Vmax = 50 V, high true logic (Sprague UDN-2981A)
*Logic True:* Transistor ON, 1.7 V drop @ 100 mA
*Logic False:* Transistor OFF, 0.2 mA leakage @ 50 V
On ES the "P" type outputs are short circuit proof and are rated 20 mA @ 50 VDC

**N: Sink Transistor**, Vmax = 50 V, low true logic (Sprague ULN-2803A)
*Logic True:* Transistor ON, 1.1 V drop @ 100 mA
*Logic False:* Transistor OFF, 0.1 mA leakage @ 50 V
**C: Sink Transistor**, Vmax = 50 V, high true logic (Sprague ULN-2803A)
*Logic True:* Transistor OFF, 0.1 mA leak, @ 50 V
*Logic False:* Transistor ON, 1.1 V drop @ 100 mA

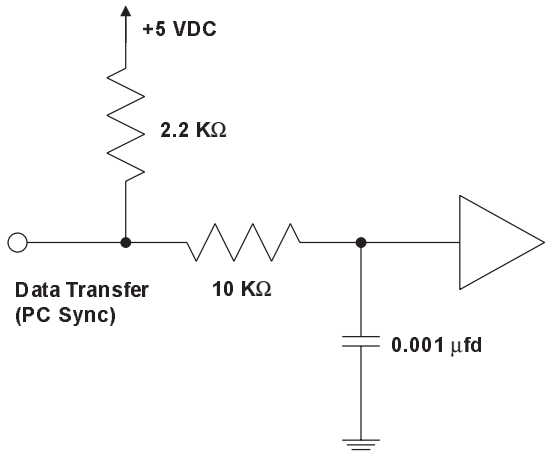
## OUTPUT TIMING

**P: *PLC Synchronization Option***
Encoder position data is latched 50 microseconds to 3 milliseconds (factory set at 3 milliseconds, field adjustable) after either transition edge of data transfer command from programmable controller (Non-retriggerable during timing period.)
**O: *Transparent/Microfreeze Option***
Encoder position data is continuously updated at full speed. The data is frozen (microfreeze) for 100 ±10% microseconds within 10 ms of either transition edge of data transfer command. Data transfer command is not required if microfreeze is not needed.

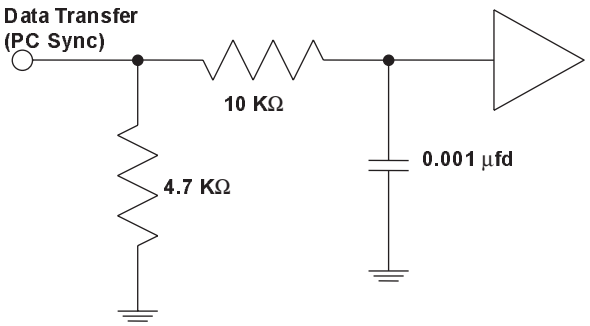
**Data Transfer Command:** (see diagrams, below)
**"C", "M", "N" and "T" Style Outputs:** TTL compatible, 2.2 K internal pull-up to 5 V, high true logic, edge triggered.
*High level:* 3.5 to 50 VDC
*Low level:* 0 to 1 VDC
*Pulse width:* Minimum to 10 microseconds
**"P" Style Outputs:** (see diagram, below)

***DigiSolver Data Transfer (PC-Synchronization)***

This diagram is for "C", "M", "N", and "T" style outputs. There is a 2.2 KΩ internal pull-up resistor to 5 VDC.




This diagram is for "P" style outputs. There is a 4.7 KΩ internal pull-down resistor to common.

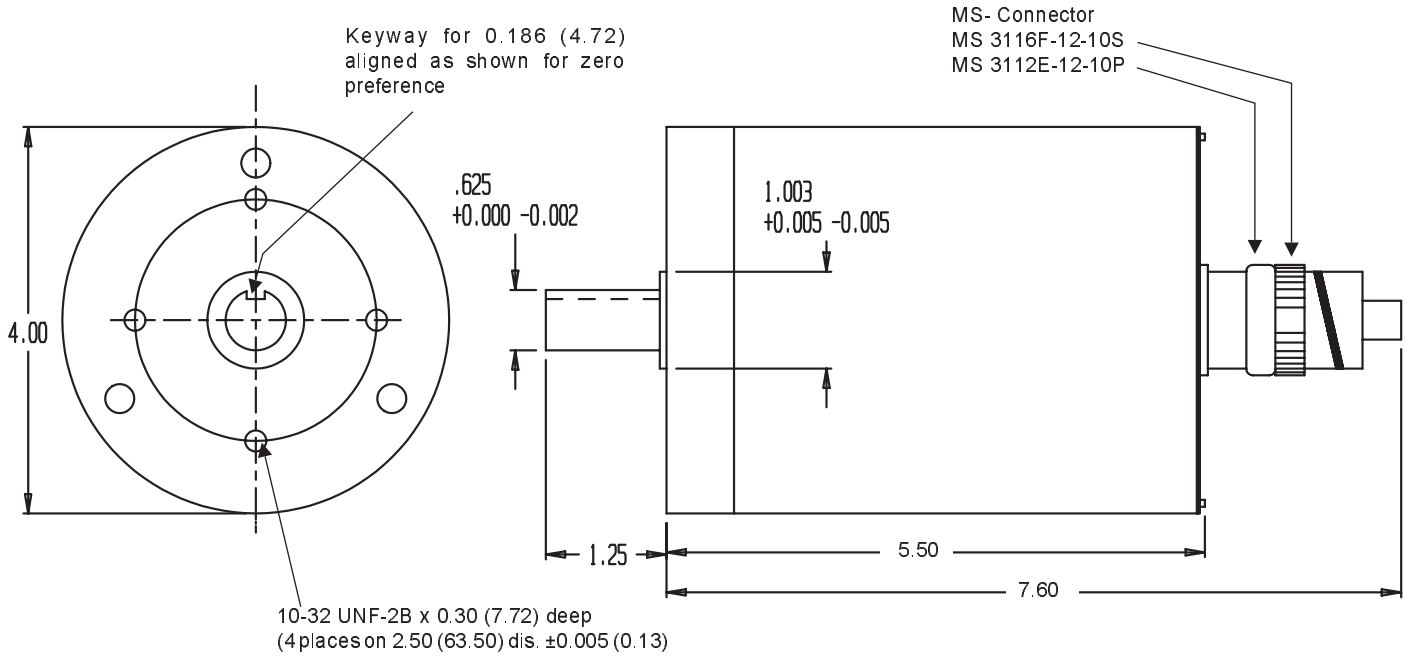



| **Mechanical** Specifications | **E5N** | **E8N** |
|---|---|---|
| Maximum Starting Torque @ 25° C (oz-in) | 8.0 | 8.0 |
| Moment of Inertia ($gm/cm^2$): | 45 | 45 |
| Maximum Slew Speed (RPM): | 5000 | 5000 |
| Shaft Sizes: | 5/8 inch | 5/8 inch |
| Maximum Shaft Load<br>Axial (lbs):<br>Radial (lbs): | <br>50<br>100 | <br>50<br>100 |
| Bearing Life At Max. Mfr. Spec. (Rev.): | $2 \times 10^9$ | $2 \times 10^9$ |
| Weight (lbs): | 4.5 | 6.5 |
| **Environmental** Specifications | | |
| Shock: | 200 g for 11 mSec. | |
| Vibration: | 20 g to 2000 Hz | |
| Operating Temperature (Ambient): | -10 to +176 °F | |
| Storage Temperature: | | -85 to 302°F |
| Enclosure: | NEMA 13 | NEMA 4X Class I, Div. I, Groups B,C, D |

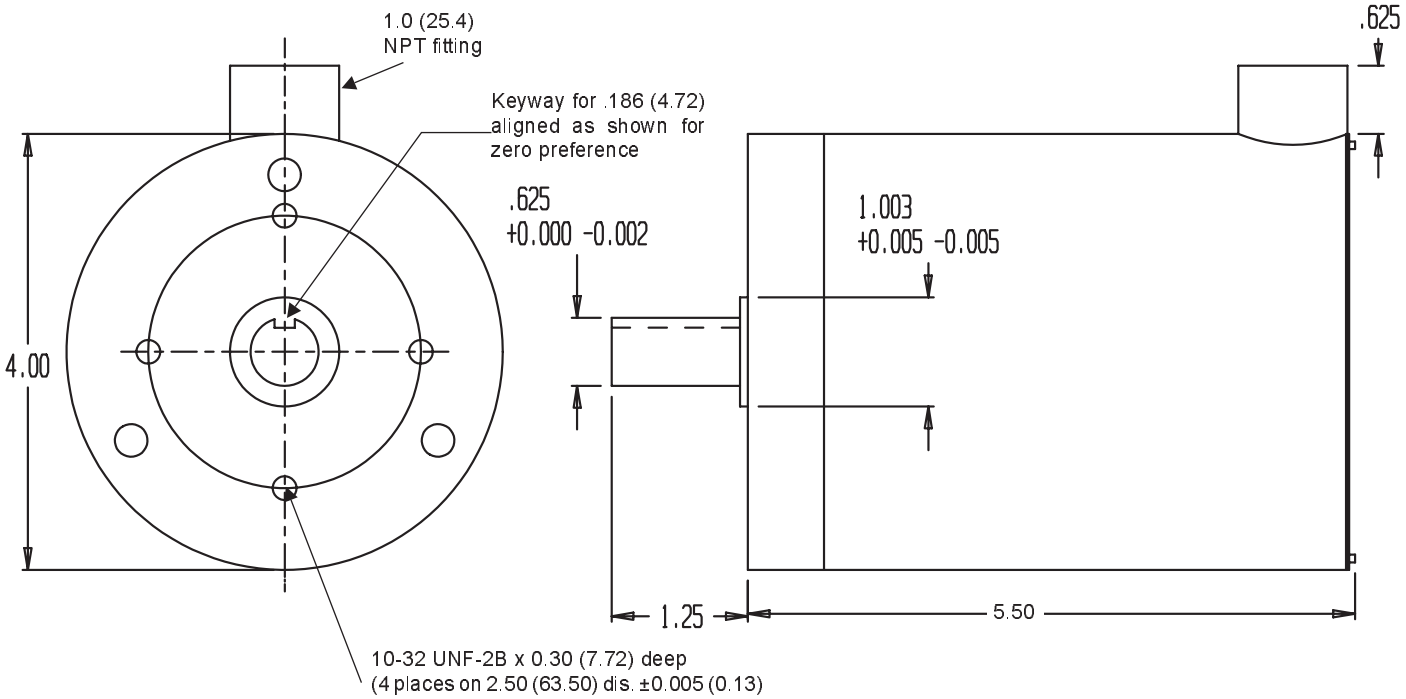
## OPTIONAL OUTPUTS

**Analog Tach Output**:
100 RPM/Volt for 0 to +10 VDC ("0" Volt = "0" RPM) or 100 RPM/1.6 mA for 4 to 20 mA (4 mA = "0" RPM).
**Direction Output:**
TTL, High = CCW, Low = CW
**Revolution Count (Marker Pulse):**
Negative pulse, TTL, pulse width 0.3 – 3.0 microseconds

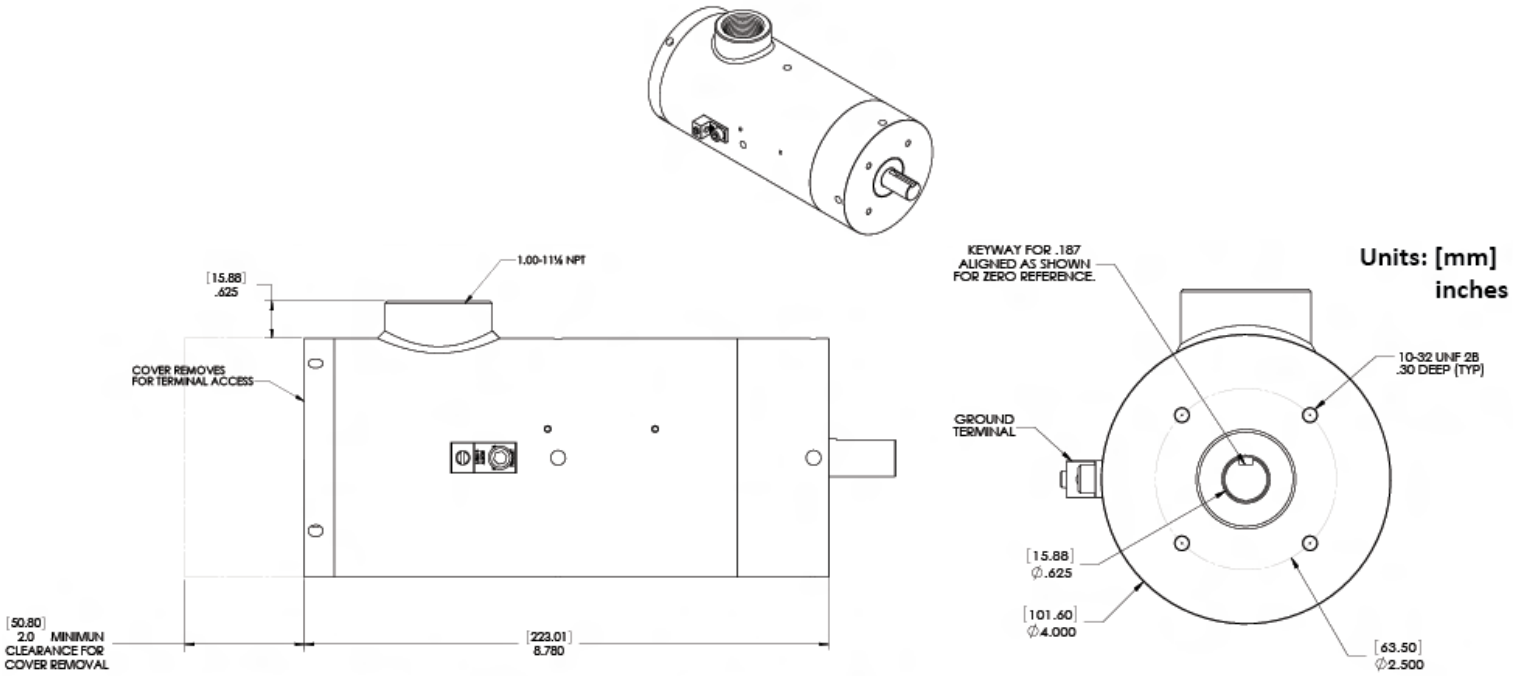
# 3 Outline Dimensions



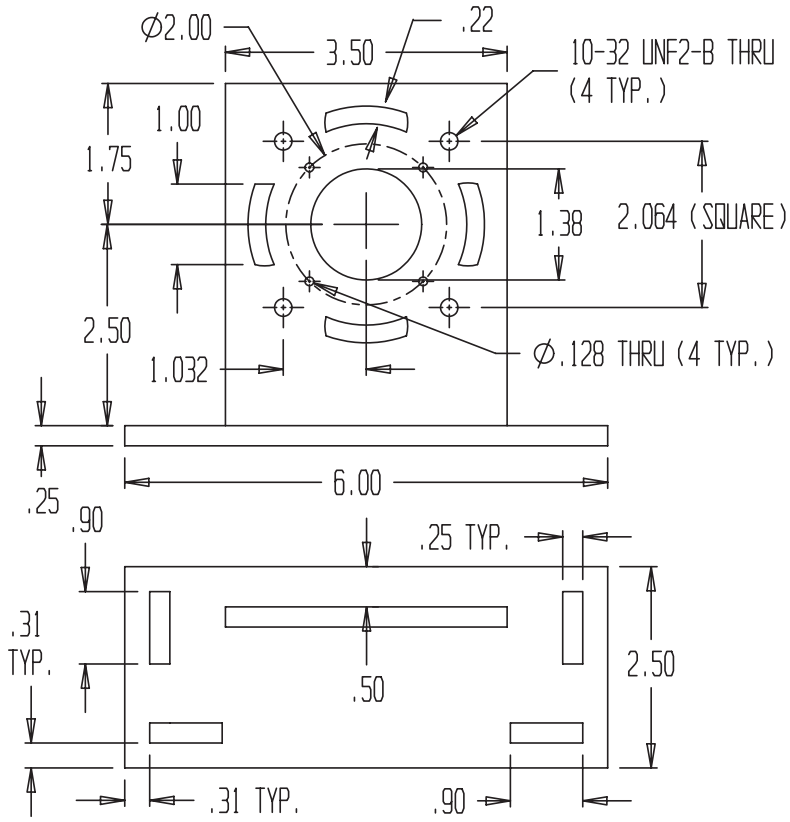

*E5N Series Dimensions (MS-Connector)*




*E5N Series Dimensions (NPT Fitting)*




***E8N Series Dimensions***

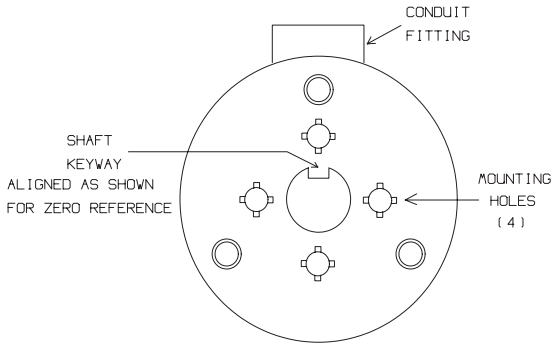



***Mounting Bracket for E5N and E8N***

# 4 Mounting and Wiring

## Mounting

It is recommended that the Autotech MB-EN359 encoder mounting bracket be used whenever possible. The DigiSolver can be mounted using the (4) 10-32 holes on the face plate. *Zero Reference*:(±5°) When the keyway on the shaft lines up with the mounting face plate holes as shown in figure.




**CAUTION NOTES:**

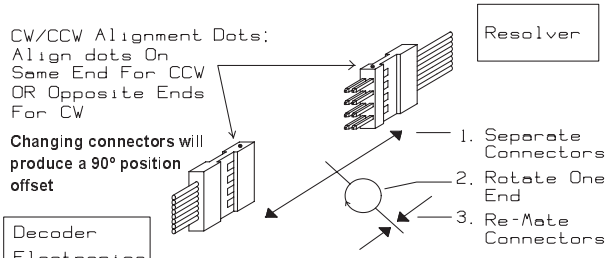
1. If the DigiSolver is to be axially driven, be sure that the shafts are aligned. Misaligned, it can destroy the DigiSolver bearings.
2. If a pulley, coupling or sprocket is mounted to the DigiSolver shaft, DO NOT hammer or press on the shaft.
3. If the DigiSolver is belt-driven or chain-driven, DO NOT overtighten the drive belt or chain.
4. To maintain NEMA13 rating of the DigiSolver, the bearing seals must be checked once every six months and replaced if necessary. Lubricating the bearing seal periodically prolongs

## Field Adjustments/Electronic Module Replacement

Normally, there are no field adjustments required in the DigiSolver. However, if you need to change the direction of rotation or have a special need for PC Handshake time adjustment, remove the backplate by unscrewing the four mounting screws.

### Direction of Rotation:

The direction of rotation is normally set at the factory for increasing count with CCW rotation (viewed from the shaft end). This may be changed to increasing count with CW rotation by reversing the internal connector between the resolver and decoder electronics. When ordered with external CW/CCW selector switch, the selection switch is mounted at the back cover plate. ***Note: In multi-turn units both connectors have to be reversed for change of direction. When reassembled, ensure connectors are matched securely and wiring is not pinched***



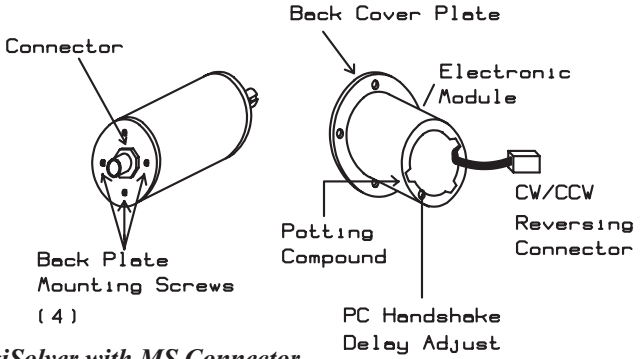

*Direction of Rotation Vs Increasing Count Adjustment*

### Delay Adjustment:

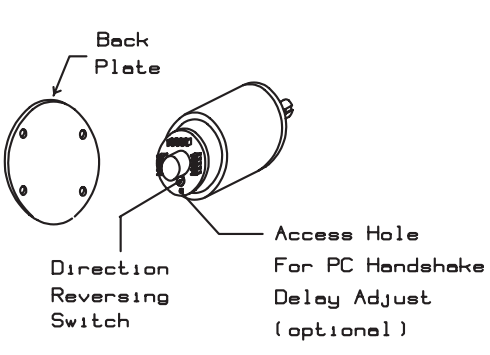
The delay adjustment for the PC Handshake option is accessible at the top end of the encapsulated electronics. This trimpot is set to maximum (CW) at the factory. It may be field adjusted from 0.05 to 3.0 milliseconds.

### Module Replacement:

In the E5N DigiSolvers with MS connector, a defective electronic module can be easily replaced in the field without dismounting the unit. In conduit fitting models, the electronic module is not field replaceable.




***DigiSolver with MS Connector***




***DigiSolver with Conduit Fitting***

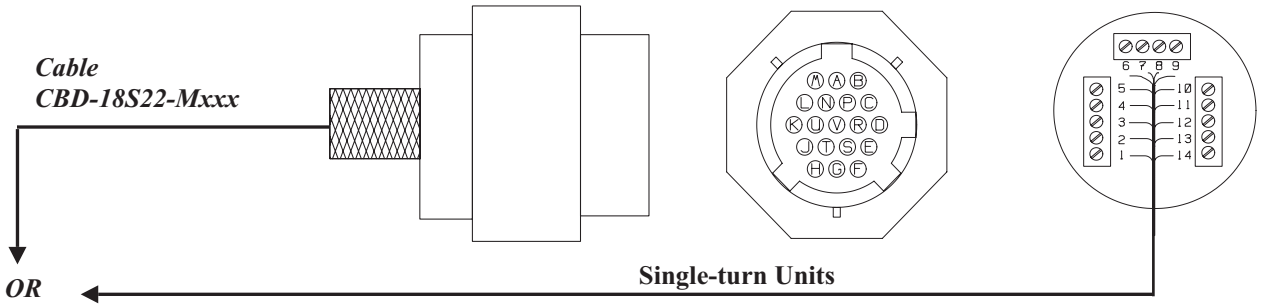
# Wiring

### E5N and E8N Wiring, Single-Turn Units

1. The shielded interconnecting cable should be run in its own conduit and kept separate from all other high voltage/high inductance wiring. The shield drain wire should be connected to earth ground at both ends of cable.
2. Use mating connector ECM-19REC-ITT for single-turn and ECM-30REC-ITT for multi-turn units.
3. Data transfer logic required is same as logic selected for output drivers.
4. This equipment uses isolated Sig Ref (Com). Failure to assure at least 100 K Ohm resistance between sig ref and ground may cause erratic output data.
5. When power is applied to the DigiSolver, the outputs go to the power-up code state for approximately 130 milliseconds as listed below and this must be taken into consideration while designing the system:
   **T** Outputs: Offstate
   **N** Outputs: All zeros
   **P** & **C** Outputs: All ones
6. For more details about **T, P, N** and **C** outputs, see at the end of this section.

**CAUTION: Check the cable wiring before applying power to the DigiSolver.**

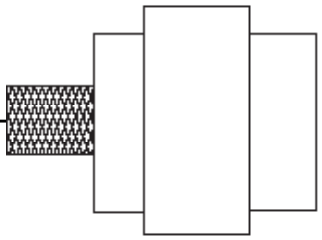
*Mating Connector Autotech's ECM-19REC-ITT* *MS Connector on DigiSolver* *Terminal Block on DigiSolver*




| Connector Pin (Terminal Numbers) | Cable CBD-18S22-Mxxx | Digital Output | | | Analog Output | |
|---|---|---|---|---|---|---|
| | | BCD | Binary | Gray | Ang | Tach |
| A (10) | Black | 1 | B0 | G0 | | |
| B (9) | White | 2 | B1 | G1 | | |
| C (8) | Grey | 4 | B2 | G2 | | |
| D (7) | Violet | 8 | B3 | G3 | | |
| E (6) | Blue | 10 | B4 | G4 | | |
| F (5) | Green | 20 | B5 | G5 | | |
| G (4) | Yellow | 40 | B6 | G6 | | |
| H (3) | Orange | 80 | B7 | G7 | | |
| J (2) | Red | 100 | B8 | G8 | | |
| K (1) | Brown | 200 | B9 | G9 | | |
| L (13)* | White/Yellow | 400 | B10 | G10 | 0-10V | |
| M (14)* | White/Orange | 800 | B11 | G11 | 4-20 mA | |
| N | White/Brown | 1000 | B12 | G12 | | |
| P | White/Red | 2000 | B13 | G13 | | 0-10V |
| R 13 | White/Green | Customer Vcc (for P and N output drivers or Tristate TTL) | | | | |
| S | Shield | Case Ground | | | | |
| T (11) | Black/12 gauge | (–) Signal Reference (Common for supply and all signals) | | | | |
| U 14 | White/Black | Data Transfer (PLC Sync or Microfreeze strobe) | | | | |
| V (12) | White/12 gauge | + Vin, 5 V or 8-30 VDC, for decoder section | | | | |
| * For analog with no digital output option | | | | | | |

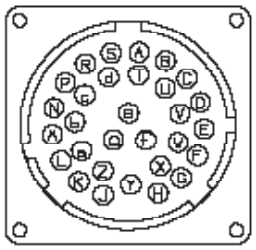
## E5N and E58 Wiring, Multi-Turn Units

***Mating Connector***
***Autotech's ECM-30REC-ITT***



***Cable***
***CBD-29S22-Mxxx***

***Connector on DigiSolver***

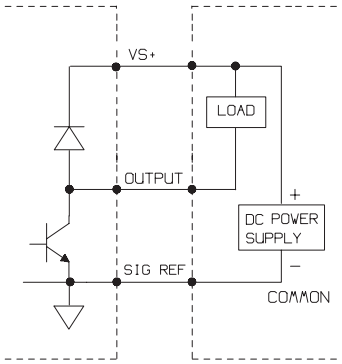



**CAUTION: Check the cable wiring before applying power to the DigiSolver.**

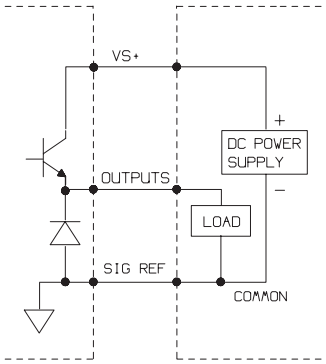
| Connector Pin | Cable CBD-29S22-Mxxx | Digital Output | | | Analog Output | |
|---|---|---|---|---|---|---|
| | | BCD | Binary | Gray | Ang | Tach |
| A | Black | 1 | B0 | G0 | | |
| B | White | 2 | B1 | G1 | | |
| C | Grey | 4 | B2 | G2 | | |
| D | Violet | 8 | B3 | G3 | | |
| E | Blue | 10 | B4 | G4 | | |
| F | Green | 20 | B5 | G5 | | |
| G | Yellow | 40 | B6 | G6 | | |
| H | Orange | 80 | B7 | G7 | | |
| J | Red | 100 | B8 | G8 | | |
| K | Brown | 200 | B9 | G9 | | |
| L | White/Yellow | 400 | B10 | G10 | | |
| M | White/Orange | 800 | B11 | G11 | | |
| N | White/Brown | 1K | B12 | G12 | | |
| P | White/Red | 2K | B13 | G13 | | |
| R | White/Green | 4K | B14 | G14 | | |
| S | White/Blue | 8K | B15 | G15 | | |
| T | White/Violet | 10K | B16 | G16 | | |
| U | White/Grey | 20K | B17 | G17 | | |
| V | White/Black/Grey | NC | B18 | NC | | |
| W | White/Black | | | | 0 - 10 V | |
| X | White/Black/Brown | Revolution Count | | | 4 - 20 mA | |
| Y | White/Black/Red | | | | 0 - 10 V | |
| Z | White/Black/Orange | CW/CCW (direction output option) | | | | |
| a | White/Black/Yellow | Data Transfer (PC Sync) | | | | |
| b | Black/12 gauge | (—) Signal Reference (Common for supply and all signals) | | | | |
| c | White/12 gauge | + Vin, 5V or 8-30 VDC, for decoder section | | | | |
| d | White/Black/Green | Customer Vcc (for P and N output drivers or Tristate TTL) | | | | |

## Output Configurations and Wiring

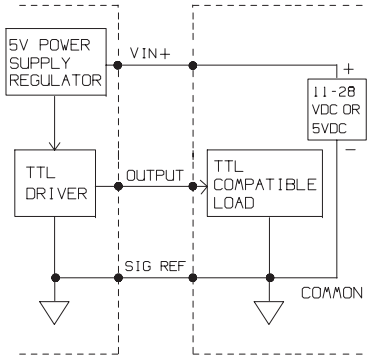
*N and C Types of Outputs*




*P Types of Outputs*




*TTL Types of Outputs*




***Analog Output Wiring: 4–20 mA Current Sourcing and Sinking****

*See the following page for Analog Output Wiring Diagrams.

## Grounding and Shielding:

**Failure to observe any of these requirements may cause unpredictable operation and will void warranty.**

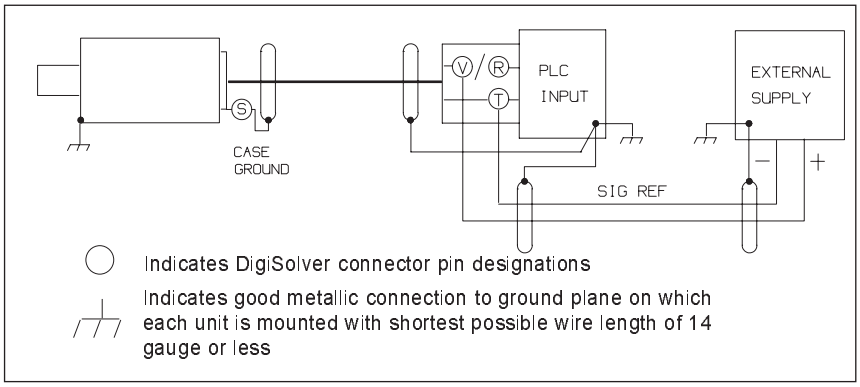
1. All logic level wiring (including external power supply) must be done using overall **foil shielded cables**, with shields and equipment grounded as per above drawing. It is recommended that the DigiSolver shielded cable be run in its own separate conduit. See How to Order section for suitable cables offered by Autotech.

2. All ground planes on which the DigiSolver 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.

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

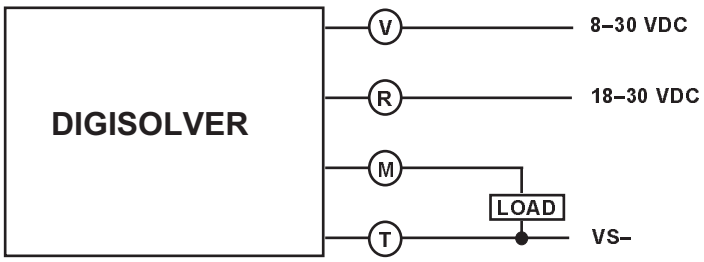
4. All shielded cable must be kept at a minimum distance of 12 inches from all motor wiring controlled by AC or DC drives.

5. **Caution:** This equipment has an isolated Sig Ref (common). Failure to maintain this isolation between chassis ground (earth ground) and Sig Ref in external equipment (power supply or I/O cards) may cause electrical noise interference resulting in unpredictable operation of this equipment.

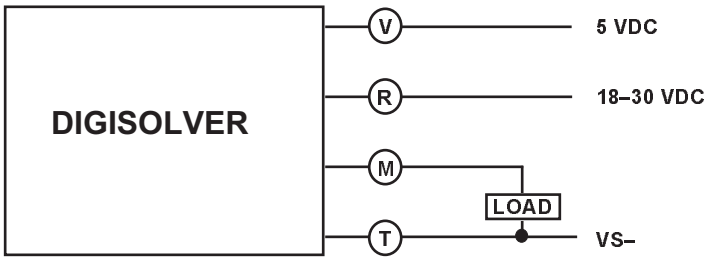


## *4–20 mA Analog DigiSolver Wiring Diagrams*

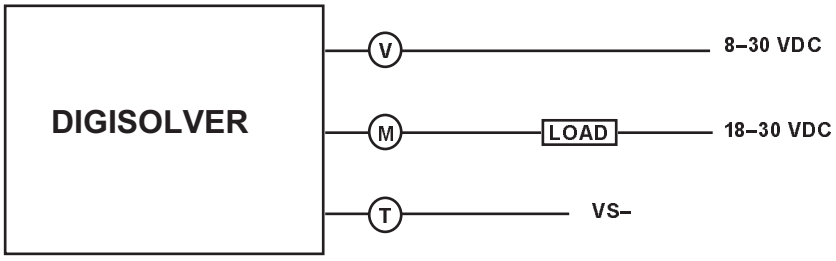
**"P" Type 18–30 Volt**




**"P" Type 5 Volt**

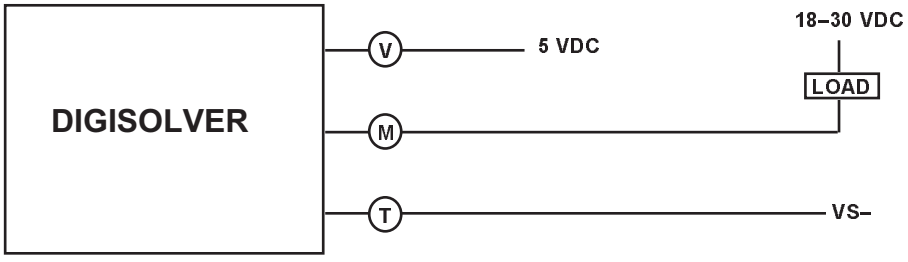



**"N" Type 18–30 Volt**




**NO CONNECTION NEEDED on PIN "R"**

**"N" Type 5 Volt**




**NO CONNECTION NEEDED on PIN "R"**

**Note:** With 8–30 V option, only one power supply may be required

# 5 How to Order

## DigiSolver: Single-Turn and Geared Single-Turn

**E X X – X XXXX – X X X X X**
**1 2 3 4 5 6 7 8 9**

**1. Housing Type**
- **5:** NEMA 13, size 40 (4" dia.), Heavy Duty
- **8:** Explosion proof, Class I, Div. I, Groups B, C & D, FM approved

**2. Short-Circuit Protection**
- **N:** NONE
- **S:** Short-circuit proof outputs and CW/CCW switch (*For P Type outputs only, Vmax 8 – 50 VDC*)

**3. Output Format**
- **G:** Standard Gray Code
- **B:** Natural Binary
- **D:** BCD
- **A:** Analog

**4. Number of Words or Counts Per Turn**
(*Custom Counts available, consult factory)*
- *Gray Code:* **0256, 0360, 0512, 1024, 4096, 8192**
- *Natural Binary:* **1024, 4096**, **8192**
- *BCD:* **0360**, **1000**, **3600**
- *Analog:* **010V:** 0 to 10 VDC
  **P20M:** 4–20mA current sourcing
  **N20M:** 4–20mA current sinking

**5. Input Power Supply**
- **5:** 5 VDC
- **8:** 8 to 30 VDC

**6. Digital Output**
- **0:** No Digital Output (only with Analog output)
- **T:** TTL with multiplexing
- **P:** PNP Source Transistor
- **N:** NPN Sink Transistor (Low True Logic)
- **C:** NPN Sink Transistor (High True Logic)
- **M:** CMOS transistor

**7. Options**
- **O:** None
- **P:** With PC-synchronization circuit
- **V:** Analog velocity, 0–10 VDC
- **A:** Analog velocity, 4–20 mA, sink (available with E5 housing only)
- **L:** P and V options together *(For other options, consult factory)*

**8. Mounting Style for Single-Turn DigiSolver or Gear Ratio for Geared Single-Turn DigiSolver**

*8.1 Mounting Style*

**M:** Face Mount

***OR***

*8.2 Gear Ratio*

**A:** 2:1
**B:** 3:1
**C:** 4:1
**D:** 8:1
**E:** 12:1
**R:** 16:1
**G:** 20:1
**H:** 24:1
**I:** 32:1
**J:** 36:1
**K:** 40:1
**L:** 48:1
**T:** 60:1
**N:** 64:1
**P:** 80:1
**Q:** 100:1

**9. Connector Position**

*For E5 DigiSolver:*

**E:** End Mount (female MS connector only)
**C:** Conduit Side Mount terminal block no MS connector (Only with 360 counts BCD, up to 1024 counts Gray Code or Binary and analog outputs; not available with geared E5 DigiSolver)

*For E8 DigiSolver:*

**C:** Conduit Side Mount (Only with 360 count BCD, up to 1024 counts Gray Code or Binary and analog outputs), terminal block no MS connector.

## DigiSolver: Dual (Multi-Turn)

**E X X – X XXXX – X X X X X**
**1 2 3 4 5 6 7 8 9**

**1. Housing Type**

**5:** NEMA13, size 40 (4" dia.)
**8:** Explosion Proof, Class I, Div. I, Groups B, C & D, FM approved

**2. Short-Circuit Protection**

**N:** NONE
**S:** Short-circuit proof outputs
*(For P Type Outputs only, Vmax 8– 50 VDC)*

**3. Output Format**

**B:** Natural Binary
**G:** Standard Gray Code
**D:** BCD

**4. Number of Words or Counts**

*Binary —*

**6,12:** 18 bits over 64 turns, 12 bits per revolution. Total 64 turns

*Gray Code —*

**5,10:** 15 bits over 32 turns, 10 bits per revolution. Total 32 turns

*BCD —*

**5,10:** 15 bits over 32 turns, 10 bits per revolution. Total 32 turns

**5. Input Power Supply**

**5:** 5 VDC

**8:** 8 to 30 VDC

**6. Digital Output**

**T:** TTL with multiplexing (High True Logic)

**P:** PNP Source Transistor (High True Logic)

**N:** NPN Sink Transistor (Low True Logic)

**C:** NPN Sink Transistor (High True Logic)

**7. Options**

**0:** NONE

**P:** With PC-Synchronization circuit

**V:** Analog Velocity, 0–10 VDC

**L:** P and V options together

*(For other options, consult factory)*

**8. Mounting**

**M:** Face Mount

**9. Connector Position**

*For E5 DigiSolver —*

**E:** End Mount (female MS connector only)

*For E8 DigiSolver —*

**C:** Conduit Side Mount (Terminal block no MS connector)

## Accessories

| | |
|---|---|
| **MMB-EN359-010** | Mounting Bracket for E5 & E8 |
| **CPL-EN359-HELI** | 5/8” to 5/8” Flexible Coupling (1.25” dia. x 1.5" length) |
| **CPL-003/8-3/8** | 3/8" to 3/8" Flexible Coupling (1" dia. x 1.25" length) |
| **ECM-19REC-ITT** | Mating MS Connector, 19 pin (for single-turn units) |
| **ECM-30REC-ITT** | Mating MS Connector, 30 pin (for multi-turn units) |
| **SAC-P5VDC-010** | Regulated DC Power Supply, 5 VDC @ 3 Amp |
| **SAC-P12DC-010** | Regulated DC Power Supply, 12 VDC @ 1 Amp |
| **SAC-P24DC-010** | Regulated DC Inner Supply, 24 VDC @ 1 Amp |
| **SAC-RD360-010** | Remote angle read-out, 0 to 359 |
| **SAC-RD999-010** | Remote read-out/tachometer/latech, 0 to 999 (CMOS compatible) |
| **SAC-RD999-MUX** | Same as above (TTL/CMOS compatible with mux output) |

## Cables

*In cable part numbers, xxx = length in feet. Replace xxx by one of the standard lengths, 010, 020, 050 and increments of 50 feet (e.g., 100, 150, 200 ft, etc.)*

***Single & Single-Geared DigiSolver Units:*** *(use 18 conductor cable*)

| | |
|---|---|
| **CBL-18S22-Cxxx** | Cable, 18 Conductors, 16 x 22 gauge and 2 x 12 gauge with overall foil shield |
| CBD-18S22-Mxxx | **Above** cable with 19 pin MS Connector at one end |

***Multi-Turn Units:*** *(use 29 conductor cable)*

| | |
|---|---|
| **CBL-29S22-Cxxx** | Cable, 29 Conductors, 27 x 22 gauge and 2 x 12 gauge with overall foil shield |
| **CBD-29S22-Mxxx** | **A**bove cable with 30 pin MS Connector at one end |

## 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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