TRIMTAB POSITION SENSOR July 5 1990

The trimtab position sensor consists of a magnet, a TL173CLP hall effect sensor, a processing circuit and a meter.

MAGNET - The magnet used is 3 1/8" long. The magnet has the characteristics of being as long as the length of travel desired. In addition it is made of a high magnetic strength alloy to obtain a consistent field strength throughout its length. Not any magnet may be used. Most magnets of this aspect ratio of over 5:1 (length/width) do not have a consistent field strength throughout their length. A magnet manufacturer should be consulted to get a proper magnet.

SENSOR - The hall effect sensor is a Texas Instruments TL173CLP device. This device cost us $1.33 Canadian in lots of 20. Consult a Texas Instruments distributor such as Arrow Electronics for volume pricing. Volume deliveries usually have a 16 week lead time.

PROCESSING CIRCUIT - The processing circuit consists of a low dropout voltage regulator and an amplifier circuit with adjustable offset. The LED is used for a stable voltage reference as it is cheaper than a zener diode. It can double as a pilot lamp.

The amplifier has a trimpot to set the operating point.

METER - This is a standard Teleflex trim tab position indicator. There are two problems with using this meter though a customer probably won't notice.

1. This meter draws a lot of current, 150mA for full deflection. This requires that the amplifier drive a power transistor to drive the meter. This raises cost by over $0.50.
2. The meter is non-linear. This is normally required as the meter is driven by a two terminal rheostat and the current vs voltage characteristic of a rheostat is non-linear. However, when used with a linear voltage source like the hall effect sensor, the non-linear meter gives a non-linear display. The effect is that the meter moves 50% of its travel when the cylinder only moves 25%. Fortunately this may not be noticeable in most applications as the user only wants a repeatable indication of the trim tab and the actual angle of the meter is not important.

However, if this technology was adopted, changes in the meter design to make it more linear and to draw less current would be desirable. Also, a smaller meter movement could be combined with a driver board using surface mount technology that fits inside the one housing.

ADJUSTMENT - Move the cylinder to the fully up position. Then, adjust the trimmer for the desired full up reading. Alternately the fully extended position may be used to adjust to the full down position or the middle position may be used to set the meter to the middle position. Try it each way until you find a way you like it.

The trimmer sets the operating point. There is no adjustment provided for sensitivity. If adjustment of the sensitivity is required due to having the magnet and sensor not so close tegether, the 43K resistor between pins 1 and 2 of the IC control this. Increase the resistor for more gain. The operating point would have to be readjusted thereafter.

Do NOT submerse this prototype. It is NOT waterproof. Further engineering work is required to make a waterproof model. Note that this technology should work quite well inside the cylinder. Being submerged in oil should not affect it in any way.

Also note that this same technology could be used to make a waterproof rudder angle indicator. Call me if you have any questions about this.

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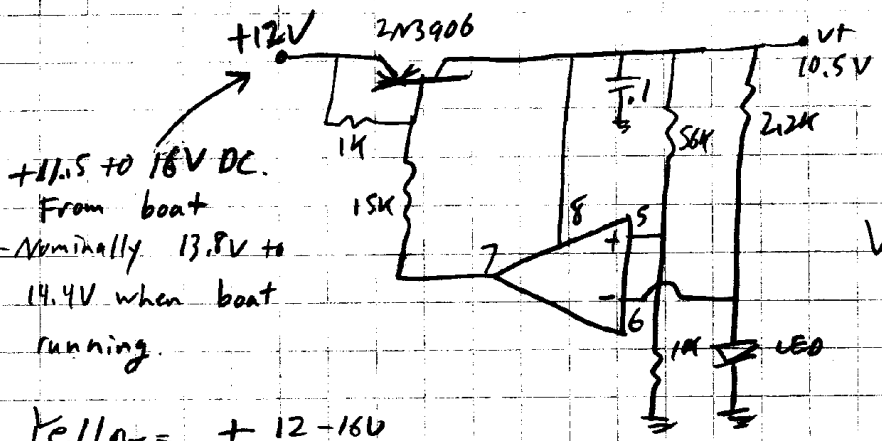
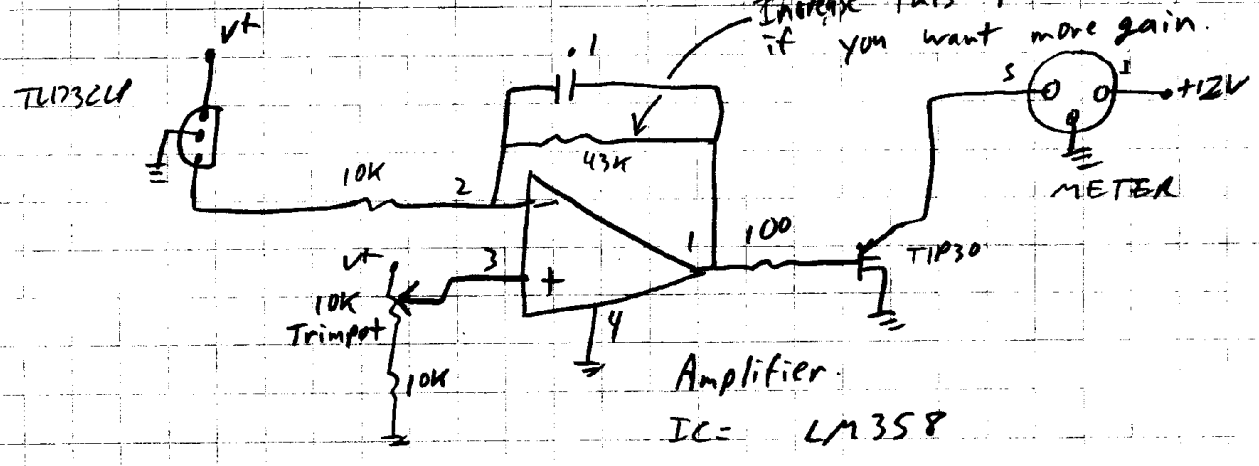
Trim tab indicator



Yellow = + 12-16V

GREY = —



Approx Cost	LM358	.40
	TIP30	.40
	2N3906	.10
	TL1136CLP	1.00
	LED	.10
	RESISTORS	.09
	Capacitors	.20
	TRIMPOT	.30
	PCB	2.00
Material total		4.59

for circuitry exc. meter & hardware.

Circuitry could be built into meter if meter was modified.

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