- Compact size
- NON-Contact measurement device
- No External Controllers required to run
- Easy Alignment (CCD based)
- Solid State Class 1 Laser Diode
- Maximum Resolution of 3.5 microns
- Over 2,500 measurements per second

- Parallel | Serial | Analog | USB | Ethernet
- Measurements of EDGE, GAP, DIAMETER, POSITION, THICKNESS, HEIGHT, PROFILE and VIBRATION
- Custom Modes are available (i.e. Centering, Minimum and Maximum thickness, Range of tolerances)
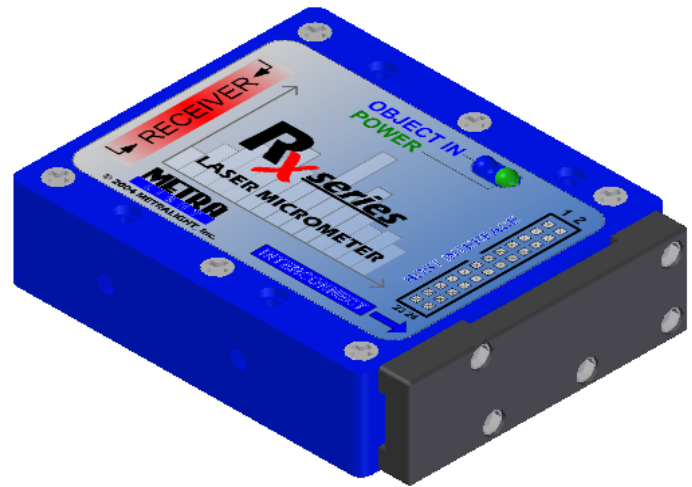
RX sensor Specifications :	
Detection Method	Laser through-beam with CCD element
Light Source	780 (or 670) nm Class I Laser Diode
Measurement Range	140 microns (0.006 in) up to 28 mm (1.10 in)
Resolution	7 microns (RX07), 3.5 microns (RX03), 0.4375µm for USB and serial
Repeatability	14 microns (Edge position)
Response Time	0.391 ms
Non-Linearity	0.2% of full range
Power	12 to 24 VDC / 80mA or USB port power
Connections	24 pin double-row, 2mm (SAMTEC) or MINI-B USB or cable
Interface (I/O)	Parallel binary (TTL) or Serial (RS232) or Analog or USB
Indicators	Green LED = Sensor ON ; Blue LED = Object Present
Data Format	12/13 bit parallel or binary or analog voltage
Overall Dimension	58.4 x 50.8 x 15.2mm (2.30 x 2 x 0.60") emitter/receiver
Weight	192g (6.7oz)

The RX sensor is a self contained photoelectric sensor. Output can be in a 12/13 bit parallel/serial data or analog voltage format. The RX is capable of real time data acquisition and processing, and allows fast and accurate measurements. Standard MODES can be set for EDGE 1, EDGE 2, GAP,CENTER, DIAMETER, FIRST EDGE (solid mode) and FIRST DIAMETER (first object that is fully in the scanning line). CUSTOM MODES are available and can be customer defined. For example: minimum diameter, maximum diameter and center position.

The RX series has 4 interface options: parallel (TTL,5V), serial (RS232), analog (voltage 0-10V) or USB (Universal Serial Bus). Other CUSTOM interface can be provided upon request (Parallel - 3.3V, Analog current, Ethernet, RS422, RS485, SPI...).
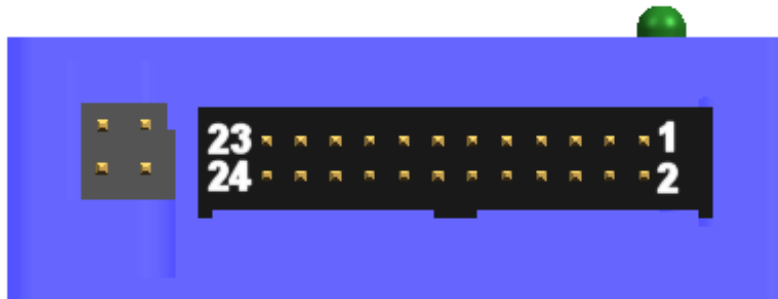
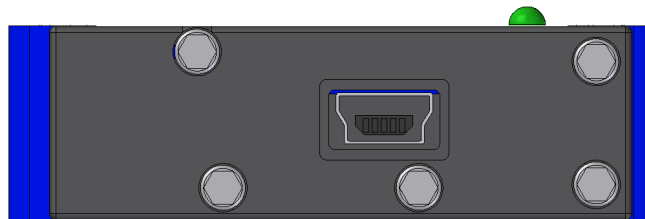*Fig. 1: RX sensor Back View , parallel, serial or analog interface*

Fig. 2: Mini-B USB connector (USB interface)

The RX sensor processes and sends output data in pixels. Pixel size is 7µm for RX07 and 3.5µm for RX03.

For example: The Rx07 sends out the number 800 : 800x7 = 5600µm = 5.6mm.
Conversion in mm or inches is done with external SW. Serial interface (RS232) or USB (Universal Serial Bus) can be customized for any output units.
Please call if you have any other specific requirements.

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Pinout

Table 2: Pinout

PIN	I/O	NAME	DESCRIPTION	PIN	I/O	NAME	DESCRIPTION
1	OUT	DATA0	Data bit 0 (LSB)	13	OUT	DATA12	Data bit 12 (MSB)*
2	OUT	DATA1	Data bit 1	14	OUT	DATA_READY	Data Ready at end of Measurement cycle
3	OUT	DATA2	Data bit 2				
4	OUT	DATA3	Data bit 3	15	IN	TRIGGER	Triggers Meas. Cycle
5	OUT	DATA4	Data bit 4	16	OUT	OBJECT_IN	Object Present
6	OUT	DATA5	Data bit 5	17	IN	M0	Measurement Mode (Edge, Diameter, Gap..), see MODE TABLE
7	OUT	DATA6	Data bit 6	18	IN	M1	
8	OUT	DATA7	Data bit 7	19	IN	M2	
9	OUT	DATA8	Data bit 8	20	IN	FILTER	Filters out small objects (e.g. dust)
10	OUT	DATA9	Data bit 9				
11	OUT	DATA10	Data bit 10	21,22	PWR	+PWR	+12 to +24 VDC
12	OUT	DATA11	Data bit 11(MSB)	23,24	GND	GND	Ground

* Pin 13 NOT USED for 7μm models

Timing Diagram
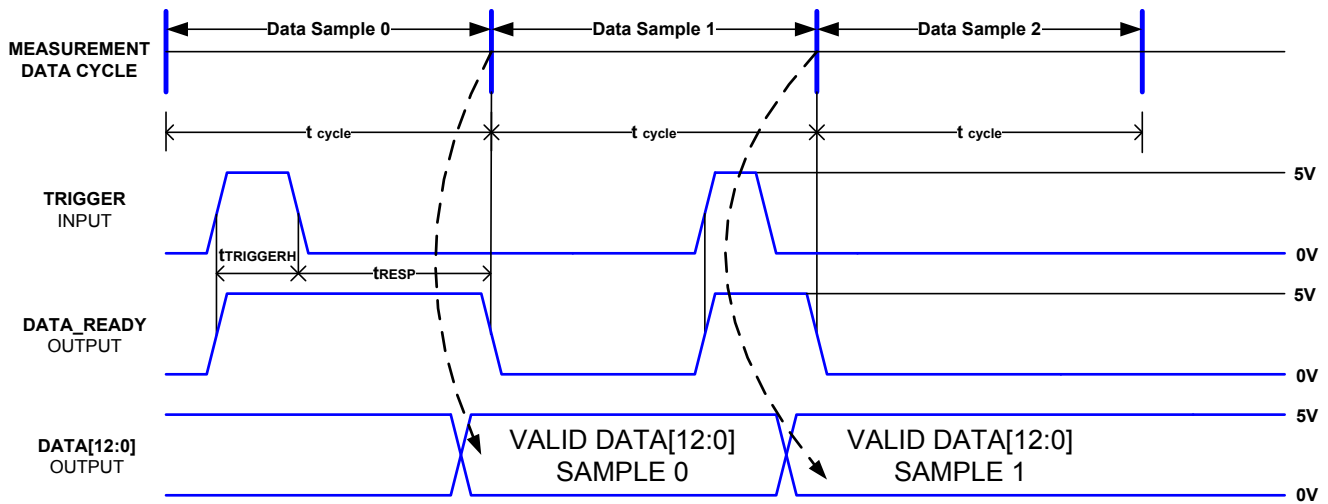
Fig. 3: Timing Diagram

Symbol	Description	Min.	Typ.	Max.
tCYCLE (μs)	1 cycle time	——	——	417
tRESP (μs)	Response time	10	——	415
tTRIGGERH (μs)	TRIGGER HIGH time	2	——	——

Table 3: Timing Diagram

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HIGH to LOW transition on the TRIGGER, commences a data output at the end of the current measurement cycle. The HIGH to LOW signal on the DATA_READY confirms a Valid Data event. The maximum response time between the TRIGGER input and the DATA_READY output is 417 µs. This DATA is presented to the output pins and retained until the next TRIGGER event. In the absence of a TRIGGER event, the previous data will be held indefinitely. This process allows slow processing computers to bypass several measurement cycles between measurement readings. MODE changes during measurement will not take effect until the *next measurement cycle*.
See Flowchart on next page for typical operation.

Measurement Modes

MODE #	M2 bit	M1 bit	M0 bit	Sensor Output Mode
0	0	0	0	Edge 1
1	0	0	1	Edge 2
2	0	1	0	Diameter
3	0	1	1	Gap
4	1	0	0	Center
5	1	0	1	First EDGE (position of the first solid edge)
6	1	1	0	First DIAMETER (first full diameter measurement)
7	1	1	1	CUSTOM

Table 4: Measurement Modes

* See Sample Applications page for details
** Please see pinout (previous page), for location of M0, M1, M2
*** 0 is logical "0" (GND), 1 is logical "1" (+5V, VCC), TTL LEVELS

Accesories, Software, Cables

METRALIGHT, Inc. provides an available PCkit package option (i.e. Parallel PCI bus I/O card, PCkit Terminal, a Windows based SW, Source codes in VB or USB kit) for collection, processing and display of data.

Various custom cables (e.g. Sensor to DB25) are also available.
Please call if you have any other specific requirements.
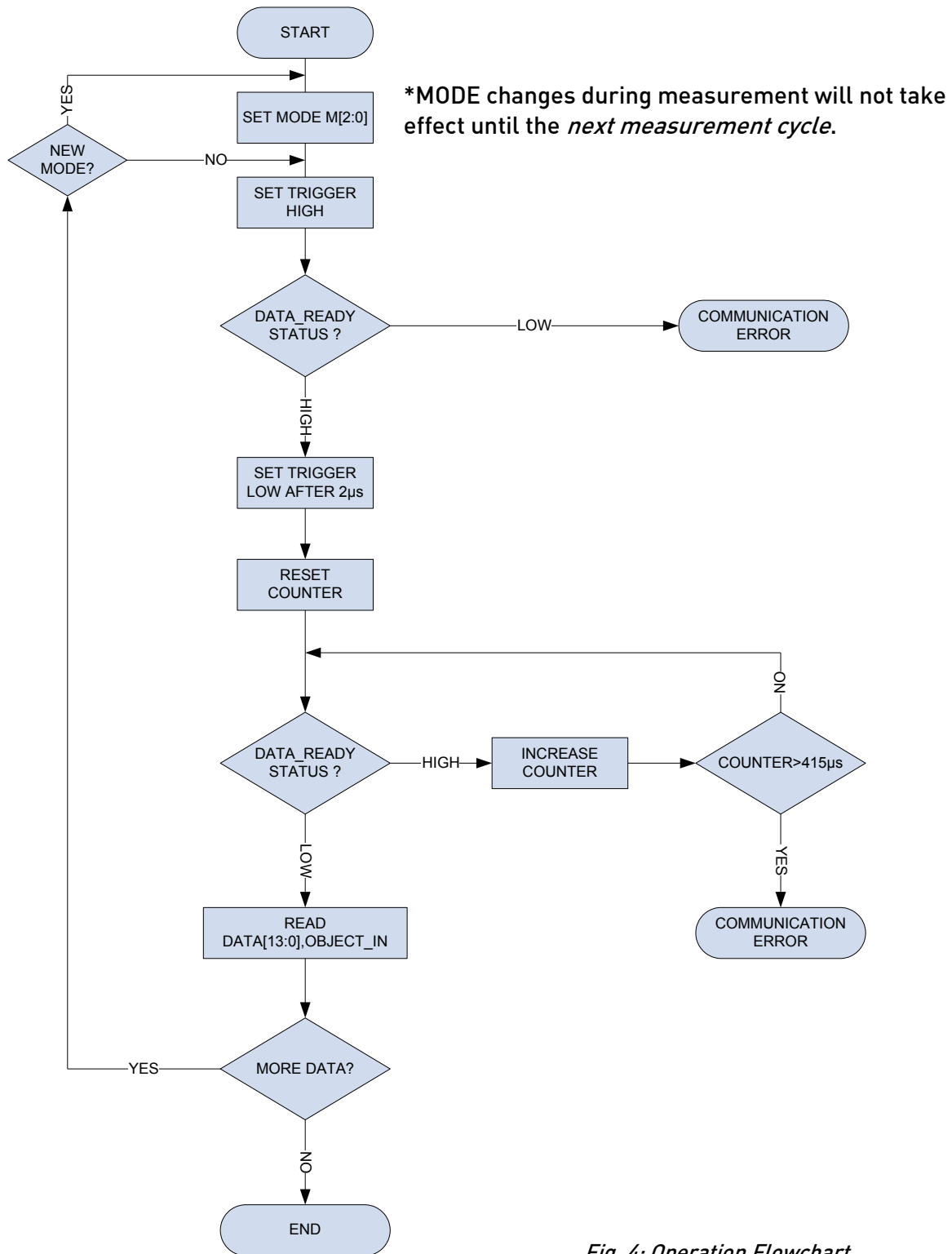
Typical Operation Flowchart

*MODE changes during measurement will not take effect until the *next measurement cycle*.

Fig. 4: Operation Flowchart

Pinout

PIN	TYPE	NAME	DESCRIPTION
1	OUT	TXD	Data TRANSMIT
2	IN	RXD	Data RECEIVE
3	GND	GND	Ground
4-14	——-	NC	NO CONNECT
15	I/O	MISO	Don't use
16	PWR	VCC	Internal VCC, +5V
17	I/O	SCK	Don't use
18	I/O	MOSI	Don't use
19	I/O	/RESET	Don't use
20	GND	GND	Ground
21-22	PWR	+PWR	+12 to +24 VDC
23,24	GND	GND	Ground

* For normal operation connect only PINS: TXD,RXD,GND,+PWR

Table 5: RS232 Pinout

COM Port Settings

Baud rate:115200b/s
Data bits:8
Parity:None
Flow control:None
(Baud rate can be changed upon customer request)

Accesories, Software, Cables

Metralight, Inc. provides an available Serial PCkit Package (i.e. Windows based SW;
DB9 Cables M-F, power supply) for collection, processing and display of data.
Standard terminals (i.e. Windows HyperTerminal) can be used to communicate.
Various custom cables (e.g. Sensor to DB9, USB) are available.
Please call if you have any specific requirements.

Command Set

The listed serial command sets, can be used for custom application development or for standard ter-
minals like HyperTerminal.
Other Custom processing commands can be added upon request .
(i.e. MIN, MAX limits, CALIBRATION, etc.)
See Appendix C for detail description of commands.

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The METRALIGHT RX, USB device is fast and easy to install. The Rx is powered via the USB port. USB drivers create a virtual COM port to communicate with any standard communication software (e.g. HyperTerminal). The USB interface uses the same command sets as the RS232 serial interface. Alternative drivers (DLL library) are also available, please call METRALIGHT, Inc. if you have other requirements.

Pinout

For Analog interface connect POWER/ANALOG cable (cable with pigtail wires on the end) and LASER Interconnect cable (cable with circular connectors on both ends). See figure bellow for connection.
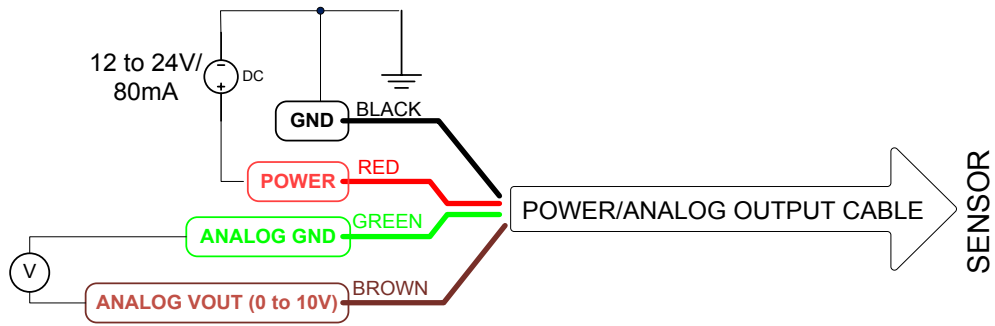
Fig 5: Analog interface pinout

Output Voltage, Modes

Measuring mode of analog sensor is set via USB connection. Analog voltage range is from 0 to 10V.

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Installation Notes

- USE APPROPRIATE MOUNTING SCREWS (SEE MECHANICAL DRAWING)
- !!! AVOID DIRECT SUNLIGHT !!! AND OTHER NON VISIBLE LIGHT SOURCES. RX SENSORS USES RG9 FILTERS TO FILTER OUT VISIBLE LIGHT (SEE CHARTS BELOW)
- ALWAYS KEEP OPTICAL WINDOWS CLEAN, FREE FROM DUST AND FINGERPRINTS , AVOID SCRATCHES ON THE OPTICAL WINDOWS.
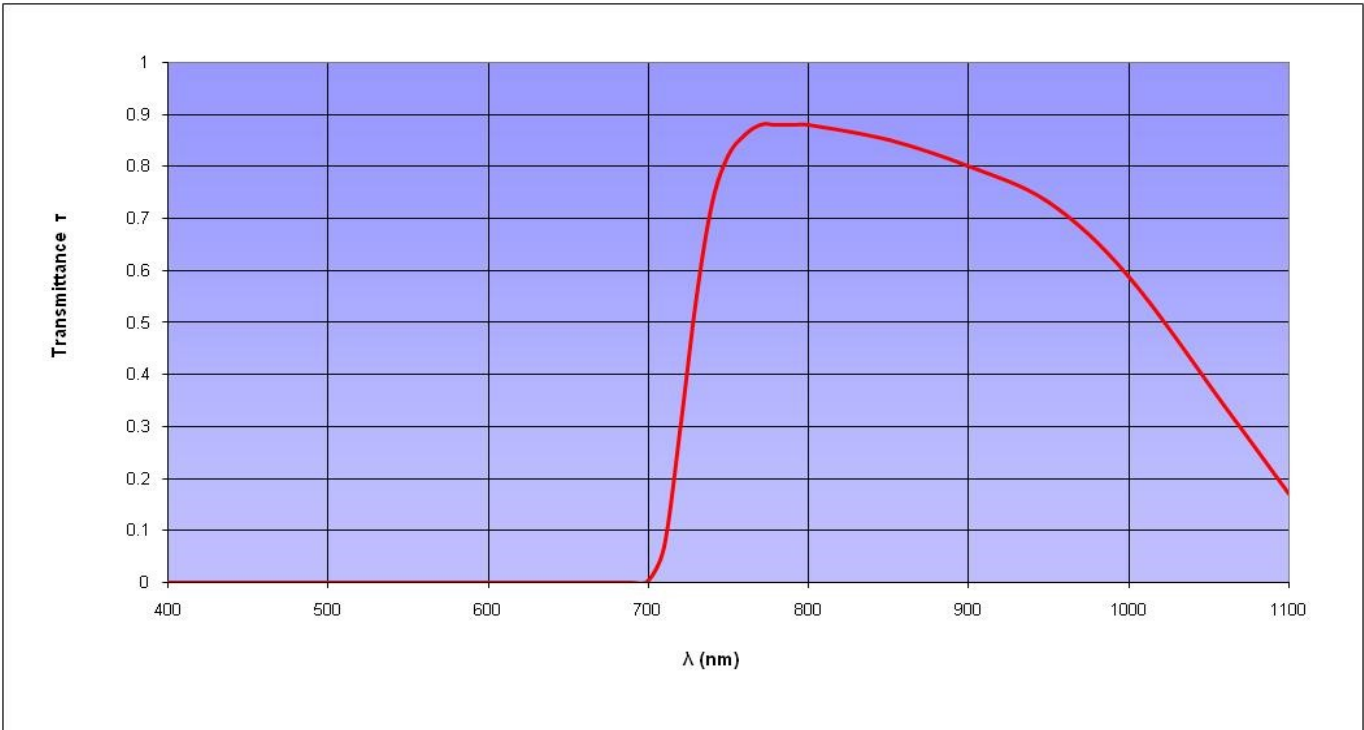- APPLY CORRECT VOLTAGE - SEE ELECTRICAL SPECIFICATION

Fig. 6: Transmittance of optical (RG9) filter

Warranty

METRALIGHT provides a ONE YEAR manufacturer's limited warranty against defective materials and workmanship. Please do not attempt to open the unit, as this will void all warranties.

Contacts

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Burlingame, CA 94010
phone: (650) 581 3088, fax: (650) 808 9830
email: sales@metralight.com
technical support: support@metralight.com
web site: http://www.metralight.com
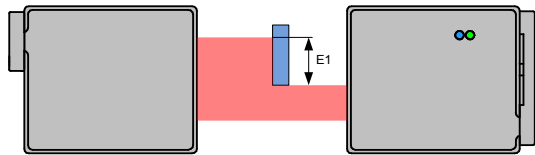
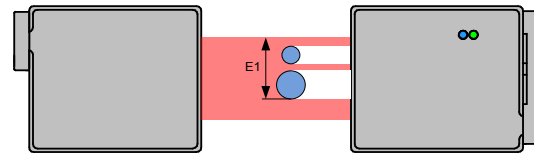*Fig.7:* **EDGE1 MODE,** LEADING EDGE

Fig.8: **EDGE1 MODE,** MULTIPLE OBJECTS
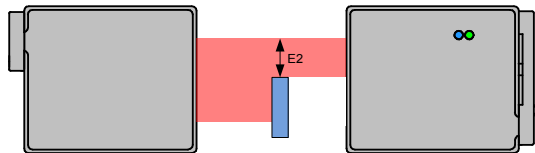
Fig.9: **EDGE2 MODE,** TRAILING EDGE
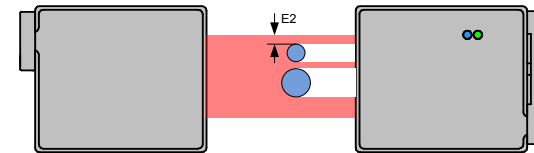
Fig.10: **EDGE2 MODE,** MULTIPLE OBJECTS
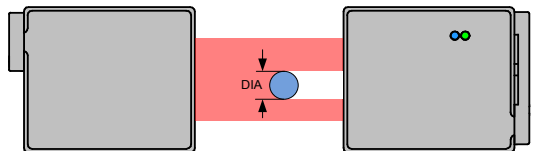
Fig.11: **DIA MODE**
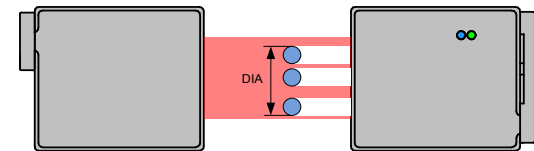
Fig.12: **DIA MODE,** MULTIPLE OBJECTS
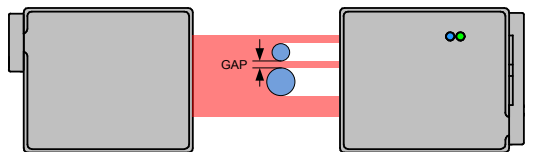
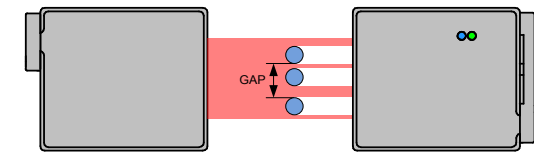*Fig.13:* **GAP MODE**

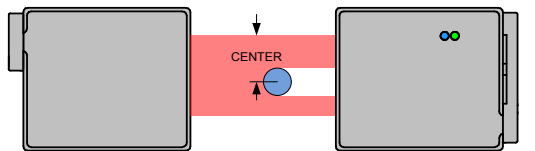*Fig.14:* **GAP MODE,** MULTIPLE OBJECTS
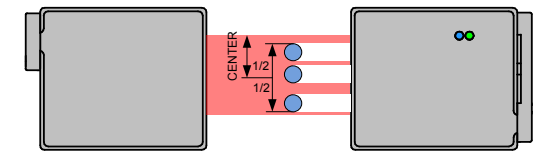

Fig.15: **CENTER MODE**
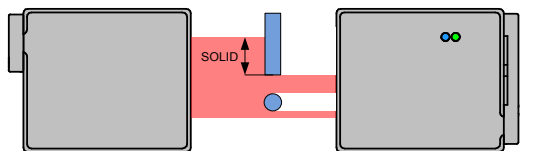

Fig.16: **CENTER MODE,** MULTIPLE OBJECTS
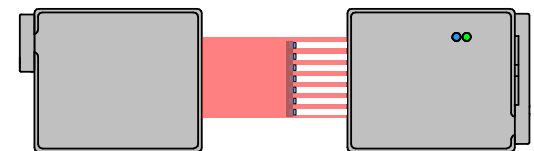

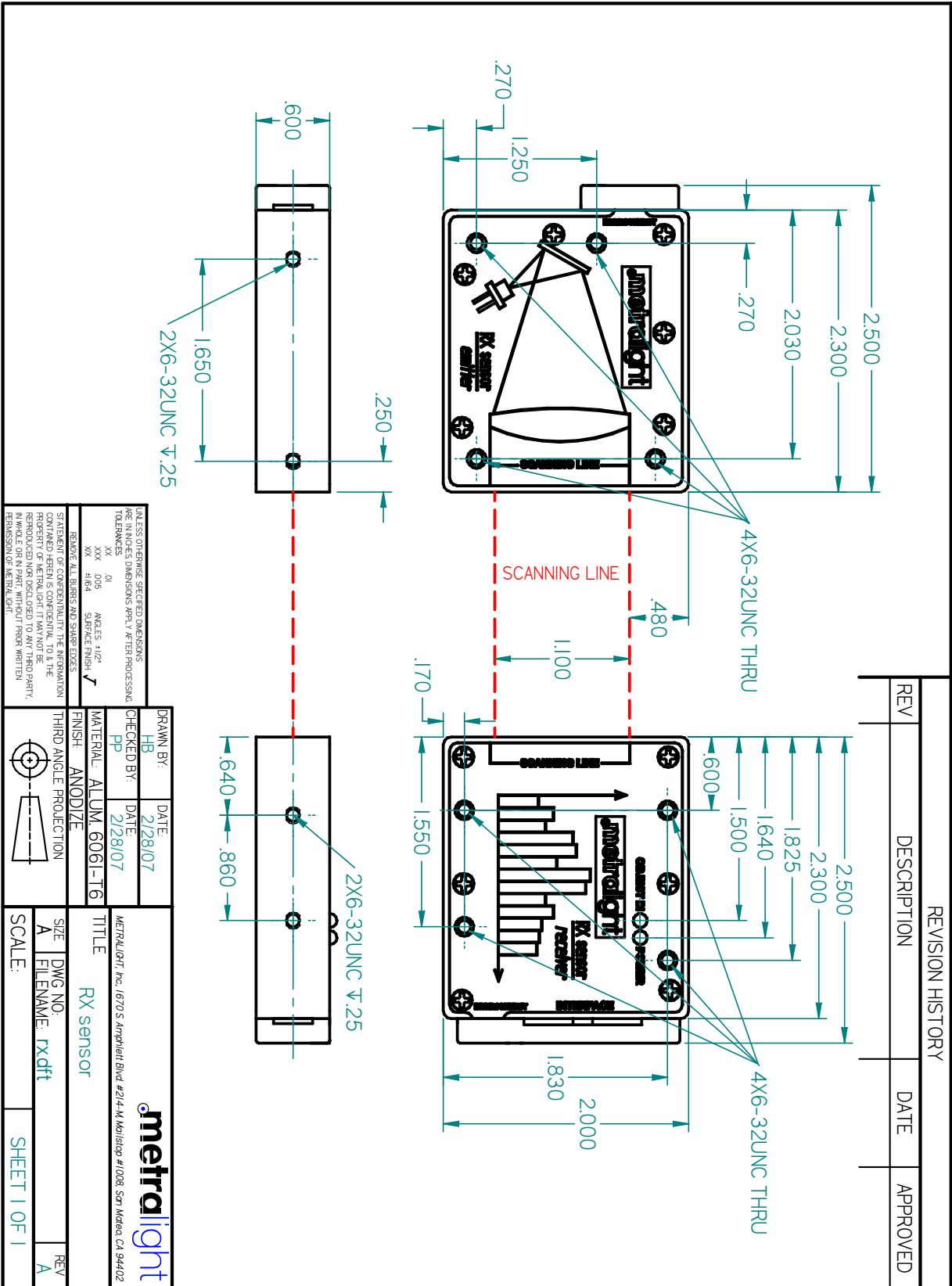*Fig.17:* **SOLID MODE,** MULTIPLE OBJECTS

Fig.18: **CUSTOM MODE,** For Example IC LEADS Dimension measurement OR Detects BENT Leads or Missing Leads.

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SCANNING LINE

.600 .270 1.250 .270 2.030 2.300 2.500

4X6-32UNC THRU

2X6-32UNC ▼.25

1.650 .250

.170 1.100 .480

.640 .860

2X6-32UNC ▼.25

1.550 .600 1.500 1.640 1.825 2.300 2.500

1.830 2.000

4X6-32UNC THRU

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. DIMENSIONS APPLY AFTER PROCESSING.
TOLERANCES
XX   .01   ANGLES ±1/2°
XXX   .005
XX   ±1/64   SURFACE FINISH ✓

REMOVE ALL BURRS AND SHARP EDGES

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DRAWN BY: HB	DATE: 2/28/07
CHECKED BY: PP	DATE: 2/28/07

MATERIAL: ALUM 6061-T6
FINISH: ANODIZE
THIRD ANGLE PROJECTION

METRALIGHT, Inc, 1670 S. Amphlett Blvd #214-M, Mailstop #1008, San Mateo, CA 94402

TITLE: Rx sensor
SIZE A DWG NO: FILENAME: rxdft REV A

SCALE: SHEET 1 OF 1

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REV	DESCRIPTION	DATE	APPROVED

REVISION HISTORY

Use following Command Set when using RS232 or USB interface.

There are 3 basic commands: DATA, STREAM and MODE. There is always 1 byte command being sent from PC to micrometer. Sensor's response varies in length for different commands. For DATA command there are 3 bytes for each data request (or multiple of three if more datas are requested). STREAM START command triggers sensor to send 3-byte length data packets until STREAM STOP is issued. There is no response for STREAM STOP command. MODE command has 1 byte response (echoes back MODE command).
Command's byte high nibble determines command type and low nibble represents parameter of this command:
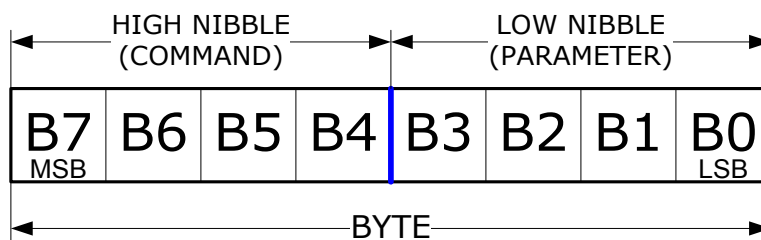

Figure: Command with parameter structure

When data are requested (DATA command or STREAM START), micrometer responds with 3 byte-length packets (2 bytes for data and 1 info byte).

M2,M1,M0.... Mode bits
#AV............. AVERAGE NOT VALID (if 0 then data average valid)
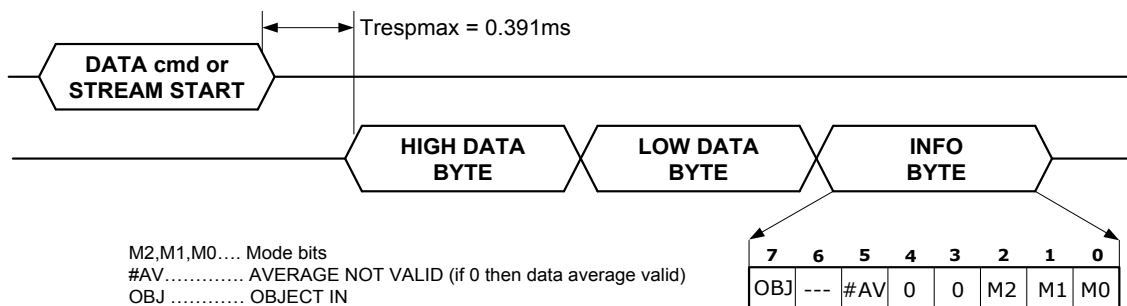OBJ .... OBJECT IN

Figure: 1 Data Packet (3 bytes)

If more data is requested then response is multiplier of 3 bytes. E.g. PC requests 4 data (via DATA command) then micrometer returns 12 bytes. If STREAM START command is issued then Micrometer continuously sends 3 byte packets until STREAM STOP command is sent. Typical PC cannot read data in full speed mode (2500 readings/s) when 1 data only is requested and sensor triggered again. For high speed applications more data should be requested per one command (DATA command with parameter for more than 1 data or STREAM command). This method allows constant data sampling frequency. This constant frequency is also maximum data frequency.

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6.1 DATA command

HIGH NIBBLE (COMMAND)				LOW NIBBLE (PARAMETER)			
0	0	0	1	z	z	z	z
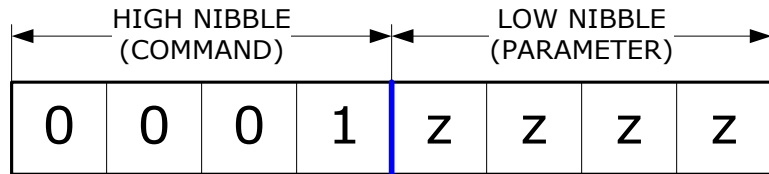
Parameter: **zzzz** represent number of data (2^{zzzz}) being requested
Response: 2^{zzzz}{data}, where {data} is 3 byte-length packet response
Response length (bytes): $3 * 2^{zzzz}$

Example 1: This command serves as basic Get Data command. Let's say we need to read size of object, just once:

PC sends: 00010000 (0x10)　　　　|　　　Micrometer response: 10100100 10110111 10000010

Description: First two (data) bytes = 10100100 10110111= 0xA4B7=42167, this is diameter in pixels.
1 pixel measures 0.4375µm, then diameter = 42167 * 0.4375 = 18.448mm

Last (info) byte =10000010. Bit OBJ=1 (object present), #AV=0 (average valid), MODE=010 (Diameter mode)

Example 2: User request 16 continuous datas:

PC sends: 00010100 (0x14)　　　　|　　　Micrometer response: Sixteen 3 bytes packets

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6.2 STREAM command

HIGH NIBBLE (COMMAND)				LOW NIBBLE (PARAMETER)			
0	0	1	0	0	0	0	z
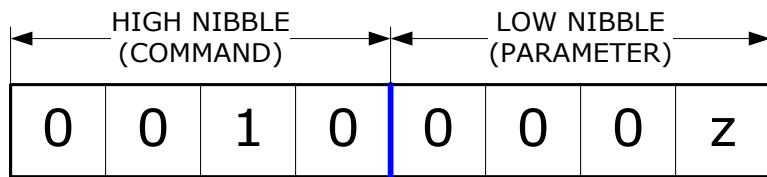
Parameter: **z=1 for STREAM START, z=0 for STREAM STOP**
Response: {data}{data$_{n+1}$}{data$_{n+2}$}{data$_{n+3}$}{data$_{n+..}$}, where {data} is 3 byte-length packet response
Response length (bytes): finite number (multiplier of 3) starting with STREAM START and ends with STREAM STOP.

Example 1: Start of data stream.
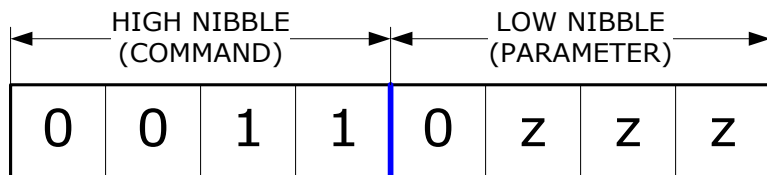
PC sends: 00100001 (0x21)
Micrometer response: {data}{data$_{n+1}$}{data$_{n+2}$}{data$_{n+3}$}{data$_{n+}$}...,

Example 2: Stop of data stream

PC sends: 00100000 (0x20)   Micrometer response: No response

6.3 MODE command

HIGH NIBBLE (COMMAND)				LOW NIBBLE (PARAMETER)			
0	0	1	1	0	z	z	z

Parameter: **zzz=000 to 111** (see mode table and MODES DEFINITION)
Response: echoes back sent byte
Response length (bytes): 1

Example 1: Set Diameter Mode

PC sends: 00110010 (0x32)
Micrometer response: 00110010 (0x32)

zzz	000b	001b	010b	011b	100b	101b	110b	111b
Mode	Edge 1	Edge 2	Dia	Gap	Center	Solid Edge	Custom	Custom

Figure: Mode table