MURPHY

by ENOVATION CONTROLS

Tachometers and Tach/Hourmeters

AT and ATH Series

Installation Instructions

IMPORTANT! These instructions are specific to tachometer models with a power input operating range of 11-28 VDC and calibration using dip switches. If your tachometer is a type using selector switch calibration, please locate installation instructions in the discontinued product literature section of the Murphy Website (www.fwmurphy.com). Refer to Tachometer and Tach/Hourmeter Installation Instructions Series: ATS, ATHS, ATA, ATHA, ATHI (00-02-0258).

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Section 70

Warranty - A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to http://www.fwmurphy.com/warranty.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- A visual inspection of this product for damage during shipping is recommended before installation.
- It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.
- Disconnect all electrical power to the machine.
- Make sure machine cannot operate during installation.
- Follow all safety warnings of the machine manufacturer.
- Read and follow all installation instructions.
- Please contact Enovation Controls immediately if you have any questions.

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General Information

These tachometers are indicators of engine speed, in revolutions per minute (RPM). Models equipped with hourmeters also record elapsed engine running time. The hourmeter counts when the engine speed is greater than 100 RPM.

For magnetic sensor (pickup) driven models, the pulses are obtained from the ring gear of an engine flywheel (having from 50 to 304 teeth). Alternator driven models function from pulses generated by the engine driven alternator that charges the battery. The alternator must have a terminal for the tachometer.

Ignition models get their signal from the ignition system. This can be from the coil, or a tachometer output from the ignition.

All units are for negative ground or isolated electrical systems. If the instrument is connected to reverse polarity, it will not operate until proper connections are made. All units are powered by a voltage range of 11 to 28 VDC.

WARNING! DIP switches D9 and D10 are factory set for the RPM range model purchased. These should not be changed.

For ATHA-30 models, D9 and D10 should both be set to OFF.
For ATHA-40 models, D9 should be set to ON and D10 should be set to OFF.

Changing these DIP switches will result in an incorrect display of RPM with the factory dial face and improper calibration.

Case Mounting Instructions

It is preferred that the units are mounted in a place where they will be protected from rain and splashing water. A minimum distance of 12 in. (305mm) from any coil, coil leads, or high voltage wiring should be maintained. These units are intended for mounting on a flat panel with a cut out of 3-3/8 in. (86mm), diameter hole as shown below. The maximum panel thickness recommended is ½ in. (12.7mm). Remove the mounting bracket from the back of the unit. Insert the instrument from the front side of the panel and place the mounting bracket to secure the instrument in place.

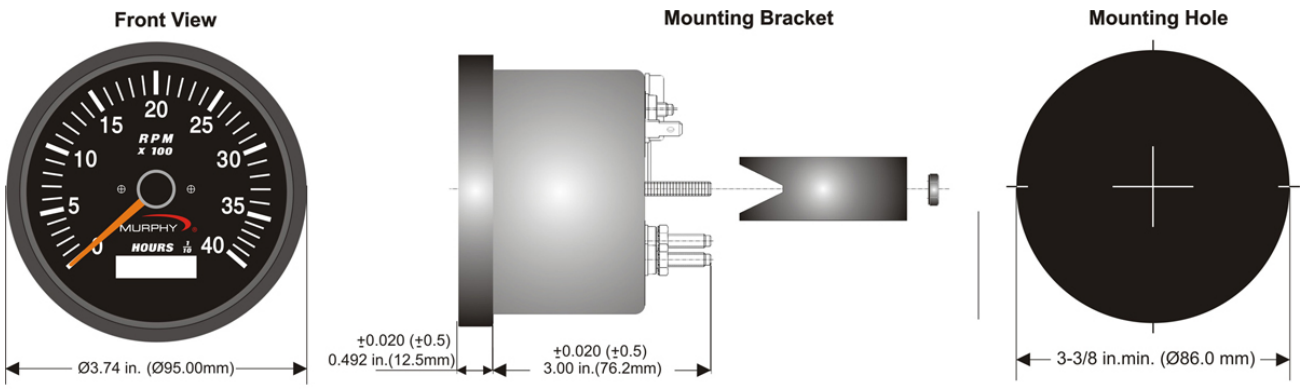


Figure 1

Mounting Requirements

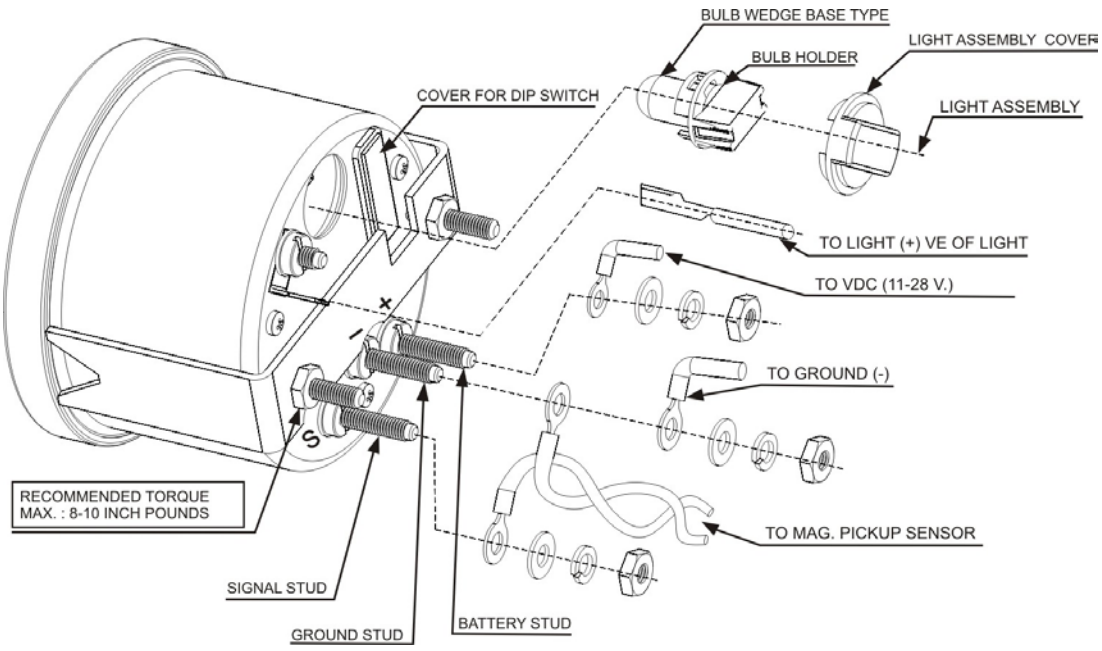


Figure 2 - Back of AT TACH

Tools and Supplies Required for Installation

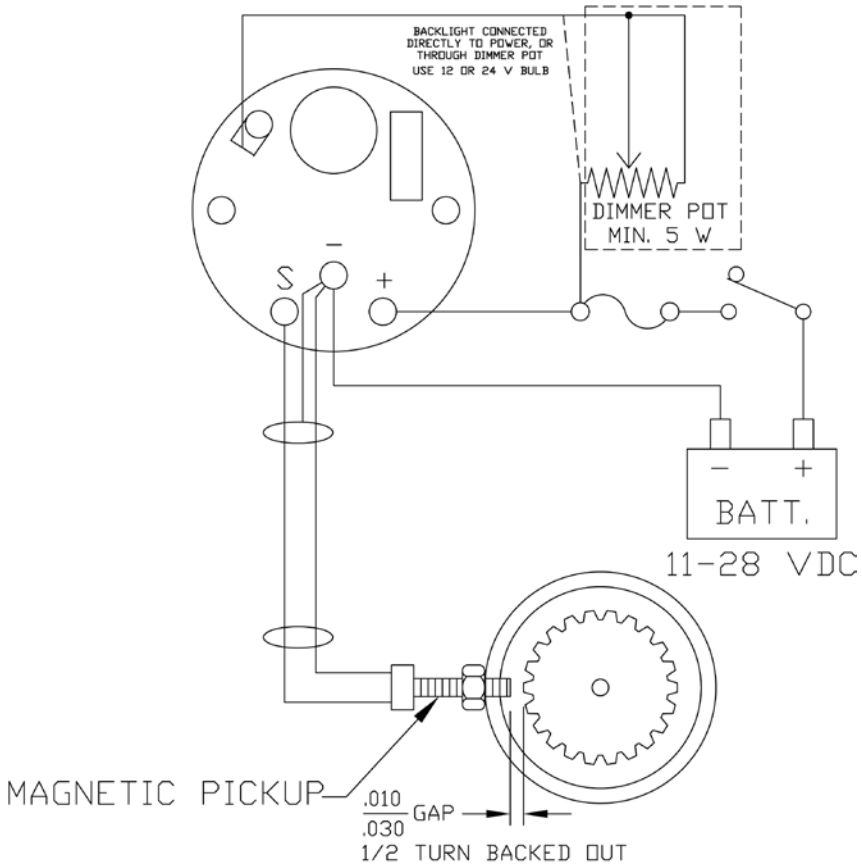
1.	11/32” and 3/8” Nut Drivers
2.	Wire Cutting & Stripping Tool
3.	Wire terminal Crimping Tool
4.	#10 crimp on ring terminals, and Faston™ or slip-on crimp terminals (for backlight)

Connection Instructions

CAUTION: For safety of both personnel and equipment, disconnect the battery/power source before beginning installation.

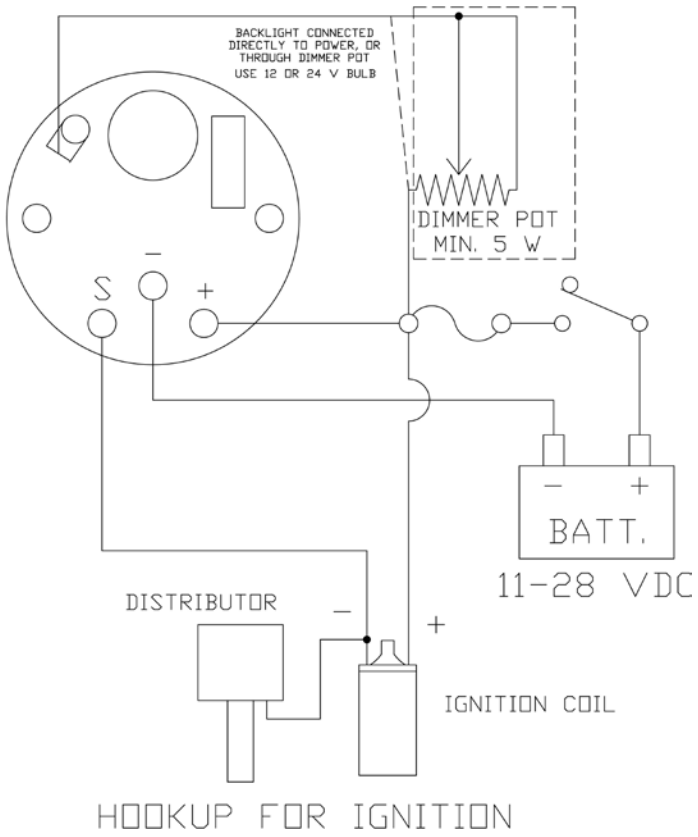
Determine voltage and polarity of the application before wiring the unit. Use the appropriate wire size. To wire the magnetic sensor pickup, use 18 AWG (1.0mm) twisted pair, shielded cable. Use insulated crimp-on (solderless) ring-type wire terminals. Allow a few inches of extra wire (service loops) for ease of servicing.

Typical Wiring Diagrams – Hookup for Magnetic Pickup



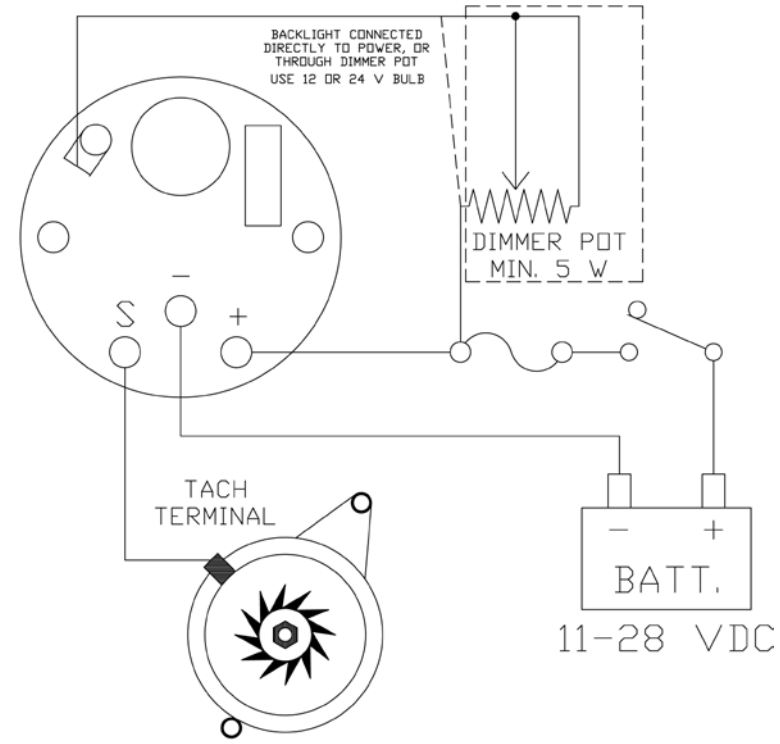
HOOKUP FOR MAGNETIC PICKUP

Typical Wiring Diagrams – Hookup for Ignition



HOOKUP FOR IGNITION

Typical Wiring Diagrams - Hookup for Alternator



HOOKUP FOR ALTERNATOR

Connecting to Power (All Models)

> **IMPORTANT**: The operating voltage range of these units is 11-28VDC only. Always ensure circuits have a fuse or a circuit breaker to protect wiring. Never connect the unit directly to a battery without a fuse or circuit breaker.

1. Connect a wire from "**+**" to Battery or Power Supply "**+**" through a fuse and the ignition switch.
2. Connect a wire from the "**-**" terminal to the negative voltage source (electrical ground).This is shown in Figure 2 as the 'ground stud' (Figure 2 is found in the section: Case Mounting Instructions under Mounting Requirements in this document).

Installing or Replacing Light Bulbs (All Models)

1. Pull out the black rubber protective cap (Light Assembly Cover) provided at back as shown in Figure 2.
2. Twist the bulb holder about 1/8 turn counter-clockwise and remove the bulb holder and bulb. (See Figure 2.)
3. To replace the bulb, pull the bulb from the socket and replace with a new 12V or 24V bulb as required.

Connecting to Magnetic Sensor (Magnetic Sensor Driven Models)

The magnetic sensor (pickup) usually has two connections (terminals or wires) exiting from it. These connections are not polarized; either connection can be considered positive or negative signals. These two connections must be routed directly to the unit. Do NOT ground one of the connections at the engine. (See Figure 2)

1. Connect one of the wires in the twisted pair (from magnetic sensor) to the "S" terminal.
2. Connect the other wire in the twisted pair (from the magnetic sensor) to the negative (**-**) terminal (also noted in Figure 2 as the 'ground stud').

Connecting to Alternator (Alternator Driven Models)

Connect a wire from the "S" terminal to AC phase terminal (sometimes marked "STA" or "R" on the alternator.

Connecting to Ignition Coil (Ignition Driven Models)

Connect wire from the "S" terminal to the negative (**-**) side of the ignition coil or to the terminal marked "TACH" on solid state ignition systems (See Figure 2 – found in this document under the section Case Mounting Instructions, Mounting Requirements).

Calibration Instructions

Magnetic Sensor Driven Models

These models have been designed to function with flywheels having 50 to 304 teeth. Any number in this range can be set using the dip switches provided on the back (see Figure 3 - following). For more details, also refer to Table 1 (In the section: Dip Switch Setting Charts, Magnetic Sensor Driven Models).

If the number of teeth on the flywheel is known, set the calibration by using a pin to adjust the dip switches (see Figure 3, following).

> **IMPORTANT**: DO NOT use a pencil or pen of any type to adjust dip switches. If the pencil breaks while setting the dip positions, graphite can cause a short internally. Leaking ink can do the same.

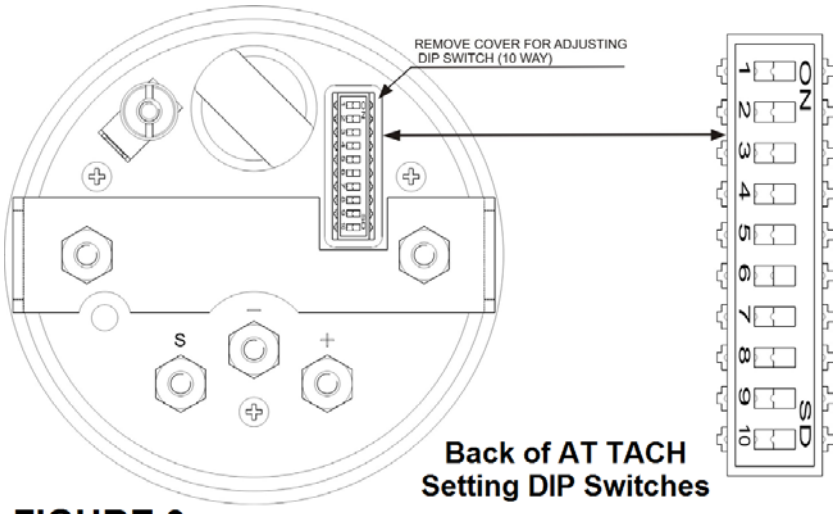


FIGURE 3

Formula for setting dip switches:

- Dip switch setting = binary of decimal equivalent.
- Decimal equivalent = number of flywheel teeth - 49.

> **NOTE:** Dip switches D1 to D8 will be used for setting calibration.
>
> Do not change settings on Dip Switches D9 and D10.
>
> For more details refer to Table 1 - Dip Switch Setting for each model type.
>
> **NOTE**: Make sure the engine has a properly functioning and certified governor before attempting this procedure.

If the number of teeth on the flywheel is not known, set up a calibrated shop tach to monitor the engine's true RPM. Start the engine, and after an appropriate warm-up period increase to normal running RPM as read on the shop tach. If the dip switch was not set previously, set it now to the position that causes the Murphy tach to read closest to the true RPM.

Alternator Driven Models

The alternator-driven tachometer-series models will operate from 3 to 100 pulses per engine revolution. Most applications will be between 3 and 40 pulses per revolution. Obtain the number of pulses per engine revolution:

1. Determine the number of poles on your alternator. Look for the designation/type in the manufacturer's manual.

2. The Alternator Tachometer Chart (Figure 4 – in the section: Pulley Ratios Chart and Alternator Tachometer Chart) lists common alternators and their minimum and maximum pulley ratios. Determine pulley ratio with the following formula:

$$\text{PULLEY RATIO} = \frac{\text{CRANK SHAFT PULLEY DIAMETER}}{\text{ALTERNATOR PULLEY DIAMETER}}$$

3. CHECK that Pulley Ratio falls within the range shown on the Pulley Ratio Chart (Figure 4) for a particular alternator. If ratio falls in the shaded area, the tachometer can be calibrated for the application.

4. To determine the pulses per engine revolution:

$$\frac{\text{NUMBER OF POLES}}{2} \times \text{PULLEY RATIO} = \text{PULSES PER ENGINE REVOLUTION}$$

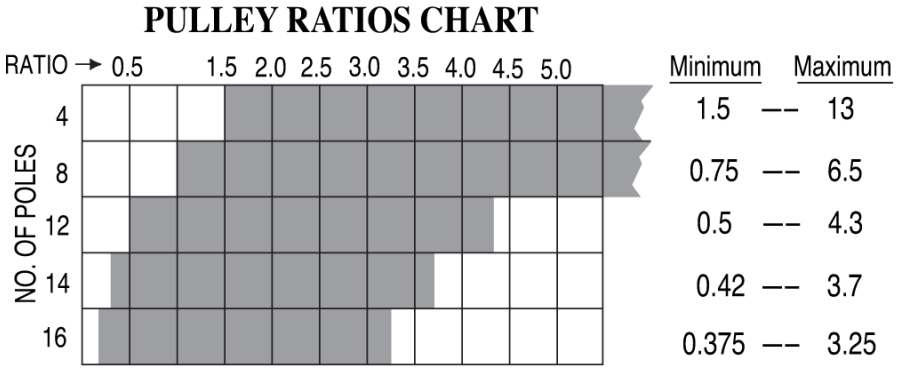
5. If the Pulses per engine revolution is determined, then set the calibration "through selector/dip switches" (See Fig. 3 in the section: Calibration Instructions, Magnetic Sensor Driven Models).

6. Formula for setting Dip switches:

Decimal equivalent = No. of Pulses will be used for setting calibration
Dip switch setting = Binary of decimal equivalent

> **IMPORTANT**
> Dip switches D1 to D8 will be used for setting of calibration.
> Do not change or disturb settings on Dip Switches D9 and D10.
> For more details, see Table 2.

Pulley Ratios Chart and Alternator Tachometer Chart



ALTERNATOR TACHOMETER CHART

Manufacturer	Designation/Type	Poles	Minimum pulley-ratio	Maximum* pulley-ratio
Prestolite	All	8	0.75	6.5
Load Handler	88A, 8LHA, 89C, 8LHC	16	0.375	3.25
Load Handler	All 5 inch models	12	0.5	4.3
Leece Neville	All	12	0.5	4.3
Bosch	G and K Series	12	0.5	4.3
C.E. Neihoff	All	12	0.5	4.3
Delco Remy	30DN	4	1.5	13
Delco Remy	15SI, 21SI, 40DN, 40SI	12	0.5	4.3
Delco Remy	10DN, 10SI, 12SI	14	0.42	3.7
Delco Remy	20DN, 25SI, 27SI	16	0.375	3.25
Delco Remy	29SI, 30SI	16	0.375	3.25
Hitachi	LT125, LT130, LT133	8	0.75	6.5
Hitachi	LT150	12	0.5	4.3
Lucas	All	12	0.5	4.3
Mando	All	12	0.5	4.3
Motorcraft	All	12	0.5	4.3
Nippondenso	All	12	0.5	4.3
Powerline	Series 23	14	0.42	3.7
Powerline	Series 24, 25, 26	12	0.5	4.3
Valeo	All	12	0.5	4.3

Figure 4

NOTE: ***** Although the tach may be calibrated for higher input frequencies in some cases, as shown on the Pulley Ratios Chart, pulley ratios in excess of 5.0 are not recommended nor are they normally used.

Ignition Driven Models

The ignition coil-driven tach series models will operate from 1 to 5 pulses per engine revolution. To obtain the number of pulses per engine revolution:

The ATI and ATHI series models have been designed to function from the ignition signal on 2 through 10-cylinder, 4-cycle engines. Set the calibration using the Dip switches. For more details, see the following formula and information in Table 3 (in the section: DIP Switch Setting Charts, Ignition Driven Models).

Work the following formulas for your Ignition Coil system:

Formula for Setting Dip Switches:

Dip switch setting = Binary of decimal equivalent.

Decimal equivalent = Number of Pulses per engine revolution.

$$\text{Number of Pulses per engine revolution} = \frac{\text{Number of engine cylinders}}{2}$$

For Dip switch settings, please refer Table 3 (in the following section) for ignition speed signals.

> **IMPORTANT**: DO NOT use a pencil or pen of any type to adjust dip switches. If the pencil breaks while setting the dip positions, graphite can cause a short internally. Leaking ink can do the same.

Dip Switch Setting Charts

Table 1 - Magnetic Sensor Driven Models

> **NOTE**
> In the following table, “1” means ON and “0" means OFF.

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
50	01	1	0	0	0	0	0	0	0
51	02	0	1	0	0	0	0	0	0
52	03	1	1	0	0	0	0	0	0
53	04	0	0	1	0	0	0	0	0
54	05	1	0	1	0	0	0	0	0
55	06	0	1	1	0	0	0	0	0
56	07	1	1	1	0	0	0	0	0
57	08	0	0	0	1	0	0	0	0
58	09	1	0	0	1	0	0	0	0
59	10	0	1	0	1	0	0	0	0
60	11	1	1	0	1	0	0	0	0
61	12	0	0	1	1	0	0	0	0
62	13	1	0	1	1	0	0	0	0
63	14	0	1	1	1	0	0	0	0
64	15	1	1	1	1	0	0	0	0
65	16	0	0	0	0	1	0	0	0
66	17	1	0	0	0	1	0	0	0
67	18	0	1	0	0	1	0	0	0
68	19	1	1	0	0	1	0	0	0
69	20	0	0	1	0	1	0	0	0
70	21	1	0	1	0	1	0	0	0
71	22	0	1	1	0	1	0	0	0
72	23	1	1	1	0	1	0	0	0
73	24	0	0	0	1	1	0	0	0
74	25	1	0	0	1	1	0	0	0
75	26	0	1	0	1	1	0	0	0
76	27	1	1	0	1	1	0	0	0
77	28	0	0	1	1	1	0	0	0
78	29	1	0	1	1	1	0	0	0
79	30	0	1	1	1	1	0	0	0
80	31	1	1	1	1	1	0	0	0

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
81	32	0	0	0	0	0	1	0	0
82	33	1	0	0	0	0	1	0	0
83	34	0	1	0	0	0	1	0	0
84	35	1	1	0	0	0	1	0	0
85	36	0	0	1	0	0	1	0	0
86	37	1	0	1	0	0	1	0	0
87	38	0	1	1	0	0	1	0	0
88	39	1	1	1	0	0	1	0	0
89	40	0	0	0	1	0	1	0	0
90	41	1	0	0	1	0	1	0	0
91	42	0	1	0	1	0	1	0	0
92	43	1	1	0	1	0	1	0	0
93	44	0	0	1	1	0	1	0	0
94	45	1	0	1	1	0	1	0	0
95	46	0	1	1	1	0	1	0	0
96	47	1	1	1	1	0	1	0	0
97	48	0	0	0	0	1	1	0	0
98	49	1	0	0	0	1	1	0	0
99	50	0	1	0	0	1	1	0	0
100	51	1	1	0	0	1	1	0	0
101	52	0	0	1	0	1	1	0	0
102	53	1	0	1	0	1	1	0	0
103	54	0	1	1	0	1	1	0	0
104	55	1	1	1	0	1	1	0	0
105	56	0	0	0	1	1	1	0	0
106	57	1	0	0	1	1	1	0	0
107	58	0	1	0	1	1	1	0	0
108	59	1	1	0	1	1	1	0	0
109	60	0	0	1	1	1	1	0	0
110	61	1	0	1	1	1	1	0	0
111	62	0	1	1	1	1	1	0	0

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
112	63	1	1	1	1	1	1	0	0
113	64	0	0	0	0	0	0	1	0
114	65	1	0	0	0	0	0	1	0
115	66	0	1	0	0	0	0	1	0
116	67	1	1	0	0	0	0	1	0
117	68	0	0	1	0	0	0	1	0
118	69	1	0	1	0	0	0	1	0
119	70	0	1	1	0	0	0	1	0
120	71	1	1	1	0	0	0	1	0
121	72	0	0	0	1	0	0	1	0
122	73	1	0	0	1	0	0	1	0
123	74	0	1	0	1	0	0	1	0
124	75	1	1	0	1	0	0	1	0
125	76	0	0	1	1	0	0	1	0
126	77	1	0	1	1	0	0	1	0
127	78	0	1	1	1	0	0	1	0
128	79	1	1	1	1	0	0	1	0
129	80	0	0	0	0	1	0	1	0
130	81	1	0	0	0	1	0	1	0
131	82	0	1	0	0	1	0	1	0
132	83	1	1	0	0	1	0	1	0
133	84	0	0	1	0	1	0	1	0
134	85	1	0	1	0	1	0	1	0
135	86	0	1	1	0	1	0	1	0
136	87	1	1	1		1	0	1	0
137	88	0	0	0	1	1	0	1	0
138	89	1	0	0	1	1	0	1	0
139	90	0	1	0	1	1	0	1	0
140	91	1	1	0	1	1	0	1	0
141	92	0	0	1	1	1	0	1	0
142	93	1	0	1	1	1	0	1	0
143	94	0	1	1	1	1	0	1	0
144	95	1	1	1	1	1	0	1	0
145	96	0	0	0	0	0	1	1	0
146	97	1	0	0	0	0	1	1	0
147	98	0	1	0	0	0	1	1	0
148	99	1	1	0	0	0	1	1	0
149	100	0	0	1	0	0	1	1	0
150	101	1	0	1	0	0	1	1	0
151	102	0	1	1	0	0	1	1	0
152	103	1	1	1	0	0	1	1	0
153	104	0	0	0	1	0	1	1	0
154	105	1	0	0	1	0	1	1	0
155	106	0	1	0	1	0	1	1	0
156	107	1	1	0	1	0	1	1	0
157	108	0	0	1	1	0	1	1	0
158	109	1	0	1	1	0	1	1	0
159	110	0	1	1	1	0	1	1	0
160	111	1	1	1	1	0	1	1	0

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
161	112	0	0	0	0	1	1	1	0
162	113	1	0	0	0	1	1	1	0
163	114	0	1	0	0	1	1	1	0
164	115	1	1	0	0	1	1	1	0
165	116	0	0	1	0	1	1	1	0
166	117	1	0	1	0	1	1	1	0
167	118	0	1	1	0	1	1	1	0
168	119	1	1	1	0	1	1	1	0
169	120	0	0	0	1	1	1	1	0
170	121	1	0	0	1	1	1	1	0
171	122	0	1	0	1	1	1	1	0
172	123	1	1	0	1	1	1	1	0
173	124	0	0	1	1	1	1	1	0
174	125	1	0	1	1	1	1	1	0
175	126	0	1	1	1	1	1	1	0
176	127	1	1	1	1	1	1	1	0
177	128	0	0	0	0	0	0	0	1
178	129	1	0	0	0	0	0	0	1
179	130	0	1	0	0	0	0	0	1
180	131	1	1	0	0	0	0	0	1
181	132	0	0	1	0	0	0	0	1
182	133	1	0	1	0	0	0	0	1
183	134	0	1	1	0	0	0	0	1
184	135	1	1	1	0	0	0	0	1
185	136	0	0	0	1	0	0	0	1
186	137	1	0	0	1	0	0	0	1
187	138	0	1	0	1	0	0	0	1
188	139	1	1	0	1	0	0	0	1
189	140	0	0	1	1	0	0	0	1
190	141	1	0	1	1	0	0	0	1
191	142	0	1	1	1	0	0	0	1
192	143	1	1	1	1	0	0	0	1
193	144	0	0	0	0	1	0	0	1
194	145	1	0	0	0	1	0	0	1
195	146	0	1	0	0	1	0	0	1
196	147	1	1	0	0	1	0	0	1
197	148	0	0	1	0	1	0	0	1
198	149	1	0	1	0	1	0	0	1
199	150	0	1	1	0	1	0	0	1
200	151	1	1	1	0	1	0	0	1
201	152	0	0	0	1	1	0	0	1
202	153	1	0	0	1	1	0	0	1
203	154	0	1	0	1	1	0	0	1
204	155	1	1	0	1	1	0	0	1
205	156	0	0	1	1	1	0	0	1
206	157	1	0	1	1	1	0	0	1
207	158	0	1	1	1	1	0	0	1
208	159	1	1	1	1	1	0	0	1
209	160	0	0	0	0	0	1	0	1

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
210	161	1	0	0	0	0	1	0	1
211	162	0	1	0	0	0	1	0	1
212	163	1	1	0	0	0	1	0	1
213	164	0	0	1	0	0	1	0	1
214	165	1	0	1	0	0	1	0	1
215	166	0	1	1	0	0	1	0	1
216	167	1	1	1	0	0	1	0	1
217	168	0	0	0	1	0	1	0	1
218	169	1	0	0	1	0	1	0	1
219	170	0	1	0	1	0	1	0	1
220	171	1	1	0	1	0	1	0	1
221	172	0	0	1	1	0	1	0	1
222	173	1	0	1	1	0	1	0	1
223	174	0	1	1	1	0	1	0	1
224	175	1	1	1	1	0	1	0	1
225	176	0	0	0	0	1	1	0	1
226	177	1	0	0	0	1	1	0	1
227	178	0	1	0	0	1	1	0	1
228	179	1	1	0	0	1	1	0	1
229	180	0	0	1	0	1	1	0	1
230	181	1	0	1	0	1	1	0	1
231	182	0	1	1	0	1	1	0	1
232	183	1	1	1	0	1	1	0	1
233	184	0	0	0	1	1	1	0	1
234	185	1	0	0	1	1	1	0	1
235	186	0	1	0	1	1	1	0	1
236	187	1	1	0	1	1	1	0	1
237	188	0	0	1	1	1	1	0	1
238	189	1	0	1	1	1	1	0	1
239	190	0	1	1	1	1	1	0	1
240	191	1	1	1	1	1	1	0	1
241	192	0	0	0	0	0	0	1	1
242	193	1	0	0	0	0	0	1	1
243	194	0	1	0	0	0	0	1	1
244	195	1	1	0	0	0	0	1	1
245	196	0	0	1	0	0	0	1	1
246	197	1	0	1	0	0	0	1	1
247	198	0	1	1	0	0	0	1	1
248	199	1	1	1	0	0	0	1	1
249	200	0	0	0	1	0	0	1	1
250	201	1	0	0	1	0	0	1	1
251	202	0	1	0	1	0	0	1	1
252	203	1	1	0	1	0	0	1	1
253	204	0	0	1	1	0	0	1	1
254	205	1	0	1	1	0	0	1	1
255	206	0	1	1	1	0	0	1	1
256	207	1	1	1	1	0	0	1	1
257	208	0	0	0	0	1	0	1	1
258	209	1	0	0	0	1	0	1	1

No. of Flywheel teeth	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
259	210	0	1	0	0	1	0	1	1
260	211	1	1	0	0	1	0	1	1
261	212	0	0	1	0	1	0	1	1
262	213	1	0	1	0	1	0	1	1
263	214	0	1	1	0	1	0	1	1
264	215	1	1	1	0	1	0	1	1
265	216	0	0	0	1	1	0	1	1
266	217	1	0	0	1	1	0	1	1
267	218	0	1	0	1	1	0	1	1
268	219	1	1	0	1	1	0	1	1
269	220	0	0	1	1	1	0	1	1
270	221	1	0	1	1	1	0	1	1
271	222	0	1	1	1	1	0	1	1
272	223	1	1	1	1	1	0	1	1
273	224	0	0	0	0	0	1	1	1
274	225	1	0	0	0	0	1	1	1
275	226	0	1	0	0	0	1	1	1
276	227	1	1	0	0	0	1	1	1
277	228	0	0	1	0	0	1	1	1
278	229	1	0	1	0	0	1	1	1
279	230	0	1	1	0	0	1	1	1
280	231	1	1	1	0	0	1	1	1
281	232	0	0	0	1	0	1	1	1
282	233	1	0	0	1	0	1	1	1
283	234	0	1	0	1	0	1	1	1
284	235	1	1	0	1	0	1	1	1
285	236	0	0	1	1	0	1	1	1
286	237	1	0	1	1	0	1	1	1
287	238	0	1	1	1	0	1	1	1
288	239	1	1	1	1	0	1	1	1
289	240	0	0	0	0	1	1	1	1
290	241	1	0	0	0	1	1	1	1
291	242	0	1	0	0	1	1	1	1
292	243	1	1	0	0	1	1	1	1
293	244	0	0	1	0	1	1	1	1
294	245	1	0	1	0	1	1	1	1
295	246	0	1	1	0	1	1	1	1
296	247	1	1	1	0	1	1	1	1
297	248	0	0	0	1	1	1	1	1
298	249	1	0	0	1	1	1	1	1
299	250	0	1	0	1	1	1	1	1
300	251	1	1	0	1	1	1	1	1
301	252	0	0	1	1	1	1	1	1
302	253	1	0	1	1	1	1	1	1
303	254	0	1	1	1	1	1	1	1
304	255	1	1	1	1	1	1	1	1

Table 2 - Alternator Driven Models

NOTE: In the following table, “1” means ON and “0" means OFF.

No. of Pulses/ Rev.	Decimal equivalent	Dip Switch Position							
		D1	D2	D3	D4	D5	D6	D7	D8
03	03	1	1	0	0	0	0	0	0
04	04	0	0	1	0	0	0	0	0
05	05	1	0	1	0	0	0	0	0
06	06	0	1	1	0	0	0	0	0
07	07	1	1	1	0	0	0	0	0
08	08	0	0	0	1	0	0	0	0
09	09	1	0	0	1	0	0	0	0
10	10	0	1	0	1	0	0	0	0
11	11	1	1	0	1	0	0	0	0
12	12	0	0	1	1	0	0	0	0
13	13	1	0	1	1	0	0	0	0
14	14	0	1	1	1	0	0	0	0
15	15	1	1	1	1	0	0	0	0
16	16	0	0	0	0	1	0	0	0
17	17	1	0	0	0	1	0	0	0
18	18	0	1	0	0	1	0	0	0
19	19	1	1	0	0	1	0	0	0
20	20	0	0	1	0	1	0	0	0
21	21	1	0	1	0	1	0	0	0
22	22	0	1	1	0	1	0	0	0
23	23	1	1	1	0	1	0	0	0
24	24	0	0	0	1	1	0	0	0
25	25	1	0	0	1	1	0	0	0
26	26	0	1	0	1	1	0	0	0
27	27	1	1	0	1	1	0	0	0
28	28	0	0	1	1	1	0	0	0
29	29	1	0	1	1	1	0	0	0
30	30	0	1	1	1	1	0	0	0
31	31	1	1	1	1	1	0	0	0
32	32	0	0	0	0	0	1	0	0
33	33	1	0	0	0	0	1	0	0
34	34	0	1	0	0	0	1	0	0
35	35	1	1	0	0	0	1	0	0
36	36	0	0	1	0	0	1	0	0
37	37	1	0	1	0	0	1	0	0
38	38	0	1	1	0	0	1	0	0
39	39	1	1	1	0	0	1	0	0
40	40	0	0	0	1	0	1	0	0

NOTE: Switch combinations up to 100 pulses per revolution are not shown as the range of 3 – 40 pulses per revolution fits most applications.

Table 3 - Ignition Driven Models

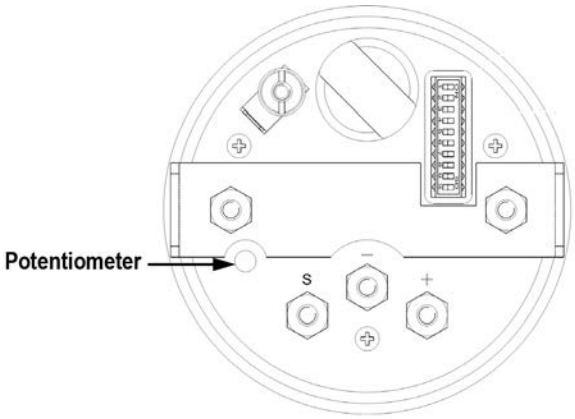
4-Cycle Engines	No. of Pulses per Engine Revolution	Decimal Equivalent	Binary of Decimal Equivalent Dip Switch Position		
			D1	D2	D3
2 cylinder	1	1	1	0	0
4 cylinder	2	2	0	1	0
6 cylinder	3	3	1	1	0
8 cylinder	4	4	0	0	1
10 cylinder	5	5	1	0	1

> **NOTE**: Dip switches D4 through D8 are not used and should be set to OFF.

Potentiometer Fine Adjustment Calibration

You can adjust calibration on all models through the fine adjust potentiometer (pot) located on the back side of the housing.

> **NOTE:** This option is for fine tuning and not for coarse tuning.



The following steps will guide you through the fine adjustment process.

1. Use a duly calibrated optical tach or master tach to determine actual engine RPM.
2. Determine DIP switch settings by calculating and using the table to set the DIP switches provided on the back side of the gauge accordingly. Refer to the preceding calibration instructions.
3. Remove the QC passed sticker to access the fine adjustment hole.
4. Use small flat screw driver (watch maker No. 4) for fine tuning. Make sure the screw driver sits properly in potentiometer slot without touching other parts of the PCB.
5. Rotate the potentiometer such that the reading of the tach matches the actual RPM noted by the master tach. Turning the pot in clockwise direction will increase RPM, while turning the pot in counter-clockwise direction will decrease the RPM.

   IMPORTANT! The fine adjustment potentiometer can only be turned ¾ of a turn. Be gentle and do not force it.

6. The maximum range for increasing and decreasing the RPM through fine adjustment pot is approximately 400 RPM.
7. If unable to match the reading with the master tach using the method above, then recheck the calculations or change the next level DIP switch setting and repeat the calibration procedure.
8. Once the pointer is adjusted to the desired position, it is recommended to cover the fine adjustment hole to protect it from water entry and other atmospheric effects.

Specifications

Magnetic Sensor Driven Models

- **Power Input:** 11-28VDC (70mA – 120mA except lamp load)
- **Backlight:** 3.4W T-10 wedge base bulb
- **RPM Input Signal Voltage:** 1.5Vrms minimum
- **Accuracy:** Tachometer: +2% full scale
  Hourmeter: +0.01% hours, +1 count
- **Temperature Range:** -40°C to +82°C (no permanent damage shall occur)
- **Dial (Face Plate):** 270° sweep with white numerals (over black background)
- **Bezel:** 304 stainless steel for bright and IS 513 E.E.E. CRCA steel for black
- **Scale:** 0-4000RPM
- **Case Material:** Plastic
- **Hourmeter Range:** 99999.9 hours in 0.1 increments.

Alternator Driven and Ignition Driven Models

- **Power Input**: 11-28VDC (70mA-120mA except lamp load)
- **Backlight**: 3.4W T-10 wedge base bulb
- **RPM Input Signal Voltage**: V low: 0.5V max, V high: 8.0V min.
- **Accuracy**: Tachometer: +2% full scale
  Hourmeter: +0.01% hours, +1 count
- **Temperature Range:** -40°C to +82°C (no permanent damage shall occur)
- **Dial (Face Plate):** 270° sweep with white numerals (over black background)
- **Bezel:** 304 stainless steel for bright and IS 513 E.E.E. CRCA steel for black
- **Scale:** 0-4000RPM
- **Case Material:** Plastic
- **Hourmeter Range:** 99999.9 hours in 0.1 increments.

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