



DIGITAL DIRECTION SENSING MOTION DETECTOR MANUAL

DP-005

GLOLAB
CORPORATION

Thank you for buying our DP-005 Digital Direction Sensing Motion Detector

The goal of Glolab is to produce top quality electronic kits, products and components. All of our products and kits are designed by Glolab engineers and tested in our laboratory. Mechanical devices, prototypes and enclosures are fabricated in our precision machine shop.

Glolab Corporation has been in business since 1994 and has two locations in New York's Hudson Valley. Our electronics laboratory and kit packaging and our machine shop are located in Wappingers Falls.

In addition to our kits, RF modules and DP-005 device, we supply some special and hard to find parts such as our Pyroelectric Infrared Sensor and Infrared Fresnel lens for those of you who want to design and build your own projects.

Technical help is available by email from lab@glolab.com.

DP-005 applications

- **Entry and exit monitoring**
- **Occupancy monitoring**
- **Automatic lighting**
- **General security devices**
- **Video recorder activation**
- **Child or animal monitoring**
- **Talking messages**

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Wappingers Falls, NY 12590

Introduction_____

The DP-005 digital direction sensing pyroelectric infrared motion detector is designed to detect infrared radiation (IR) from a moving human or animal both in daylight and at night and to indicate the direction of movement.

The circuits are housed in a plastic enclosure with a Fresnel lens mounted in its cover. It includes dual digital pyroelectric infrared sensors, a microprocessor and two output transistors; one for each direction. An on-board voltage regulator powers the circuits and accepts an external 4.5 to 15 volt DC power supply voltage.

The output transistors within the DP-005 can sink up to 200 milliamperes each to directly drive relays, light emitting diodes or other loads. The outputs can also be fed into a logic or timing circuit to add specific functions such as robot control.

Features_____

- **15 foot (4.5 meter) detection distance**
- **On board voltage regulator**
 - **Can be powered by 4.5 to 15 volts DC**
- **Micropower circuits for low current drain**
 - **Average current < 80 microamperes**
 - **Long battery life**
- **High current output drivers**
 - **200 milliampere current sink**
 - **Can directly drive remote relays**
- **Programmable sensitivity setting**
 - **Adjusts detection range**
- **Programmable dwell setting**
 - **Adjusts output ON time**
- **Direction sensing or bi-directional**
- **Only four wire connections needed**
 - **Two for power**
 - **Two for output**

Digital Technology

The Glolab DP-005 uses two Digital infrared detectors. This new technology incorporates a sensor, amplifier, filter, A/D converter in a TO5 package.

Unlike typical analog pyroelectric sensors, the digital sensor outputs serial data pulses that represent the amplitude of detected infrared radiation in digital form. Since all of the amplification and signal processing is done within the sensor package, the detector has very high immunity to RF radiation from cell phones and other sources.

Figure 1 is a block diagram of the DP-005. Power is supplied to the digital pyroelectric sensors and to the processor through a micropower voltage regulator. The processor decodes serial bits from the sensors and turns an NFET transistor on when motion is detected. The amount of time that the NFET remains on (dwell) can be programmed. Detection sensitivity that affects detection range can also be programmed. Programming is done by on-board DIP switches. The DP-005 is supplied with default settings of medium sensitivity and 1 second dwell time.

A diode is connected from each output to +V to suppress voltage transients from inductive loads.

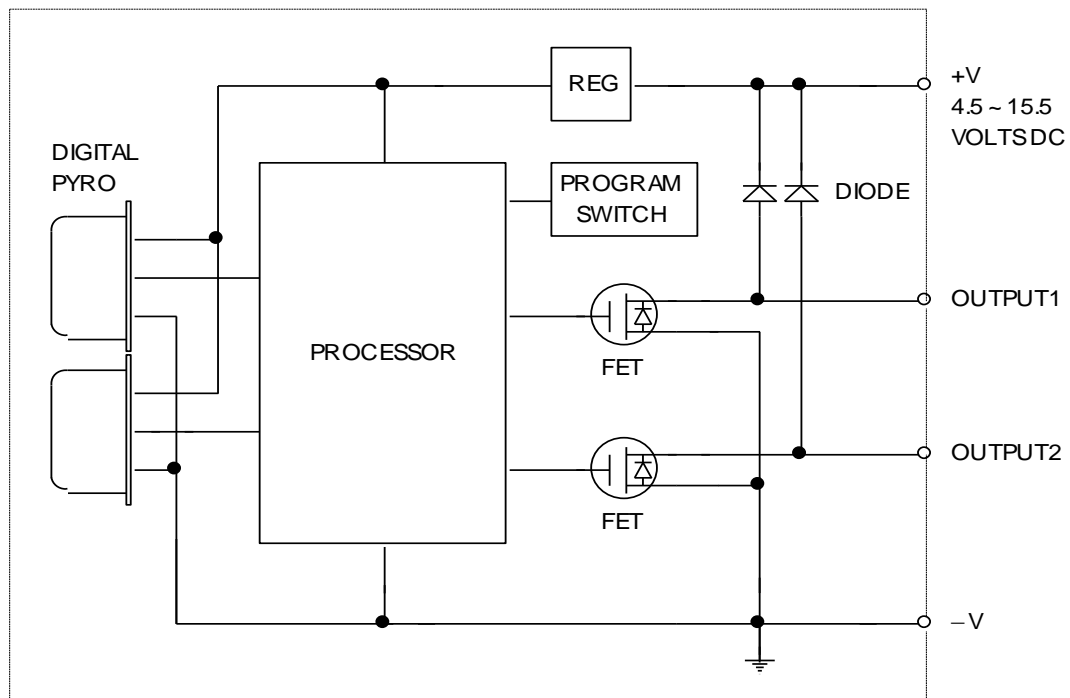


Figure 1

Description

The DP-005 is 1.1 inch (28mm) deep, 2.4 inch (61mm) wide, and 3.3 inch (84mm) long with mounting flanges extending to 4.3 inch (110mm). The enclosure should be mounted with its flanges on top and bottom for best sensitivity to horizontal motion. A 0.9 inch (23mm) diameter Fresnel lens is mounted in the cover. A terminal block with four screw terminals is provided on the circuit board for connecting power and output wires. Sensitivity and dwell are programmed by DIP switches on the circuit board. Programming instructions are on page 9.

Sensitivity

Sensitivity and therefore range (detection distance) can be programmed for one of four levels. Sensitivity default is set to medium. Maximum detection distance is about 15 feet (4.5 meter) but will be shorter when background objects are at a higher temperature because it is then more difficult for the sensor to distinguish an IR source from its background.

Outputs

Output terminals 1 and 2 each connect directly to the drain of an NFET transistor. Only one NFET turns on at a time to indicate the direction of motion. Both NFETs can conduct up to 200 milliamperes to ground (-V). Suppressor diodes within the DP-005 allow relays or other inductive loads to be connected directly from +V to the outputs. A load should not be connected to a voltage higher than +V, the voltage used to power the DP-005.

Dwell

One of five dwell times, or the amount of time an output transistor remains on after motion is detected can be programmed. Default is set at 1 second. See table 2 on page 9.

The DP-005 is designed for use as a direction sensing motion detector but it can also be used as a bi-directional detector by connecting both output terminals together and to a single load. Outputs can also be programmed for different patterns, for example, left motion can output a single one second pulse and right motion can output three short pulses. If both output terminals are connected together and to a single LED or buzzer, these distinctive patterns will indicate direction.

Power

A 4.5 to 15 volt battery will power the DP-005 at less than 80 microamperes current draw when no motion is detected. A DC wall transformer (AC adapter) can also be used, however most wall transformers output much higher than the rated voltage when lightly loaded so its output should be measured to be sure that the 15 volt maximum power supply input to the DP-005 is not exceeded. Battery discharge rate charts from major battery manufacturers indicate that a 9 volt alkaline battery will power the DP-005 circuits for about one year.

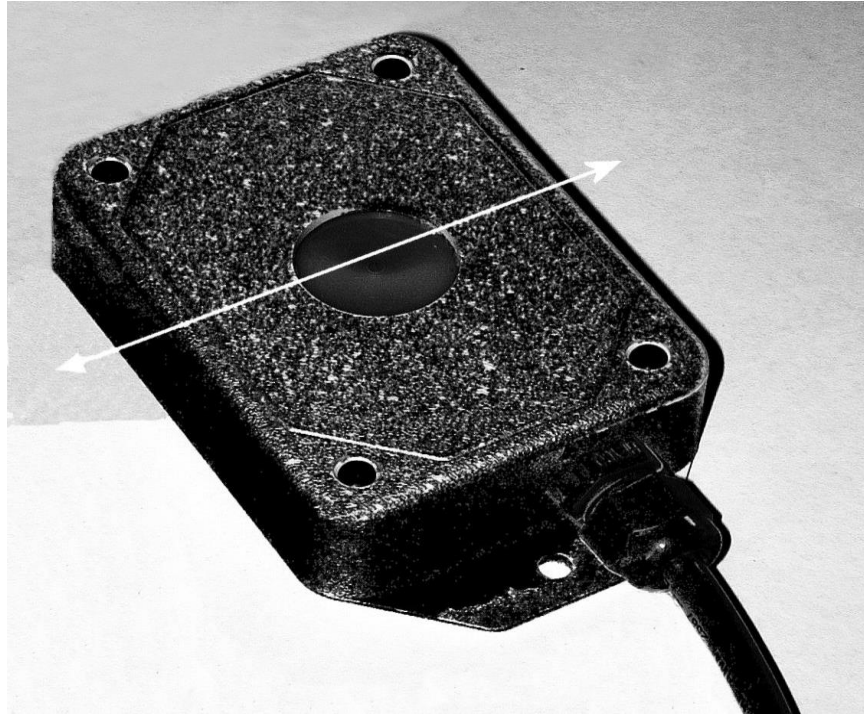


Figure 2 showing DP-005 with cover in place and cable in strain relief collet. The enclosure can be mounted on a wall or ceiling by holes in its flanges or by other types of fasteners. Sensing of direction will be as shown by the arrows above.

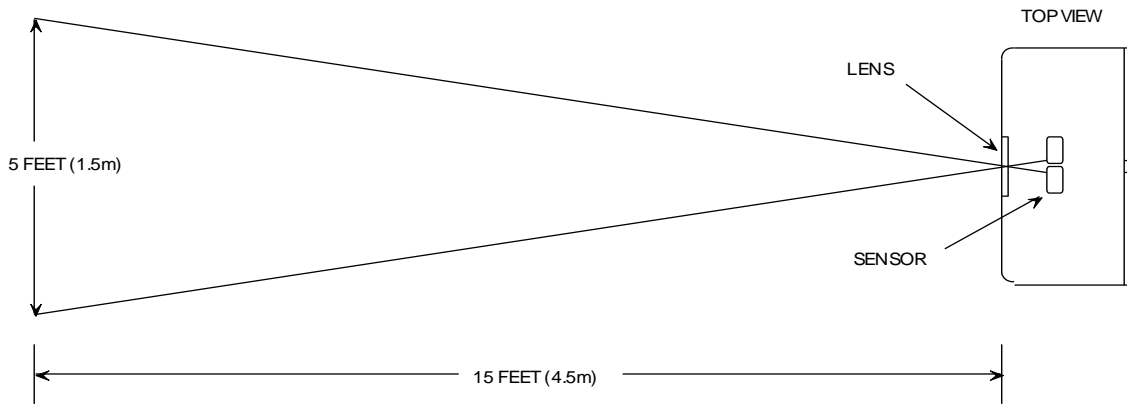
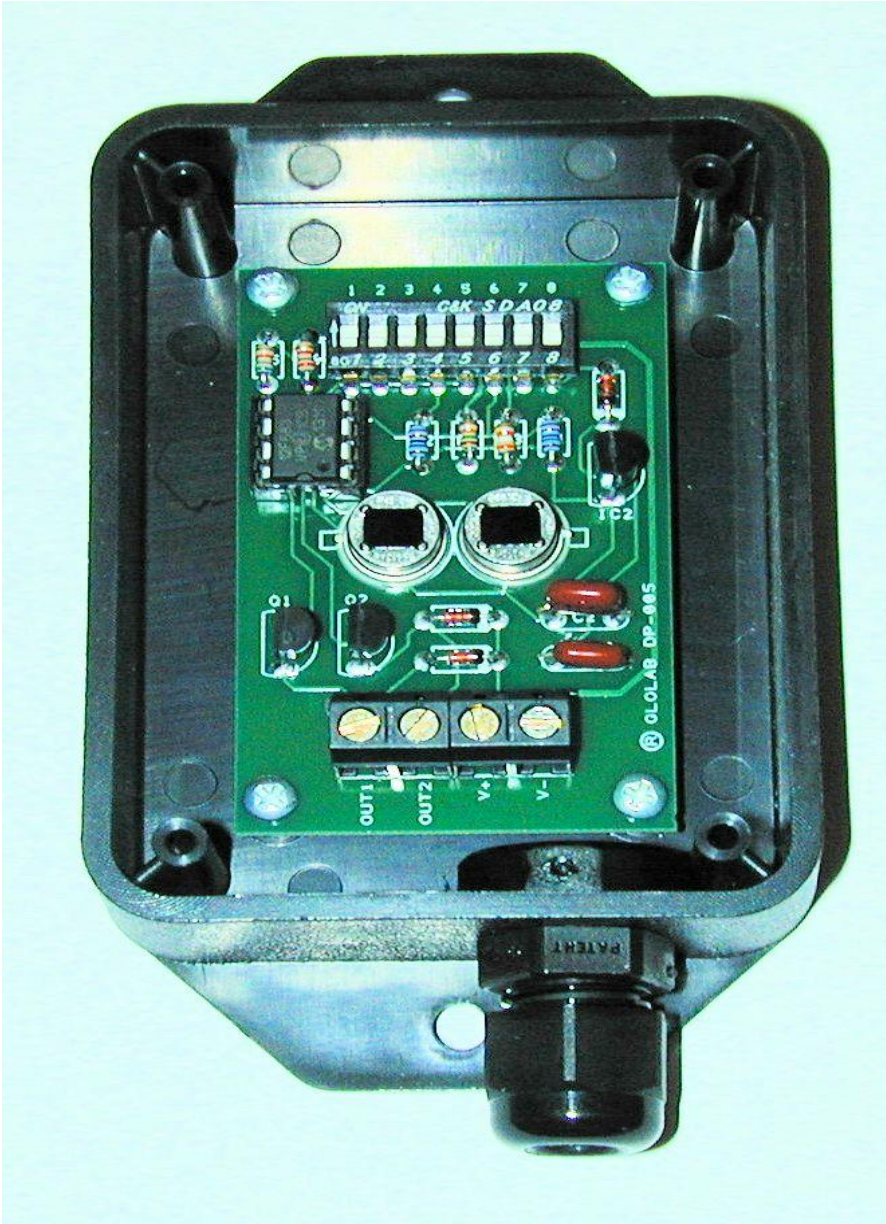


Figure 3. Approximate view angle and maximum detection distance.

Output and power connections and programming switches



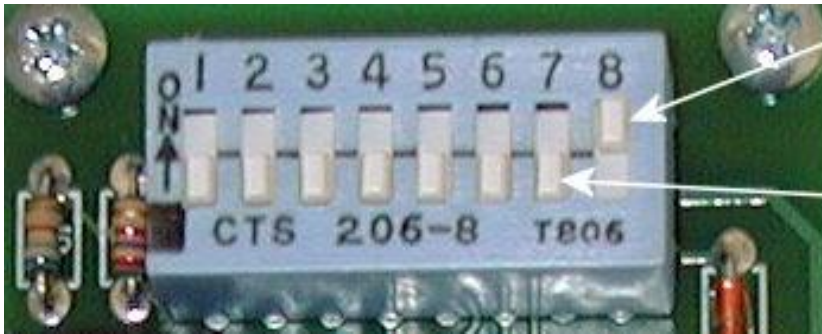
Remove four cover screws and remove the front cover to access the terminal block and programming switches.

Programming switches are at the top of the circuit board in this photo and are numbered 1 through 8. Switches are OFF when they are in the down position and are ON when they are moved up.

Output and power wires enter the enclosure through a strain relief at the bottom in this photo. Connections are made to the four position terminal block. Screw terminals are provided for secure, easy connections.

The enclosure can be inverted but it should be mounted with its long dimension vertical for best detection of horizontal motion.

The enclosure is not waterproof and is intended for indoor use only.



ON
OFF

Installation

The DP-005 enclosure has mounting flanges that should be positioned at the top and bottom so that the DP-005 sensors are horizontal for high sensitivity to horizontal motion.

Power and output can be through wires or a cable with a minimum of three conductors, two for power and one for output. Four conductors are required if individual direction sensing outputs are used. The terminal blocks will securely anchor individual wires. A collet type of strain relief is provided for a cable if used.

Connect a light emitting diode in series with a 510 ohm resistor from +V to each output terminal. One of the LEDs will light when left motion is detected and the other will light when right motion is detected. Connect a power source to the PC board power terminals +V and -V. Allow at least 30 seconds for the circuits to stabilize after applying power.

The PIR sensors are sensitive to fast temperature and air density changes especially at high sensitivity setting. The DP-005 might produce false outputs if fast air density changes occur near it. Warm or cold air movement from an air conditioner, heating system, open window or other moving air sources should be avoided. The sensor will stabilize in about one minute after the source of temperature change has been removed.

Placement of the DP-005 can affect the reliability of its direction indication. Infrared radiation within its detection range can be emitted by other than human and animal bodies and can cause false outputs. Positioning the DP-005 at a different angle or in a different location can usually eliminate false outputs. Very fast or very slow motion will not be detected.

Direction detecting accuracy depends on spacing between people and speed of movement. Bunching and multiple people moving through a wide doorway or corridor will produce detection errors.

Programming sensitivity and dwell

Defaults are medium sensitivity and one second dwell time but these can be changed by programming. One of four sensitivity levels and one of five dwell times can be programmed. Following the four steps below for table 1 does programming of sensitivity. Repeat the four steps for table 2 to program dwell. Programming is stored in microprocessor memory and will not be lost even when power is turned off. Programming can be done any number of times.

1. **Set switch 8 OFF (module power off)**
2. **Set switches 1 through 6 for the desired function as shown in the tables below**
3. **Set switch 8 ON (data is stored in memory)**
4. **Set switches 1 through 6 OFF**

Switch 7 is not used.

Table 1 Program sensitivity

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 8	SENSITIVITY
			ON			OFF-ON	High sensitivity
				ON		OFF-ON	Medium sensitivity (default)
		ON				OFF-ON	Lower sensitivity
	ON					OFF-ON	Lowest sensitivity

Table 2 Program dwell

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 8	DWELL
ON					ON	OFF-ON	0.2 second
				ON	ON	OFF-ON	1 second (default)
	ON				ON	OFF-ON	2 second
		ON			ON	OFF-ON	Left 1 sec, Right 3 X 0.2 sec
			ON		ON	OFF-ON	Left 2 sec, Right 3 X 0.4 sec

Note that the last two dwell selections produce distinctive outputs

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNITS
Power supply voltage ¹	15.5	Volts
Output current ²	200	Milliamperes

Notes:

1. Voltage from + to – power terminals on PC board
2. External load on each output

TYPICAL OPERATION

PARAMETER	MIN	TYPICAL	MAX	UNITS
Power supply voltage ³	4.5	9.0	15.0	Volts
Module current ⁴	-	70	-	Microamperes
Output current ⁵	-	100	200	Milliamperes
Operating temperature	-40°C	-	+85°C	
Field of view	-	20	-	Degrees

Notes:

3. Voltage from + to – power terminals on PC board
4. Not including external load on output
5. Load connected from +V to output

Ordering information_____

PART NUMBER	DESCRIPTION
DP-005	Digital motion detector

Application circuits _____

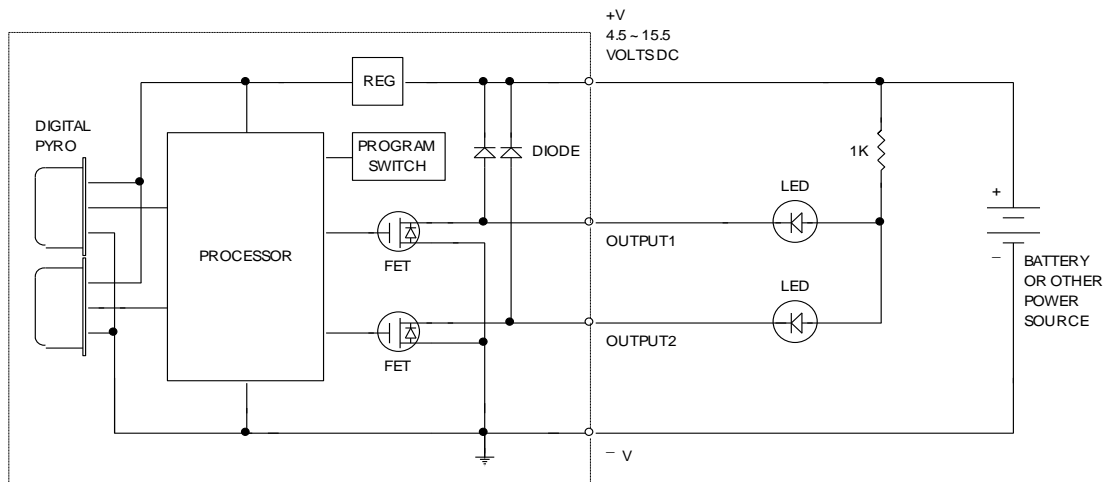


FIGURE AP1 Driving light emitting diodes

A resistor is required in series with the LEDs to limit current. The resistor value can be chosen for the power supply voltage and the desired LED intensity. Only one LED will be on at a time.

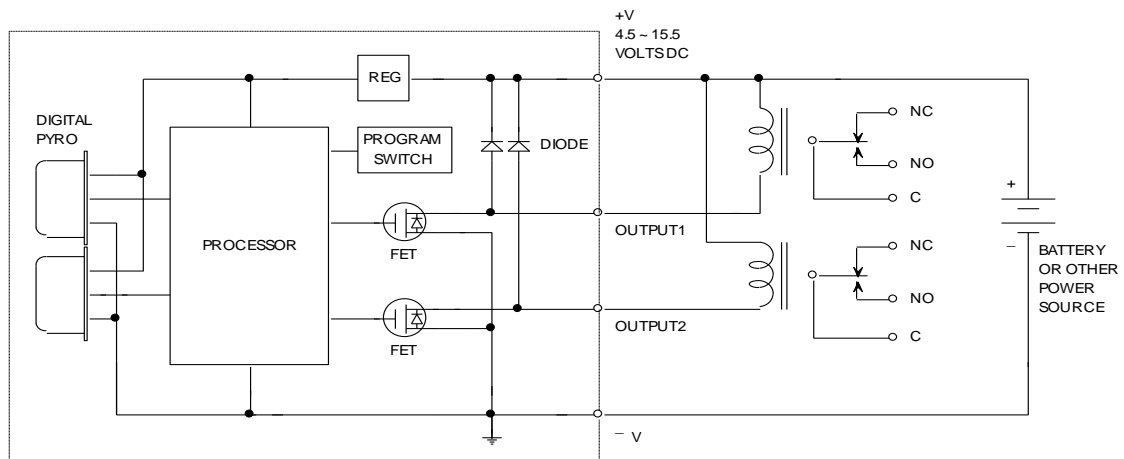


FIGURE AP2 Driving relays

The DP-005 has internal suppressor diodes for inductive loads. The relay coil voltage rating should match the power supply voltage. Solid state relays can also be used.

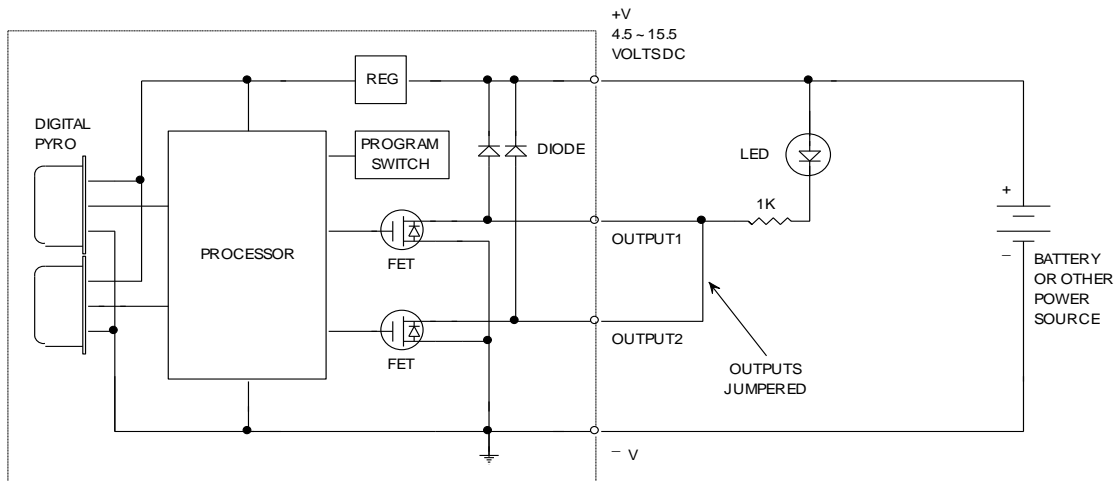


FIGURE AP3 Jumpered outputs driving an LED

Outputs can be connected (jumpered) together for bi-directional sensing. The DP-005 can also be programmed for distinctive output patterns that indicate direction even when only one LED or other output indicator is used. This diagram shows an LED being driven from jumpered outputs.

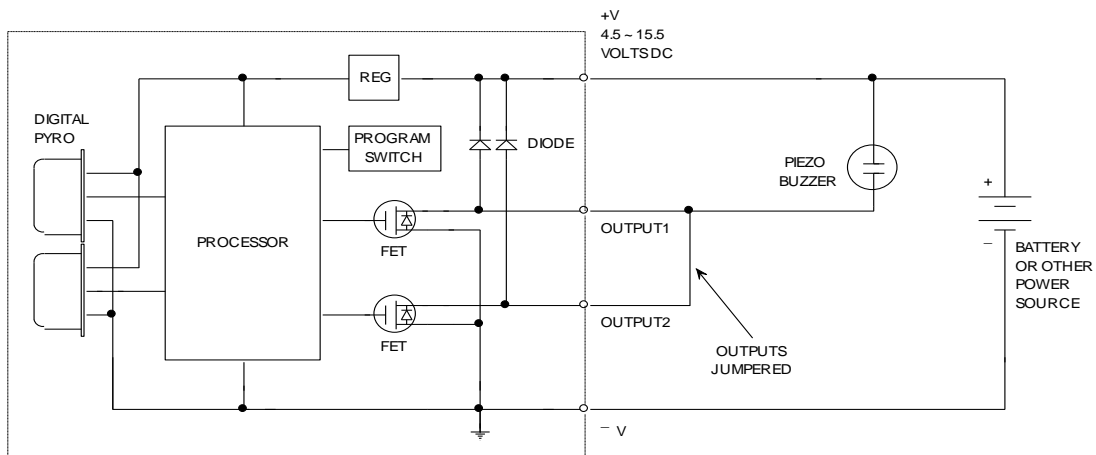


FIGURE AP4 Jumpered outputs driving a buzzer

This diagram shows a piezo buzzer being driven from jumpered outputs. The DP-005 can be programmed for distinctive output patterns that indicate direction

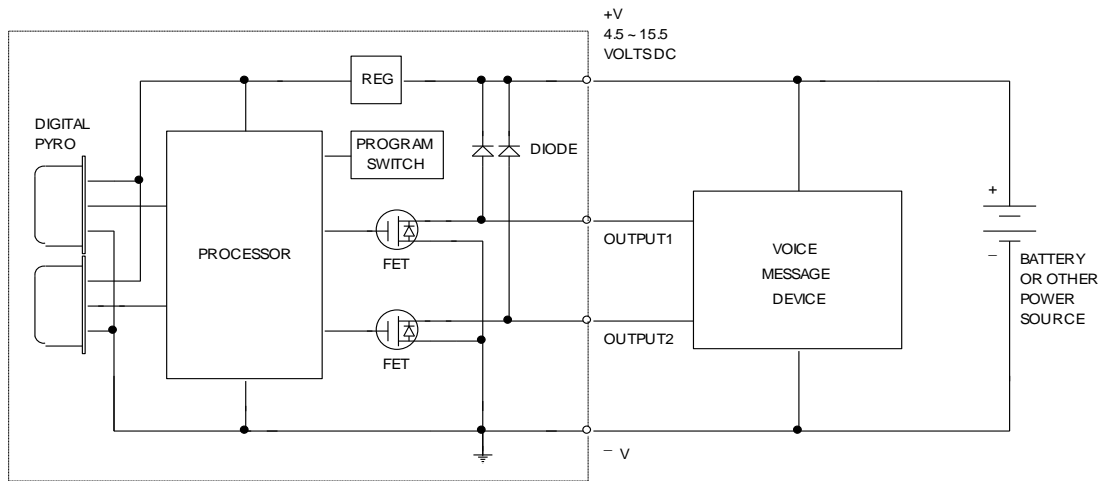


FIGURE AP5 Driving a talking chip

The DP-005 can be used at a store entrance to trigger a talking chip circuit saying, for example: “Welcome to price shocker, we hope you find what you need” and: “Leaving so soon? Please come back again”

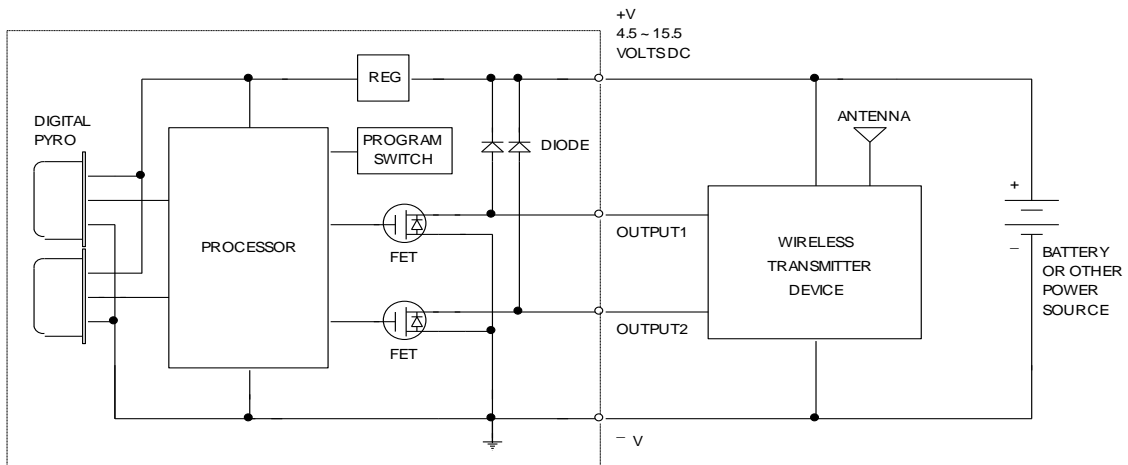


FIGURE AP7 Driving a wireless transmitter

Outputs from the DP-001 can trigger a two channel wireless transmitter to send direction data to a remote two channel receiver.

WARRANTY STATEMENT

WHAT DOES OUR WARRANTY COVER?

- Any defect in material or workmanship.

FOR HOW LONG AFTER THE ORIGINAL PURCHASE?

- To the original purchaser only – 90 days

HOW DO I SEND MY MODULE, IN OR OUT OF WARRANTY?

- Properly pack your motion detector.
- Include invoice number, a copy of the sales receipt or other evidence of date of original purchase (if the motion detector was purchased within the last 90 days).
- Include a description of the defect.
- Include payment for any service or repair not covered by warranty, as determined by Glolab Corporation.
- Ship the unit via FedEx insured or equivalent to:

GLOLAB CORPORATION
307 PINE RIDGE DRIVE
WAPPINGERS FALLS, NY 12590

WHAT DOES OUR WARRANTY NOT COVER?

- Water or moisture damage.
- Damage from misuse, neglect, or acts of nature (lightning, floods etc.).
- Motion detectors that have been operated beyond absolute maximum ratings.
- Motion detectors that may have been modified without authorization from Glolab Corp.
- Motion detectors purchased and/or operated outside the USA, its territories, or Canada.
- Motion detectors serviced by a service facility other than Glolab Corporation.
- Other equipment that may or may not have been connected to Glolab motion detectors.
- Motion detectors purchased more than 90 days from current date.

LIMITS OF LIABILITY

- No liability is assumed for any consequential damages resulting from the use of Glolab motion detectors.
- Glolab is not responsible for nor warrants motion detectors for merchantability or fitness for a particular purpose.

The information in this manual is believed to be accurate at the time of publication. However, Glolab assumes no responsibility arising from the use of the specifications described. The applications mentioned herein are used solely for the purpose of illustration and Glolab makes no warranty or representation that such applications will be suitable without further modification, nor recommends the use of its products for applications that may present risk to human life or to property due to malfunction or otherwise. Glolab reserves the right to change its design and specifications without prior notification.



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