

AUTOMATION PRODUCTS GROUP, INC.

Operator's Manual

IRU-2xx4/3xx4 Series

Rev. A2, 11/08
Doc. 9002673



Automation Products Group, Inc.

APG...Providing tailored solutions for measurement applications

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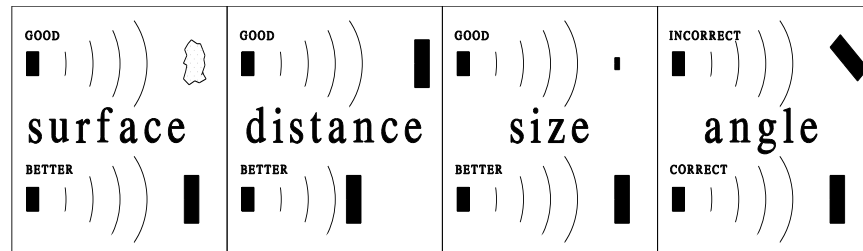
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UNDERSTANDING ULTRASONICS

Ultrasonic sensors measure distance by using a transducer to send out ultrasonic bursts. Each burst contains a series of pulsed sound waves. The ultrasonic burst emits in the shape of a cone, reflects off the detected target, and is received by the transducer. The time required for this burst to travel to and from the target is measured and converted into a distance measurement by the sensor.

Ultrasonic sensing is affected by several factors including the target's surface, size, angle and the distance from the sensor. Environmental conditions such as temperature, humidity, gases, and pressure may also affect the measurement. APG sensors automatically compensate for most of these varied environments. The following considerations will help ensure the best possible sensing conditions.



SURFACE

The ideal target surface is hard and smooth. This surface will reflect a greater amount of signal than a soft, rough surface. A weak echo, which is the result of a small or soft object, will reduce the operating distance of the sensor and decrease its accuracy.

DISTANCE

The shorter the distance from the sensor to an object, the stronger the returning echo will be. Therefore, as the distance increases, the object requires better reflective characteristics to return a sufficient echo.

SIZE

A large object will have more surface to reflect the signal than a small one. The surface area recognized as the target is generally the portion closest to the sensor.

ANGLE

The inclination of the objects' surface facing the ultrasonic sensor affects the reflectivity of the object. The portion perpendicular to the sensor returns the echo. If the entire surface is at a great enough angle, the signal will be reflected away from the sensor and no echo will be detected.



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DESCRIPTION

The IRU-2xx4/3xx4 is a low cost ultrasonic sensor used for non-contact measurement over a 1' to 35' range. RS-485 interface allows for convenient sensor communication. The sensor is encased in a sealed chemical resistant housing and has built in temperature compensation.

SPECIFICATIONS

| | IRU-2xx4 | IRU-3xx4 |
|-----------------|--|--------------------------------|
| Range: | 1' to 25' | 1.25' to 35' |
| Housing: | ABS or PVC | PVC |
| Outputs: | RS-485 & NPN | RS-485 & NPN |
| Supply Voltage: | 12 to 28 VDC (24 VDC Recommended sensor performance is diminished if lower voltage applied) | 12 to 28 VDC |
| Current Draw: | 60 ma @ 24 VDC 2.0 Watts Max. | 60ma @ 24VDC 2.0 Watts Max. |
| Transducer Type | Ceramic | Ceramic |
| Ratings | NEMA 4X | NEMA 4X |
| Sensor adjust | RS-485 interface | RS-485 interface |
| Operating temp. | -40 to 60 °C | -40 to 60 °C |
| Resolution | .1inches (2.5mm) | .1inches (2.5mm) |
| Accuracy | +/- 0.25% Range | +/- 0.25% Range |
| Temp. Comp. | Internal (thermistor located on transducer face) | Internal |
| Sample Rate | Programmable, 1 to 22 Hz | |
| Beam pattern | 9 degrees off axis (when operating with high sensitivity) | |
| Cable | 6 conductor, 22 gauge 6' length | |

SETUP & OPERATION

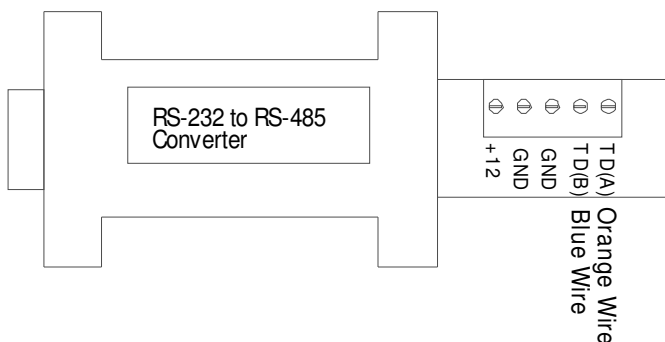
Wire the IRU-2XX4/3XX4 as described below.

| <u>Color</u> | <u>Description</u> |
|---------------|-----------------------------|
| Red | + 12 - 24 VDC |
| Black | Ground |
| Orange | T(+) or TD(A) |
| Blue | T(-) or TD(B) |
| White | NPN (200 ma max) |
| Green | Clock Sync. |

RS-485 COMMUNICATIONS DATA

All Communication to the sensor is in the following format:

| | |
|----------|---------------|
| Protocol | RS-485 2 wire |
| Speed | 9600 |
| Length | 8 bits |
| Stop | 1 bit |
| Parity | none |
| Echo | on |



COMMAND PROTOCOL

A command must be sent to the sensor in order to obtain any information from the unit.

- All distances coming from the sensor will be in whole millimeters.
- The temperature is returned as a Celsius value with a 40° positive offset
- No negative numbers, decimal numbers or fractions are sent.

COMMAND STRUCTURE

All of the IRU-2XX4/3XX4 commands follow the format below.

Messages from the sensor

| | |
|-----------------|----------------------|
| Start character | (AAh) |
| Sensor Number | as single byte value |
| Command Number | as single byte value |
| Data values | as double byte value |
| Stop character | (55h) |
| | 6 bytes Total |

Messages from the sensor

| | |
|-----------------|---|
| Start character | (66h) |
| Sensor Number | as single byte value |
| Command Number | as single byte value |
| Data value 0 | as double byte value |
| Data value 1 | as single byte value for returning distance and temperature if possible |
| Stop character | (99h) |
| | 7 bytes total |

MEMORY

There are two types of memory available in the IRU-2XX4/3XX4, E² and RAM. E² is nonvolatile and will retain the data if power to the sensor is lost or turned off. RAM is volatile and will not be retained without power. The number of WRITES available to E² is approximately 10,000. Prudent use of this function will allow a lifetime of use. The number of READS from E² is unlimited. If frequent parameter changes are anticipated or necessary, use the WRITE RAM functions to avoid “wearing out” the E² memory.

COMMAND LIST

COMMAND

| | |
|------|--------------------------------|
| 01h) | Read Sensor Number EE |
| 02h) | Write Sensor Number EE |
| 03H) | READ BANK NUMBER EE |
| 04H) | WRITE BANK NUMBER EE |
| 05H) | READ BLANKING EE |
| 06H) | WRITE BLANKING EE |
| 07H) | READ PULSES EE |
| 08H) | WRITE PULSES EE |
| 09H) | READ SENSITIVITY EE |
| 0AH) | WRITE SENSITIVITY EE |
| 0BH) | READ CALIBRATION EE |
| 0CH) | WRITE CALIBRATION EE |
| 0DH) | READ TEMPERATURE COMPENSATION |
| 0EH) | WRITE TEMPERATURE COMPENSATION |
| 0FH) | READ AVERAGE EE |
| 10H) | WRITE AVERAGE EE |
| 11H) | READ OUT OF RANGE SPAN EE |
| 12H) | WRITE OUT OF RANGE SPAN EE |
| 13H) | READ OUT OF RANGE COUNT EE |
| 14H) | WRITE OUT OF RANGE COUNT EE |
| 15H) | READ SAMPLE RATE EE |
| 16H) | WRITE SAMPLE RATE EE |
| 17H) | READ TRIP BEGIN |
| 18H) | WRITE TRIP BEGIN |
| 19H) | READ TRIP END |
| 1AH) | WRITE TRIP END |
| 1BH) | READ TRIP TYPE |
| 1CH) | WRITE TRIP TYPE |
| 1DH) | READ TRANSMIT OFF(0)/ON(1) |
| 1EH) | WRITE TRANSMIT OFF(0)/ON(1) |
| 1FH) | RESET PARAMETERS TO DEFAULTS |
| 20H) | START TRANSMIT SENSOR |
| 21H) | STOP TRANSMIT SENSOR |
| 22H) | START TRANSMIT BANK |
| 23H) | STOP TRANSMIT BANK |
| 24H) | DISTANCE AND TEMPERATURE READ |

PARAMETERS

The **Parameters** (E) command displays the current settings of the sensor. The following is an example of a parameter report from the IRU-2XX4/3XX4.

| <u>PARAMETERS MENU</u> | <u>Min.</u> | <u>Max.</u> |
|---------------------------|-------------|-----------------------|
| Distance Sensor Number EE | 0 | 9 |
| Bank Number EE | 0 | 9 |
| Blanking EE | 152 | 7620 |
| Pulses EE | 0 | 20 |
| Sensitivity EE | 0 | 100 |
| Calibration EE | 0100 | 1999 (0.100 to 1.999) |
| Temp. Compensation | 0 | 1 |
| Average EE | 1 | 10 |
| Out of Range Span EE | 0 | 7620 |
| Out of Range Count EE | 0 | 250 |
| Sample Rate EE | 23 | 1000 |
| Trip point begin | 0 | 7620 |
| Trip point end | 0 | 7620 |
| Trip point type | 0 | 7 |
| Sensor Transmit | 0 | 1 (0 = OFF, 1 = ON) |

The IRU-2XX4/3XX4 will display the distance to a target in millimeters.

DISTANCE SENSOR

To request the Distance and temperature from sensor number 1, send:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 24h | Command | 24h | Command |
| 00h | Data (not used) | ##h | Distance (High Byte) |
| 00h | Data (not used) | ##h | Distance (Low Byte) |
| 55h | End Byte | ##h | Temperature |
| | | 99h | Stop Byte |

SENSOR NUMBER

Up to 10 sensors may be attached to the same communication and power line. Each sensor is then assigned a unique number. ***Each sensor must have a unique Sensor Number.*** Sensor Numbers are assigned one at a time as the sensors are placed on line. When assigning these values, ensure that only the desired sensor is connected to the RS-485 line.

With only one sensor connected to the RS-485 communication lines, assign a sensor number to a sensor by using the following steps.

1. Determine the present sensor number by reading the sensor number:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 01h | Command | 01h | Command |
| 00h | Data (not used) | 01h | Sensor # (High Byte) |
| 00h | Data (not used) | 00h | NA (Low Byte) |
| 55h | End Byte | 00h | NA |
| | | 99h | Stop Byte |

2. Program New sensor number, Example Change from #1 to #0:

| <u>Send</u> | |
|-------------|------------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 02h | Command |
| 00h | Data |
| 00h | Data (Not Apply) |
| 55h | End Byte |

BANK NUMBER

There are 10 banks (0-9) available for sensor assignment and up to 10 sensors may be assigned to any 1 bank. However, this system will support a maximum of 10 sensors and each sensor must have a unique Sensor Number. Banks allow a number of sensors to be controlled simultaneously.

Assign a Bank Number by,

| <u>Send</u> | | |
|-------------|-----------------|---------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 03h | Command | |
| 02h | Data | Bank number 2 |
| 00h | Data (not used) | |
| 55h | End Byte | |

BLANKING

Blanking allows the sensor to ignore all echoes returned before this distance. There is a minimum distance to which this can be set which is 152 millimeters. This distance (or time) allows the ceramic in the transducer to stop vibrating after it has transmitted a series of pules.

To read the current setting for the blanking in the sensor:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 05h | Command | 05h | Command |
| 00h | Data (not used) | ##h | Blanking (High Byte) |
| 00h | Data (not used) | ##h | Blanking (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To send a new Blanking distance use the command structure:

| <u>Send</u> | |
|-------------|------------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 06h | Command |
| 00h | Data (High Byte) |
| 00h | Data (Low Byte) |
| 55h | End Byte |

Example: Suppose the sensor is mounted in a position that were a partial structure is located 600 mm from the sensor head. The desired detection range is from 650 mm to 2100 mm . Setting the blanking at 620mm would allow the sensor to ignore the structure and monitor the desired detection area.

PULSES

Pulses is used to control output power of the sensor. Each burst from the sensor contains a number of pulses. More pulses equate to more power and fewer pulses to less power. *Caution: More power may not always be best as more pulses can create more echoes and may result in false readings.*

To read the pulses in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|-------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 07h | Command | 07h | Command |
| 00h | Data (not used) | ##h | Pulses(High Byte) |
| 00h | Data (not used) | ##h | NA (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the pulses in the sensor to 9 , use the command structure:

| <u>Send</u> | | |
|-------------|-----------------|----------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 08h | Command | |
| 09h | Data | 9 pulses |
| 00h | Data (not used) | |
| 55h | End Byte | |

SENSITIVITY

Sensitivity controls the gain of the receive circuit. High values will amplify the return pulse enabling the sensor to detect weak signals. *Caution: High sensitivity setting increases the chance for the sensor to detect unwanted objects, which can decrease the reliability of the output.*

To read the Sensitivity in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|-------------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 09h | Command | 09h | Command |
| 00h | Data (not used) | ##h | Sensitivity (High Byte) |
| 00h | Data (not used) | ##h | NA (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Sensitivity in the sensor to 80%, use the command structure;

| <u>Send</u> | | |
|-------------|-----------------|---------------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 0Ah | Command | |
| 50h | Data | 80 decimal = 50 hex |
| 00h | Data (not used) | |
| 55h | End Byte | |

CALIBRATION

Calibration The IRU-2XX4/3XX4 must be calibrated if a familiar reading is desired. The software is designed so that a calibration factor of 1000 will yield units that represent inches, feet and meters. Variations of the speed of sound in different atmospheres may yield readings which slightly differ from actual measured values. If this is unacceptable, vary the Calibration factor to “dial in” the exact number desired.

Acceptable values for this parameter range from 0100 to 1999

If a certain distance to a target is known and the sensor is not outputting the desired reading, use the following formula to obtain the desired reading.

New Calibration Factor = (Desired Distance Reading x Old Calibration Factor) / Sensor Distance Reading.

Example: Suppose a target is 5.50 feet from the face of the sensor. The sensor has a calibration factor of 1000 and it yields a Distance Reading of 5.65 ft.

Calculate the new Calibration Factor by:

New Calibration Factor = (5.50 x 1000) / 5.65 = 0973.

To read the calibration factor in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|-------------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 0Bh | Command | 0Bh | Command |
| 00h | Data (not used) | 03h | Calibration (High Byte) |
| 00h | Data (not used) | E8h | Calibration (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the calibration factor in a sensor, use the command structure;

| <u>Send</u> | | |
|-------------|-----------------|--------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 0Ch | Command | |
| 03h | Data (not used) | 0973 D = 3CD |
| CDh | Data (not used) | |
| 55h | End Byte | |

TEMPERATURE COMPENSATION

Temperature Compensation allows the operator to enable or disable temperature compensation. When this feature is enabled, the IRU-2XX4/3XX4 will make adjustments for variations in temperature, which affects the speed of sound. This will produce a more exact output.

To Read the Temperature Compensation in a sensor, use the command structure:

| Send | | Receive | |
|-------------|-----------------|----------------|-------------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 0Dh | Command | 0Dh | Command |
| 00h | Data (not used) | 00h | Temp. Comp. (High Byte) |
| 00h | Data (not used) | 00h | NA(Low Byte) |
| 55h | End Byte | 00h | NA |
| | | 99h | Stop Byte |

To change the Temperature Compensation in the sensor from OFF to ON, use the command structure;

| Send | | |
|-------------|-----------------|---------------------------------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 0Eh | Command | |
| 01h | Data | Change to 1 for temp. Compensation ON |
| 00h | Data (not used) | |
| 55h | End Byte | |

AVERAGE

Average: The sensor will average the number of samples set in the Average Parameter. Each qualified sample is placed into a buffer and averaged with the previous samples to generate a steady output. A qualified sample is one that falls within the boundaries set in the Out of Range Span Parameter.

To Read the number of samples being averaged in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|---------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 0Fh | Command | 0Fh | Command |
| 00h | Data (not used) | ##h | Average (High Byte) |
| 00h | Data (not used) | ##h | NA (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the average to 7 in the sensor, use the command structure;

| <u>Send</u> | | |
|-------------|-----------------|------------------------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 10h | Command | |
| 07h | Data | Number of samples to average |
| 00h | Data (not used) | |
| 55h | End Byte | |

OUT OF RANGE SPAN

Out of Range Span The Out of Range Span was designed to eliminate extraneous signals and noise. This Span or window changes with the distance of the average distance reading. This window will allow only readings that fall within its limits. If the target is suddenly changed outside of the window limits, the sensor will wait until a number of echoes specified in the Out of Range Count are received within a new window before updating the output reading.

To Read the Out of Range Span in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 11h | Command | 11h | Command |
| 00h | Data (not used) | ##h | Span (High Byte) |
| 00h | Data (not used) | ##h | Span (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Out of Range Span in the sensor to 304 mm, use the command structure;

| <u>Send</u> | |
|-------------|-------------------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 12h | Command |
| 01h | Data 304 decimal = 130h |
| 30h | Data |
| 55h | End Byte |

OUT OF RANGE COUNT

Out Range Count : indicates the number of consecutive samples outside the Out of Range Span that would need to be detected before the sensor recognizes them as legitimate samples. For example, with the Out of Range Span set at 300mm, the sensor detecting a distance at 1,520mm and the OUT OF RANGE COUNT set to 10, and a target entered the detection area of the sensor at a distance less than 1,220mm or greater than 1,820mm, the target would need to be present long enough for the sensor to receive 10 samples before the sensor would recognize the target. If the target were in the detection area of the sensor for only 9 samples, the sensor would retain the 1,520mm distance reading.

To Read the Out of Range Count in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|--------------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 13h | Command | 13h | Command |
| 00h | Data (not used) | ##h | Out of range (High Byte) |
| 00h | Data (not used) | ##h | NA (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Out of Range Count to 10 in the sensor, use the command structure;

| <u>Send</u> | | |
|-------------|-----------------|--------------------|
| AAh | Start Byte | |
| 01h, | Sensor Number | |
| 14h | Command | |
| 0Ah | Data | 10 decimal = A hex |
| 00h | Data (not used) | |
| 55h | End Byte | |

SAMPLE RATE

Sample Rate is used to control the burst rate. The number entered in this field represents the number of milliseconds between each burst.

To Read the Sample Rate in a sensor, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|-------------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 15h | Command | 15h | Command |
| 00h | Data (not used) | ##h | Sample Rate (High Byte) |
| 00h | Data (not used) | ##h | Sample Rate (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Sample Rate to 80 msec in the sensor, use the command structure;

| <u>Send</u> | |
|-------------|--|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 16h | Command |
| 00h | Data (high byte) 80 decimal = 50 hexadecimal |
| 50h | Data (low byte) |
| 55h | End Byte |

TRIP POINT SETTINGS

The IRU-2XX4/3XX4 has a programmable NPN trip point that is fully programmable for 'BEGIN' and 'END' points and 'TYPE' of operation. (see page 20) The zero point of distance will be at the transducer, the relay trip points is programmed in millimeters.

| DESCRIPTION | PARAMETERS | EXPLANATION |
|-------------|---|---|
| Begin Trip | Units = millimeters Default = | Sets the begin point of Trip |
| End Trip | Units = millimeters Default = | Sets the end point of Trip |
| Trip Type | Range = 0 - 7 0 - near 1 - exclusive 2 - hysteresis near 3 - far 4 - inclusive 5 - hysteresis far 6 - disable Default = 0 | Selects the type of function Trip will perform. (See Page 20) |

To read the Begin Trip Distance in sensor number 1 , use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 17h | Command | 17h | Command |
| 00h | Data (not used) | ##h | Distance (High Byte) |
| 00h | Data (not used) | ##h | Distance (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Begin trip distance in sensor number 1 to 900mm, use the command structure;

| <u>Send</u> | |
|-------------|--|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 18h | Command |
| 03h | Data (high byte) 900 mm decimal = 384h |
| 84h | Data (low byte) |
| 55h | End Byte |

To read the End Trip Distance in sensor number 1 , use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 19h | Command | 19h | Command |
| 00h | Data (not used) | ##h | Distance (High Byte) |
| 00h | Data (not used) | ##h | Distance (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Begin trip distance in sensor number 1 to 1200mm, use the command structure;

| <u>Send</u> | |
|-------------|--|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 1Ah | Command |
| 04h | Data (high byte) 1,200 mm decimal = 4B0h |
| B0h | Data (low byte) |
| 55h | End Byte |

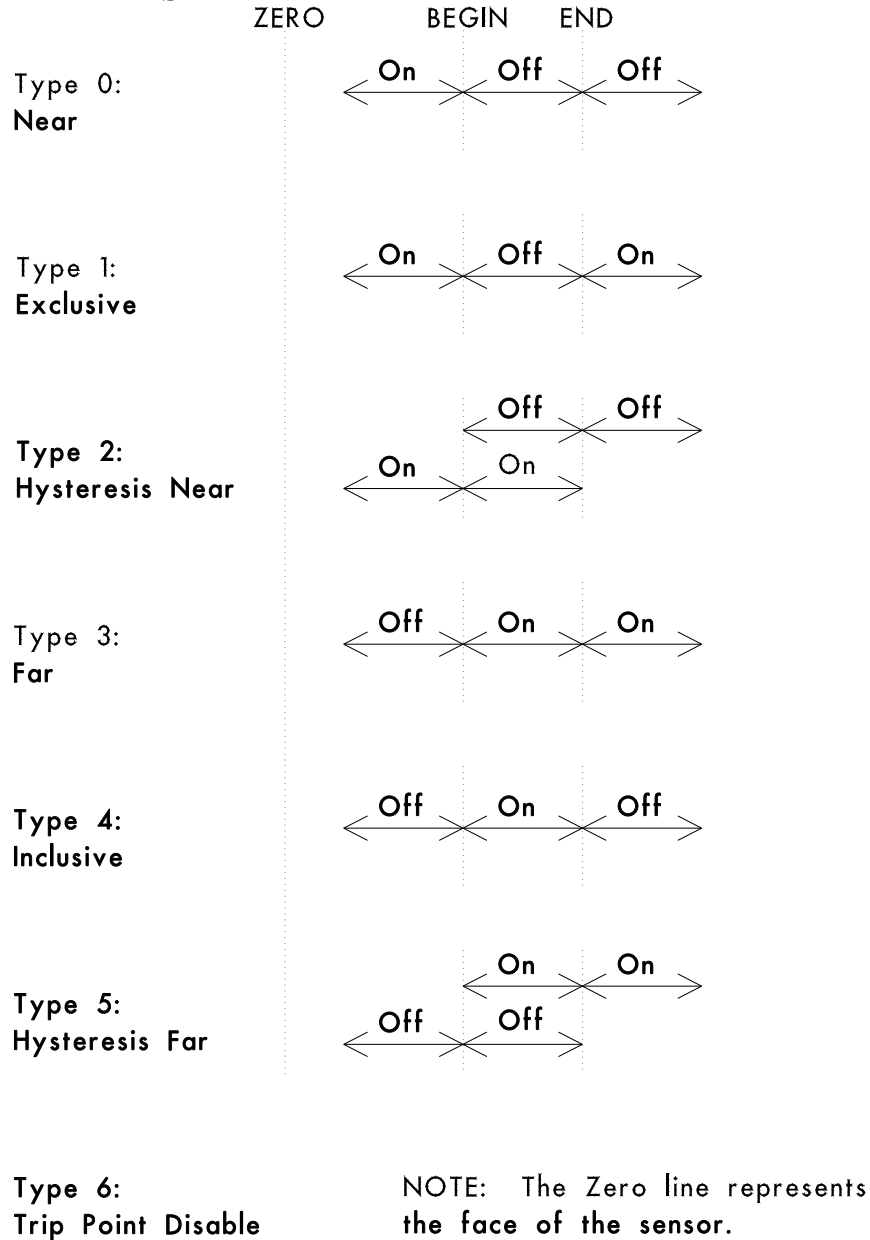
To read the Trip Type in sensor number 1 , use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|-----------------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 1Bh | Command | 1Bh | Command |
| 00h | Data (not used) | ##h | Trip Type (High Byte) |
| 00h | Data (not used) | ##h | NA (Low Byte) |
| 55h | End Byte | ##h | NA |
| | | 99h | Stop Byte |

To change the Trip Type in sensor number 1 to 4, use the command structure;

| <u>Send</u> | |
|-------------|---------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 1Ch | Command |
| 04h | Data |
| 84h | NA |
| 55h | End Byte |

TRIP TYPES



CONTINUOUS TRANSMIT

The IRU-2XX4/3XX4 can operate in two different modes:

(0) Control mode where the sensor will begin and end transmitting when it receives a begin or end transmit or bank command.

(1) Continuous transmit mode where the sensor will transmit as long as it has power.

To read the mode the sensor number 1 is operating in, use the command structure:

| <u>Send</u> | | <u>Receive</u> | |
|-------------|-----------------|----------------|----------------|
| AAh | Start Byte | 66h | Start Byte |
| 01h, | Sensor Number | 01h | Sensor Number |
| 1Dh | Command | 1Dh | Command |
| 00h | Data (not used) | 00h | Operating mode |
| 00h | Data (not used) | 00h | NA |
| 55h | End Byte | 00h | NA |
| | | 99h | Stop Byte |

To change the operating mode in sensor number 1 to transmitting all of the time, use the command structure;

| <u>Send</u> | |
|-------------|---------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 1Eh | Command |
| 01h | Data |
| 00h | NA |
| 55h | End Byte |

START TRANSMIT SENSOR

Start Transmit Sensor allows the user to identify a sensor and have it start transmitting. This command controls a single sensor.

To have sensor number 1 begin transmitting, use the command structure;

| <u>Send</u> | |
|-------------|---------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 20h | Command |
| 00h | NA |
| 00h | NA |
| 55h | End Byte |

STOP TRANSMIT SENSOR

Stop Transmit Sensor allows the user to identify a sensor and have it start transmitting. This command controls a single sensor.

To have sensor number 1 stop transmitting, use the command structure;

Send

| | |
|------|---------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 21h | Command |
| 01h | NA |
| 00h | NA |
| 55h | End Byte |

START TRANSMIT BANK

Start Transmit Bank allows the user to identify a bank of sensors and have them start transmitting. This command controls up to 10 sensors providing they are all assigned to the same bank.

To have Bank number 1 begin transmitting, use the command structure;

Send

| | |
|------|--------------|
| AAh | Start Byte |
| 00h, | NA |
| 22h | Command |
| 01h | Bank Number) |
| 00h | NA |
| 55h | End Byte |

STOP TRANSMIT BANK

Stop Transmit Bank (e) allows the user to identify a bank of sensors and have them stop transmitting. This command controls up to 10 sensors providing they are all assigned to the same bank.

To have Bank number 1 stop transmitting, use the command structure;

Send

| | |
|------|-------------|
| AAh | Start Byte |
| 00h, | NA |
| 23h | Command |
| 01h | Bank Number |
| 00h | NA |
| 55h | End Byte |

RESET PARAMETERS

Reset allows the user to reset the parameters in a particular sensor to the factory defaults.

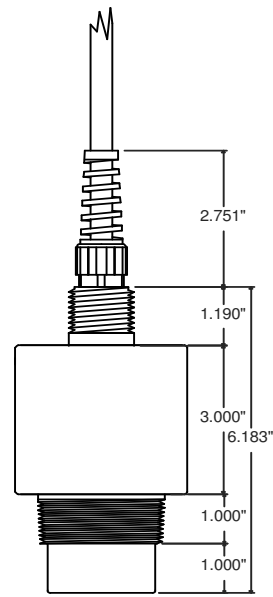
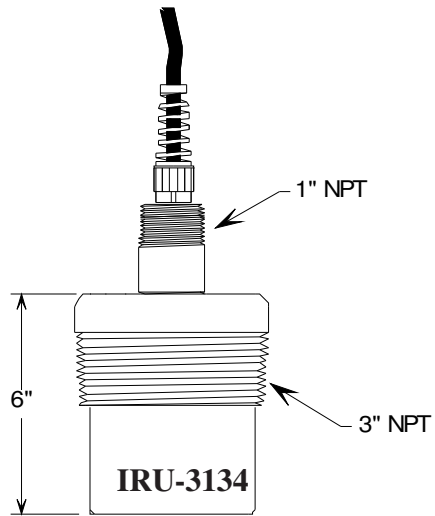
To reset the parameters in sensor number 1, use the command structure:

Send

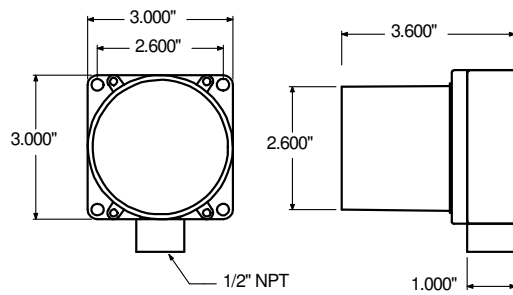
| | |
|------|---------------|
| AAh | Start Byte |
| 01h, | Sensor Number |
| 1Fh | Command |
| 00h | NA |
| 00h | NA |
| 55h | End Byte |

MOUNTING

When mounting any ultrasonic sensor, alignment is critical. Ensure the face of the transducer is parallel to the target. A misalignment of a few degrees can affect the accuracy and reliability of the sensor.



IRU-2124



IRU-2004

Notes

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