Honeywell

N431X Decoded

Laser Scan Engines

Models N4313 and N4315

Integration Manual

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Customer Support and Technical Assistance

For customer support, contact your local Honeywell Sales Representative or fill out the support form at sps.honeywell.com/us/en/contact-us.

Product Service and Repair

Honeywell International Inc. provides service for all of its products through service centers throughout the world. To obtain warranty or non-warranty service, return your product to Honeywell (postage paid) with a copy of the dated purchase record. To learn more, go to sps.honeywell.com/us/en/support/sensing-and-iot/technical-support.

Limited Warranty

For warranty information, go to sps.honeywell.com/us/en/support/productivity/warranties.

Product Agency Compliance

CB Scheme

IEC 62368-1

UL/C-UL (Recognized component)

UL 60950-1, 2nd Edition

CAN/CSA C22.2 No. 60950-1-07, 2nd Edition

LED Safety

LEDs have been tested and classified as “EXEMPT RISK GROUP” to the standard IEC 62471:2006.

Laser Safety

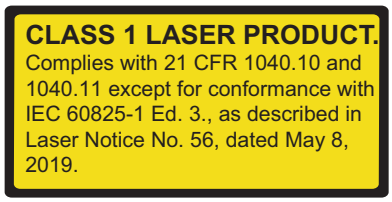
LASER has been tested and classified as a “Class 1 LASER Product” to the standard IEC 60825-1:2014.

The Standard also states that the following be included in all user documentation, spec sheets, and brochures, which describe this product:

"Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure."

Laser Label

For reference only. The product label may be updated at any time.



ESD Precautions

The engine is shipped in ESD safe packaging. Use care when handling the scan engine outside its packaging. Be sure grounding wrist straps and properly grounded work areas are used.

Dust and Dirt

The engine must be sufficiently enclosed to prevent dust particles from gathering on the imager and lens. When stocking the unit, keep it in its protective packaging. Dust and other external contaminants will eventually degrade unit performance.

Product Environmental Information

Refer to www.honeywellaidc.com/environmental for the RoHS / REACH / WEEE information.

型号 (Model) : N431X
产品中有害物质的名称及含量 (Names and Content of Hazardous Substances in the Product)

产品名称 (Products Name)	有害物质 (Hazardous Substances)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
N431X Engine (Laser)	x	o	o	o	o	o

本表格依据 SJ/T11364 的规定编制。(The table is created by SJ/T11364 requirement.)
o: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 标准规定的限量要求以下。(Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in China’s GB/T26572.)
x: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 标准规定的限量要求。(Indicates that this hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement in China’s GB/T26572.)

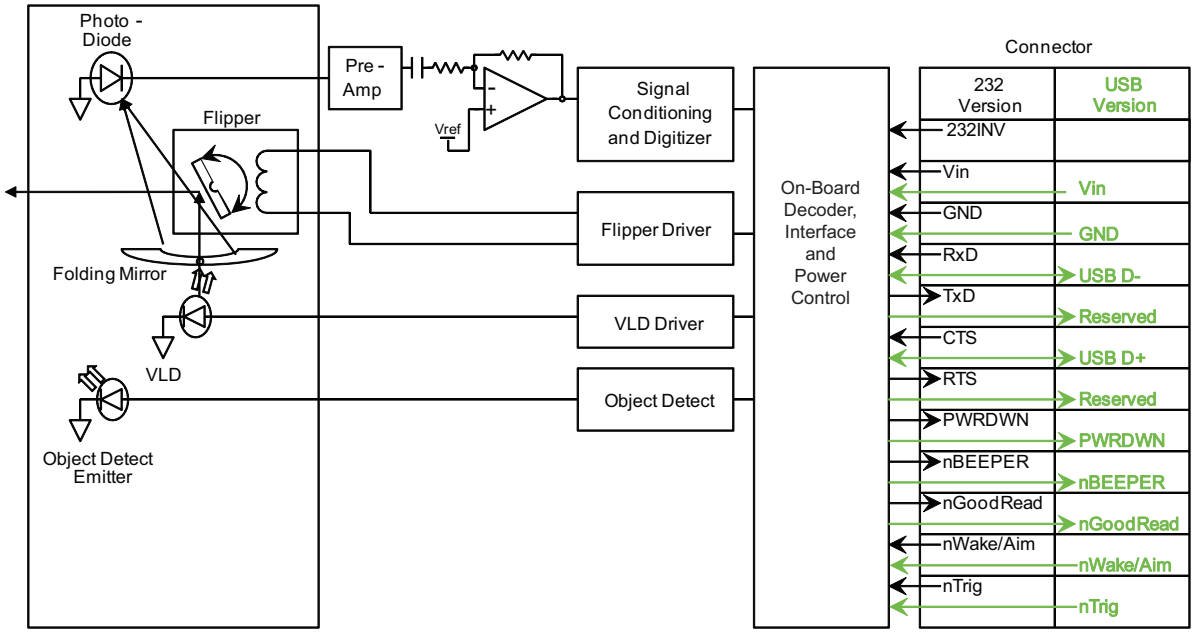
CHAPTER

1 INTRODUCTION AND INSTALLATION

About the N431X Decoded Out Laser Engines

The N431X decoded out engine is a miniature bar code laser scan engine. The modules are designed for easy integration into an OEM portable device.

The onboard decoder uses a microprocessor and memory system to support reading of 1D bar codes.



The following information is presented to assist you in integrating the N431X module into an OEM application.

The following parts allow you to assemble your own configuration:

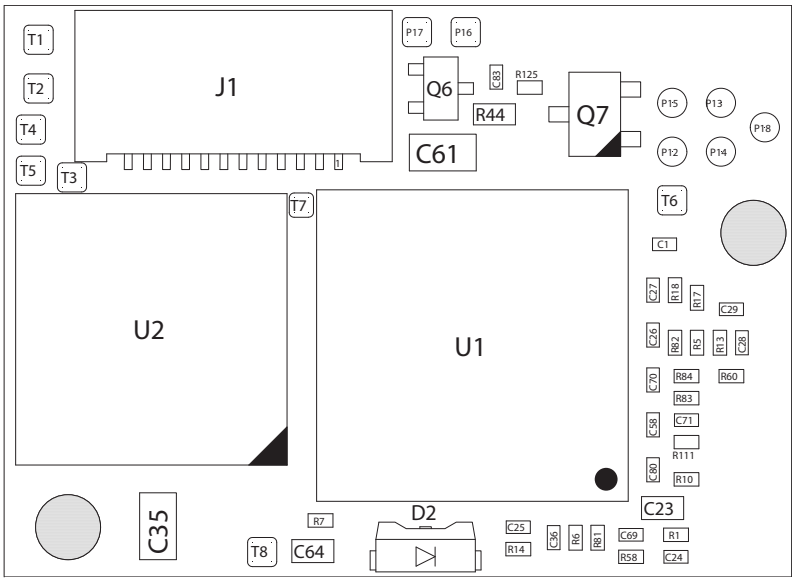
Description	Part Number
80 mm, 12 POS Flex Cable	19-00329
3.3VDC, 232 Decoder Board, TTL-232 interface	N4313-TTL
3.3VDC, 232 Decoder Board, TTL-232 interface, High Density	N4313HD-TTL

Description	Part Number
5VDC, 232 Decoder Board, TTL-232 interface	N4315-TTL
5VDC, USB Decoder Board, USB Full-Speed interface	N4315-USB

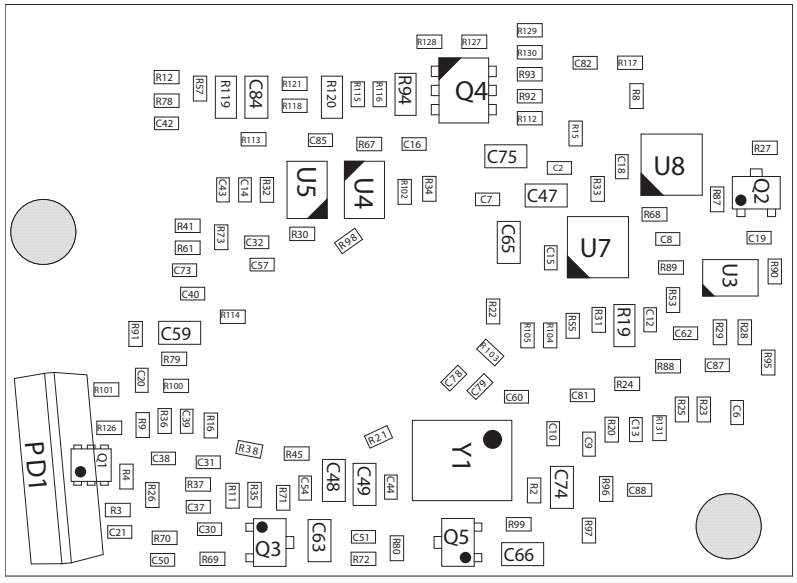
Engine to Host Interface Connectors

The interface connector is a Molex .5mm surface mount FFC/FPC connector (part number 51281-1292). See Host Flex Circuit/Strip on page 30 for details.

Top



Bottom



12-pinM FPC Connector (Gold)

The product is fitted with a 12-pin FPC connector located on the back of the unit for TTL232 or USB (full speed) communication, optional power, and signaling.

Pin Number	TTL Level 232	Input/Output
1	232 Inv	Input
2	Vin	Power
3	GND	Power
4	(n)RXD[1,2,4]	Input
5	(n)TxD[2]	Output
6	(n)CTS[1,2,4]	Input
7	(n)RTS[1]	Output
8	PWRDWN[3]	Output
9	nBEEPER	Output
10	nGoodRead	Output
11	nWAKE/AIM	Input
12	nTrig	Input/Output

1. Signal polarity is selectable using pin 1.

2. Inputs should be terminated if not driven by the host device. The resistor value should be greater than 10k.

3. Signal operation is determined by software configuration.

4. For USB Full-Speed: 100k ohm pull-up resistors are populated in this configuration.
For RS232: Termination of these signals are required in this configuration. Need to terminate Pin 6 (CTS) if flow control is not used.

	TTL Level 232 Engine		Full Speed USB Engine	
Pin Number	**Description**	**Signal Type**	**Description**	**Signal Type**
1	232 Inv	Input	<no connection>	-
2	Vin	Power	Vin	Power
3	GND	Power	GND	Power
4	(n)RXD[1,2,4]	Input	D-	Input/Output
5	(n)TxD[1]	Output	<reserved>	Output
6	(n)CTS[2,4]	Input	D+	Input/Output
7	(n)RTS	Output	<reserved>	Output
8	PWRDWN[3]	Output	PWRDWN[3]	Output
9	nBEEPER	Output	nBEEPER	Output
10	nGoodRead	Output	nGoodRead	Output
11	nWAKE/AIM	Input	nWAKE/AIM	Input
12	nTrig	Input	nTrig	Input

1. Signal polarity is selectable using pin 1.

2. Inputs should be terminated if not driven by the host device. The resistor value should be greater than 10k.

3. Signal operation is determined by software configuration.

4. For USB Full-Speed: 100k ohm pull-up resistors are populated in this configuration.
For RS232: Termination of these signals are required in this configuration. Need to terminate Pin 6 (CTS) if flow control is not used.

Host Interface Signal Descriptons

Warning: Do not connect a flex strip to or disconnect a flex strip from the host interface connector when power is present on the flex strip. This could damage the laser engine.

TTL Level 232 (12-pin Connector)

Signal	Description
232INV	Input - TTL level 232 polarity control with 33.2k ohm pull-down. Connect to ground or UART to UART serial signal polarity and override internal polarity control. This signal can also be driven to a logic high to invert the RS232 signal polarity. There is no internal polarity control.
Vin	Power – Supply voltage input. Refer to specified input values on page 11.
GND	Power – Supply and signal ground.
(n)RxD[1]	Input – TTL level 232 receive data (default) and not receive data. (Polarity is not menu selectable.)
(n)TxD	Output – TTL level 232 transmit data (default) and not transmit data. (Polarity is not menu selectable.)
(n)CTS[1]	Input – TTL level 232 Clear to Send signal (default) and not Clear to Send. (Polarity is menu selectable.)
(n)RTS	Output – TTL level 232 Request to Send (default) and not Request to Send. (Polarity is menu selectable.)
PWRDWN	Output – Open drain, 100K pull up on engine; PWRDWN (active high) indication that the N431X is in power off mode. (Operation is menu selectable.)
nBEEPER	Output – Open drain, 100K pull up on engine; idle high signal that can be an active low DC or PWM controlled AC signal used to drive an external beeper.
nGoodRead	Output – Open drain, 100K pull up on engine; active low signal for driving a low current Good Read LED circuit.
nWAKE/AIM	Input – 100K pull up on engine; when in power off mode active low wake up signal to the N431X.
nTrig	Input/Output, Open drain, weak pull up on engine; Trigger line is an active low signal to trigger the unit. Leave the signal floating for inactive state and connected to ground for active state.

1. For USB Full-Speed: 100k ohm pull-up resistors are populated in this configuration.
For RS232: Termination of these signals are required in this configuration. Need to terminate Pin 6 (CTS) if flow control is not used. (This input can accept both TTL and CMOS level signals).

USB Full Speed Compliant Signals (12-pin Connector)

Signal	Description
D-	USB D- differential data signal.
D+	USB D+ differential data signal.

TTL Level 232 Interface

Interface Signal Polarity Control

This control allows the user to configure the output for TTL level 232 or inverted TTL level 232 signal polarities. This can be done internally through the TTL INVERT signal. This means that the signals are driven at logic levels that would normally be presented to the inputs of an RS-232 (EIA-232) serial port. Setting the signals for inverted TTL level 232 will cause the N431X to invert the signals' polarity but maintain the TTL compatible signal levels. The signals are then driven at logic levels that can interface directly to another UART. The 232INV signal allows external control. Pulling this input to V_{cc} is not recommended. Tying this input to GND is recommended to invert the signal polarity and allow direct interface to another UART.

USB Interface

The N431X supports the following USB Full-Speed compliant client interfaces:

Keyboard

The bar code data is sent as it would be typed. The engine can be configured to send certain keystrokes before and after the bar code. Typical speed is 10-15ms per character.

COM Port Emulation

The COM port emulation performs as if the engine was connected to a typical COM port. A custom driver is provided by Honeywell.

HIDPOS

The N431X conforms to the USB Bar Code Reader Interface definition.

IBM SurePOS

This interface is used if you want to connect via USB with IBM SurePOS capabilities. (This is the best choice when connecting to the USB port of an IBM POS terminal).

Note: *For additional USB programming and technical information, refer to Honeywell's "USB Application Note," available at www.honeywellaidc.com.*

Trigger Modes

The N431X supports two basic trigger modes: Manual/Serial and Presentation Mode. See the User's Guide for additional trigger mode information.

Manual/Serial Trigger

Manual and serial trigger modes are used to initiate a scanning session. The N431X waits in a reduced power state for a trigger indication in the form of a command from the TTL Serial or USB interface, or an active low signal from the nTRIG pin of the host interface connector.

The serial command strings that activate and deactivate the trigger function are:

Serial Trigger
Activate:[SYN]T[CR] or [SYN]t[CR]
Deactivate:[SYN]U[CR] or [SYN]u[CR]
where [SYN] = 0x16 and [CR] = 0x0d

Note: *Serial Trigger commands can be set using ASCII Characters. See User's Guide for more information.*

Presentation Mode

By default you must press the external trigger to read a bar code. Use the following commands to adjust how the engine behaves.

Presentation Mode: The engine automatically detects bar codes, then scans and transmits the data. The laser turns off afterward.

Presentation Mode with CodeGate®: The engine automatically detects bar codes and decodes them. However, the data is not transmitted until you press the external trigger. The laser remains on briefly after the transmission.

Continuous Scan Mode

Continuous Scan Mode programs the engine to continuously scan and decode, with the laser and motor staying on.

Object Detection Mode

Object Detection Mode uses an LED to detect when an object is in the engine's field of view. When an object is detected, the laser turns on and the engine attempts to scan the bar code.

Note: *For information on window placement for Object Detection refer to* *Object Detection Window Placement beginning on page 26.*

Status Indicators

Good Read LED

The N431X provides a pin on the host interface connector (Good Read LED) that can be used to drive an LED to indicate a Good Read status. The driver for the Good Read LED signal is driven by an Open Drain SN74LVC2G06 device with a V_{Omax} = 6.5V through the 100K Ohm pull up resistor on the engine. It is capable of sinking 32 mA at Vin = 4.5V or 24mA at Vin = 3.3V.

Beeper

The N431X provides a pin on the host interface connector (BEEPER) that provides a PWM output for generating audible feedback to the user. This signal is used to indicate the status of the device using a variety of patterns and frequencies.

The driver for the beeper signal is driven by an Open Drain SN74LVC2G06 device with a V_{Omax} = 6.5V through the 100K Ohmpull up resistor on the engine. It is capable of sinking 32 mA at Vin = 4.5V or 24mA at Vin = 3.3V.

Power Down

The N431X provides a pin on the host interface connector (PWRDWN) that provides an indication when the device is powered down (active high).

CHAPTER

2 POWER CONTROL

Flipper, Laser, and Aimer Control

The laser engine flipper, laser, and aimer are controlled directly by the device. Management of these features, other than enabling or disabling them, is not exposed to the end user. See the User's Guide for programmable aimer control options.

Thermal Considerations

Warning: When selecting any continuous trigger mode, the ambient temperature should not exceed the maximum operating temperature of the device. If the temperature exceeds the maximum operating temperature, the performance of the device may be reduced, the life of the product may be shortened, and permanent damage may occur to the device.

Care must be taken when designing the laser engines into high ambient temperature applications where high duty cycle or auto-trigger scanning is required. Such conditions can induce self heating of the laser engine that can increase noise. This can result in degraded bar code reading performance and a reduction in quality. The following precautions should be taken when integrating the laser engine.

- When auto-trigger operation is required, use presentation mode since this mode has "built-in" thermal management features.
- Provide air flow to the laser engine, when possible.

Honeywell engineers have successfully designed the laser engine into many applications as described above. Please contact your Honeywell sales manager or solutions architect for detailed design assistance.

CHAPTER

3 ELECTRICAL

DC Characteristics

Operating Voltage

Configuration	Min	Nominal	Max	Units
+3.3V Engines	2.97	3.30	3.60	V
Full Speed USB +5V Engines	4.50	5.00	5.50	V

Note: *At least 3.0V must be maintained at the N431X input connector during scanning.*

Warning: Do not connect a flex strip to or disconnect a flex strip from the host interface connector when power is present on the flex strip. This could damage the laser engine.

Absolute Maximum Ratings (T=23°C)

Parameter	Min	Typ	Max	Units
V_{Input}	-0.5	3.3	-0.3 to Vcc +0.3	V
V_{Output}	Vcc -0.5			V

DC Operating

Vcc +3.3V, T = 23°C

Parameter	Signals	Min	Typ	Max	Unit
V_{IL}	RXD; CTS	-0.3		Vcc X 0.2	V
V_{IH}		Vcc X 0.8		Vcc + 0.3	V
V_{IL}	EXT. WAKE; EXT. TRIGGER	-0.3		Vcc X 0.2	V
V_{IH}		Vcc X 0.8		Vxx + 0.3	V
V_{OL}	PWRDWN; BEEPER; GR.LED			0.55	V
V_{OH}		100K to +3.3V			V
V_{OL}	TXD; RTS			0.55	V
V_{OH}		2.3			V

Vcc +5V, T = 25°C

Parameter	Signals	Min	Typ	Max	Unit
V_{IL}	RXD[1]; CTS[1]			1.5	V
V_{IH}		3.51			V
V_{IL}	EXT. WAKE; EXT. TRIGGER			1.0	V
V_{IH}		3.35			V
V_{OL}	PWRDWN; BEEPER; GR.LED			0.55	V
V_{OH}		100K to VCC			V
V_{OL}	TXD; RTS			0.55	V
V_{OH}		3.8			V

1. For USB Full-Speed: 100k ohm pull-up resistors are populated in this configuration.
For RS232: Termination of these signals are required in this configuration. Need to terminate Pin 6 (CTS) if flow control is not used.

Current Draw

For RS232: Power Save Modes, Off, Sleep, and Hibernate, are controlled by PWRMOD [0, 1, 2]. PWRLPT [0-65535] determines the amount of time in seconds the unit will enter into the designated Power Save mode after each wake up cycle. PWRMOD2 is the deepest of the two Power Save modes and conserves the most amount of energy.

For USB: Standby mode is entered when USB suspends.

(T_A= 23◦C)

Power Mode	Description	3.3V (RS232) w/Interface Board	5V (RS232)	5V (USB) No interface board connected
I_{Surge}	Maximum current spike seen when the engine turns on after power is applied	<400mA	<400mA	<400mA
I_{Peak}	Peak current draw when the engine is scanning (Manual Trigger).	105mA	128mA	130mA
$I_{OperatingAverage}$	Average current draw when the engine is scanning (Manual Trigger).	100mA	105mA	105mA
I_{Idle} (engine powered on)[1]	Maximum current draw while not scanning or decoding, but power is applied to the engine.	65mA	65mA	65mA
I_{Idle} (engine powered off)[1]	Maximum current draw while power is not applied to the engine.	0mA	0mA	0mA
I_{Sleep}[1,2]	Maximum current draw while in Sleep mode. For RS232, Sleep mode is entered when the menu command PWRLPT expires while in PWRMOD1 mode. (This mode is only available in a 232 configuration).	< 1.5mA	< 1mA	< 1mA
$I_{Hibernate}$[1,2]	Current draw while in Hibernate mode (PWRDWN signal is high). Hibernate mode is entered when the menu command PWRLPT expires while in PWRMOD2 mode. (This mode is only available in a 232 configuration).	<1.2mA	< 1mA	< 1mA

1. Average Value

2. No interface board used for this measurement

Note: *The N431X is compliant with USB power specifications.*

Power Conditioning and Interruptions

Always apply power to the laser *after* connecting to the interface device.

Warning: Connecting the laser to live power (“hot plugging”) may damage the electronic components of the laser.

A clean and stable power source is recommended for the laser. Momentary power interruptions or fluctuations within the first 2 seconds of power up puts the laser into Power Off mode. An active low signal on the nTRIGGER or the nWAKE input powers the laser back up. A serial command will also power the laser back up. It is therefore recommended that the host device activate the nWAKE signal directly to power up the scanner.

In applications where the laser does not need to use the Power Off mode, it is recommended that a 10k pull down resistor be added to the nWAKE input.

AC Characteristics

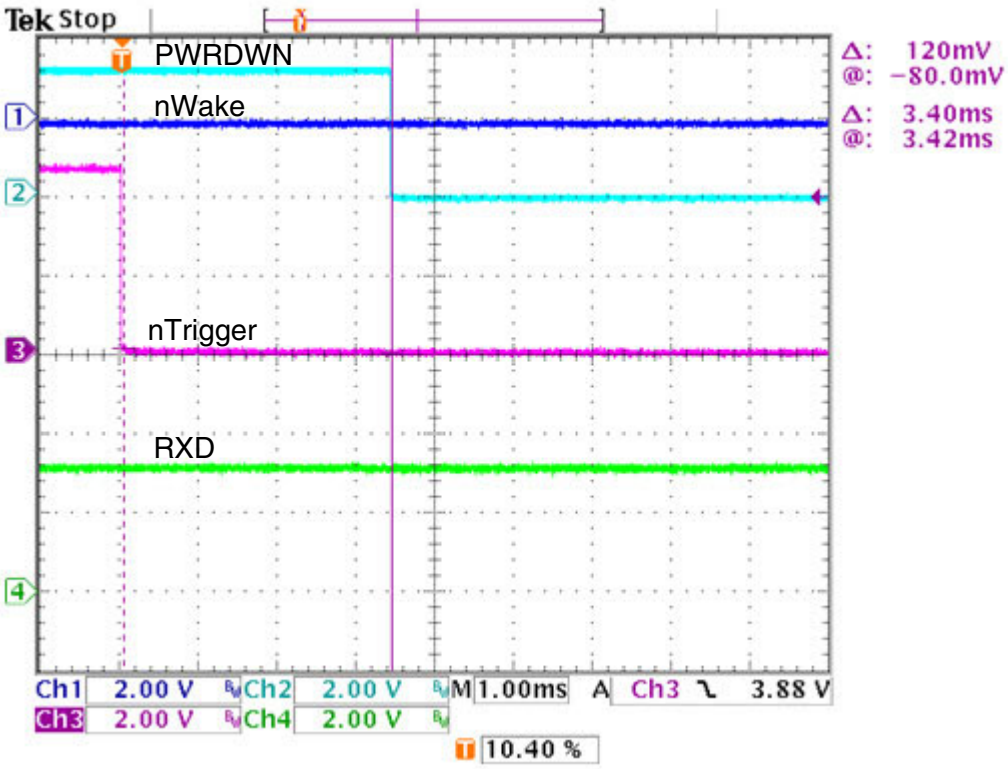
The following diagrams indicate the typical timing for the Power-up and Power-off.

The following laser interface timing diagrams may be used for reference when designing a custom laser engine to decoder flex circuit. The diagrams indicate the timing signals as they originate from the laser, and timing relationship that is required at the decoder board connector.

Power Up From Power Off State (Low Power Mode)*

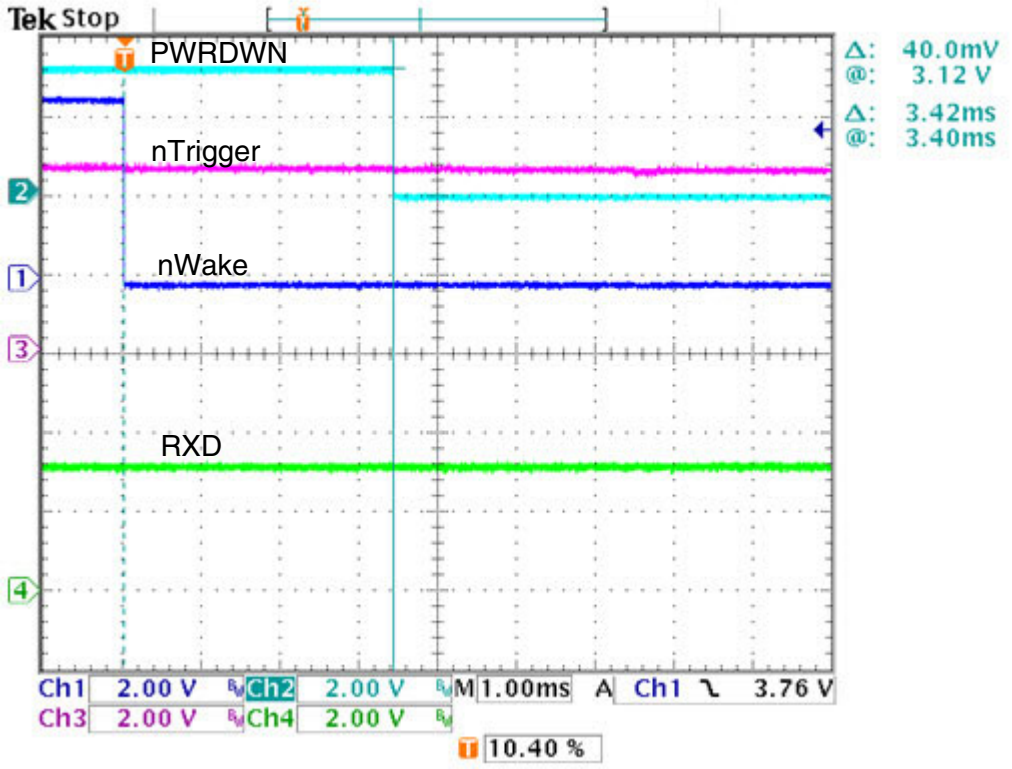
The PWRDWN signal goes low ~3.40ms after the wake up event occurs, indicating that the device is powered up and ready to start scanning.

nTrig – Activating the trigger*

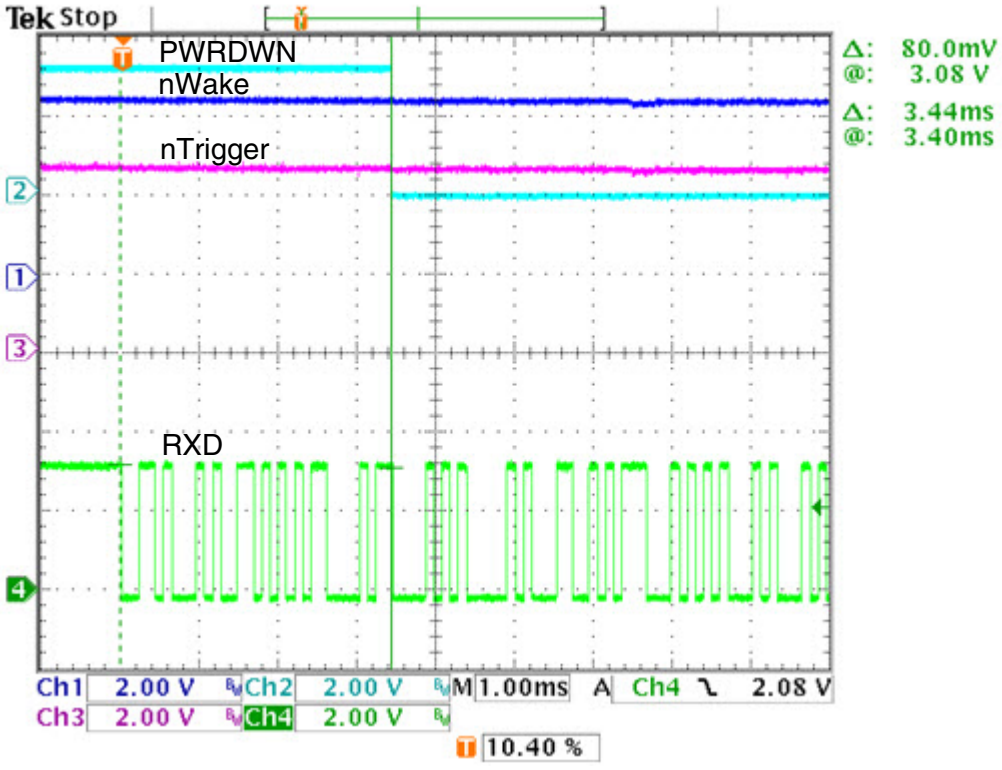


Note: ** The following settings were used to capture the above plot: DEFALT;PWRMOD1;PWRLPT5.*

nWake – Toggling nWake*



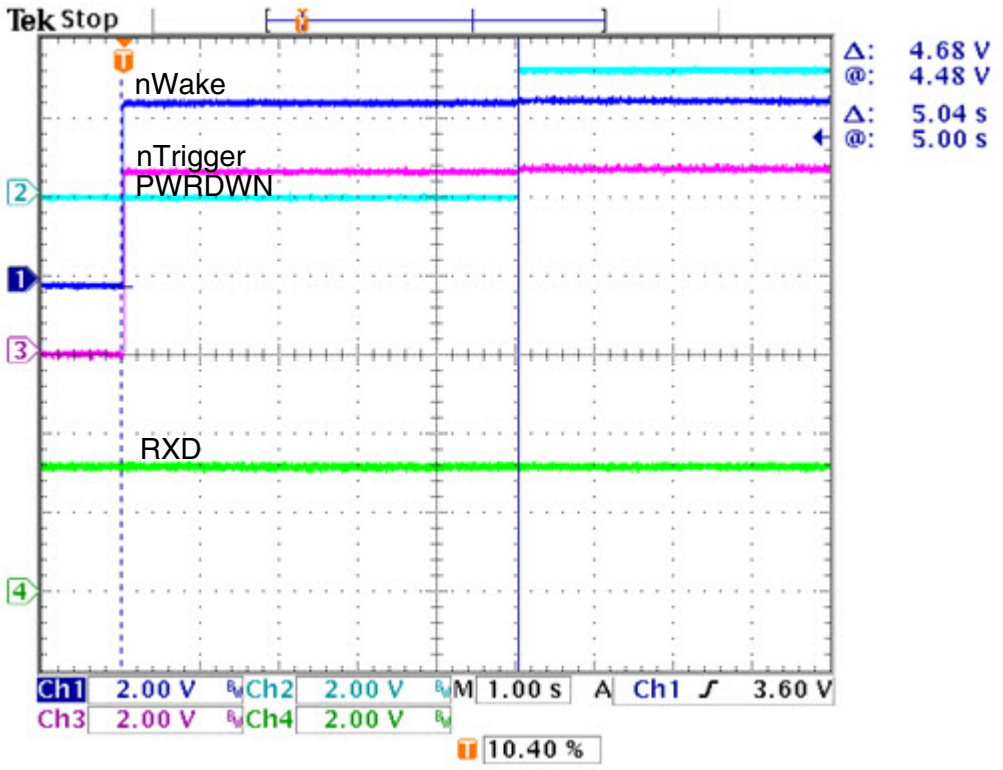
Tx – Sending data from the host*



Note: ** The following settings were used to capture the above plots: DEFALT;PWRMOD1;PWRLPT5.*

Power Off Timing (Low Power Mode)*

After nWAKE and nTRIG are released it takes about 5 seconds for the PWRDWN signal to go high (hardware time-out) with the PWRMOD1; PWRLPT5 settings (low power time-out of 5 seconds). Below is a representation of the power off sequence.



Note: ** The following settings were used to capture the above plot: DEFALT;PWRMOD1;PWRLPT5.*

Environmental Specifications

Parameter	Specification
Temperature Ranges (non-condensing):	
Operating	-4° F to 140° F (-20° C to 60° C) Chassis Temperature
Storage	-40° F to 158° F (-40° C to 70° C) Ambient Temperature
Humidity (Operating and Storage)	Up to 95% RH, non-condensing
Shock	The Laser Scanning Engine optics modules function properly after being subjected to shocks of 2,000 Gs for 0.85 msec at -4° F to 140° F (-20° C to 60° C) applied via the mounting surface.
Vibration	The Laser Scanning Engine module withstands a vibration of $0.04G^2/H_z$ over 10-500H_z.
MTBF	Scanning Engines have a calculated MTBF of greater than 70,000 hours based upon MIL-HDBK-217F (release December 1, 1991). The calculation is based on the part count method for the Ground Benign (GB) environmental conditions.
Light Immunity	
Direct Sunlight	100,000 lux
Artifical Light	4,500 lux

CHAPTER

4 OPTICS

Window Placement

The angle of the window must not be perpendicular to the exit beam of the scan engine. The angle of the window can cause the beam's laser light to reflect off the inside of the window back into the scan engine's optics. Please refer to the Exit Beam Diagram and Return Aperture Diagram for proper window positioning.

Reflective Materials in the Laser's Field of View

Highly reflective objects in the laser's field of view can cause bright spots to appear in the image and can increase the amount of time needed to read the image. These bright spots are analogous to the reflections seen when taking a snapshot of a mirror with a flash camera. When designing the laser into fixed mount applications, keep highly reflective machine components out of the laser's field of view. If such components must be within the laser's field of view, blacken or shield them to prevent this problem from occurring.

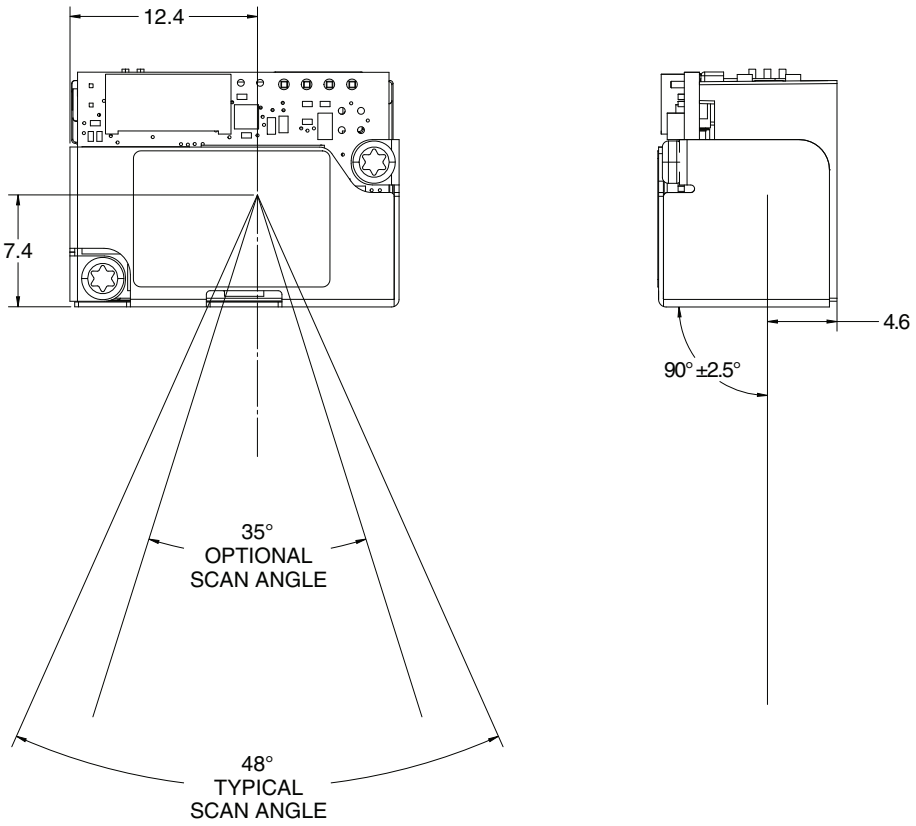
Window Size and Material Requirements

1. Window material must be clear. Clarex (cast acrylic) is preferred. Polycarbonate and CR39 are also acceptable. The window material should have a hard coating over it to protect it from scratches.
2. The exit window must exhibit a wavefront distortion (transmission) of no more than 0.2 wavelengths peak-to-valley maximum over any 0.08 in. diameter within the clear aperture.
3. The exit window must have a 60-40 surface quality and be optically flat, clear, and free of scratches, pits, or seeds.
4. The window size must increase as it is moved away from the optics module to accommodate the exit beam and return aperture envelopes shown on page 21 and page 23.

5. An anti-reflective coating can be applied to the inside and/or outside of the window to reduce the possibility of internal beam reflections interfering with the scan performance of the engine. If an anti-reflective coating is applied, it is recommended that it be on both sides of the window providing a 0.5% maximum reflectivity on each side from 640 to 690 nanometers at the nominal window tilt angle. The coating must also meet the hardness adherence requirements of MIL-M-13508.

Exit Beam Diagram

Standard Range



Units = mm

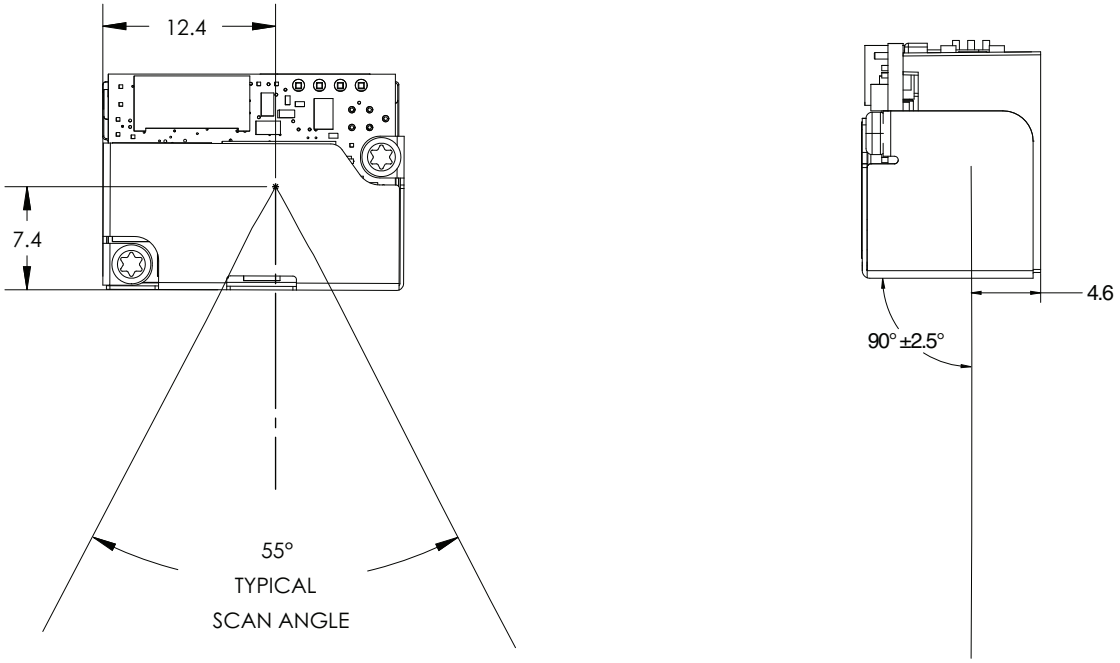
Note: *Ensure the scan engine's beam sweep is free from obstructions.*

Note: *A dark matte-finish on the internal walls of the housing can be utilized to avoid internal beam reflections and stray light.*

Note: *At 254mm a double beam of up to 3mm is to be expected. A double beam will not affect scanning performance and is not a product defect.*

Note: *Upon activation of the N431X, the unit will produce a laser beam which is slightly shorter in length than the normal 48 degree sweep. The sweep will expand slightly beyond the normal 48 degree sweep and then settle to the proper 48 degree sweep angle. This startup behavior is intentional as it provides the best scanning performance for the engine. Successful scanning can occur any time during this startup process.*

High Density (HD)



Units = mm

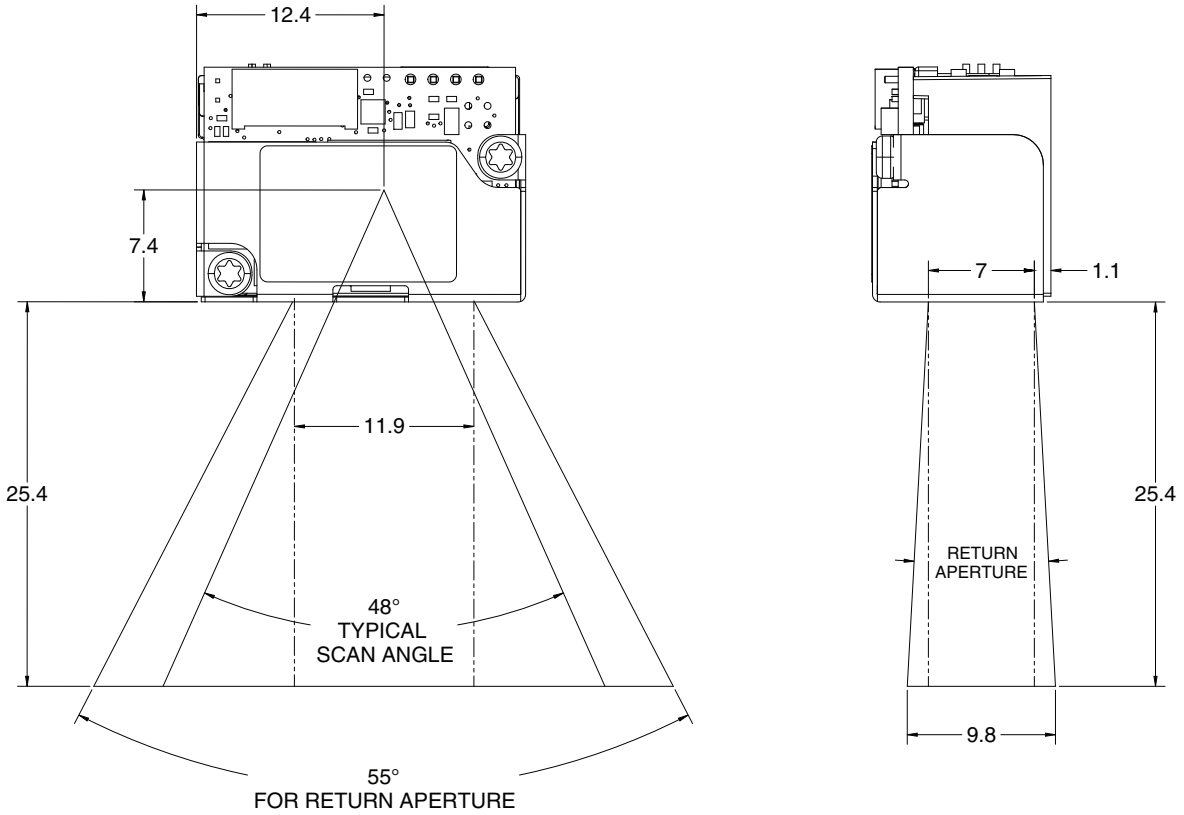
Note: *Ensure the scan engine's beam sweep is free from obstructions.*

Note: *A dark matte-finish on the internal walls of the housing can be utilized to avoid internal beam reflections and stray light.*

Note: *At 254mm a double beam of up to 3mm is to be expected. A double beam will not affect scanning performance and is not a product defect.*

Note: *Upon activation of the N431X, the unit will produce a laser beam which is slightly shorter in length than the normal 55 degree sweep. The sweep will expand slightly beyond the normal 55 degree sweep and then settle to the proper 55 degree sweep angle. This startup behavior is intentional as it provides the best scanning performance for the engine. Successful scanning can occur any time during this startup process.*

Return Aperture Diagram



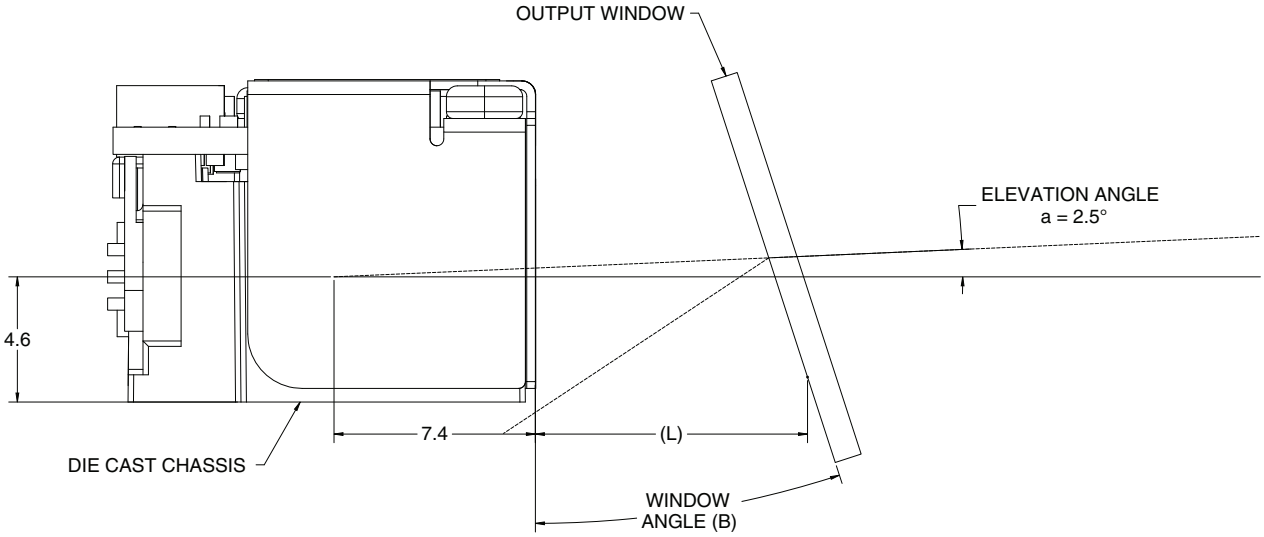
Units = mm

Note: *Ensure the scan engine's exit beam and return aperture are free from obstructions.*

Window Angle

The following diagrams show the minimum allowable window angles required to avoid detrimental internal reflective beam interference for positive and negative tolerances.

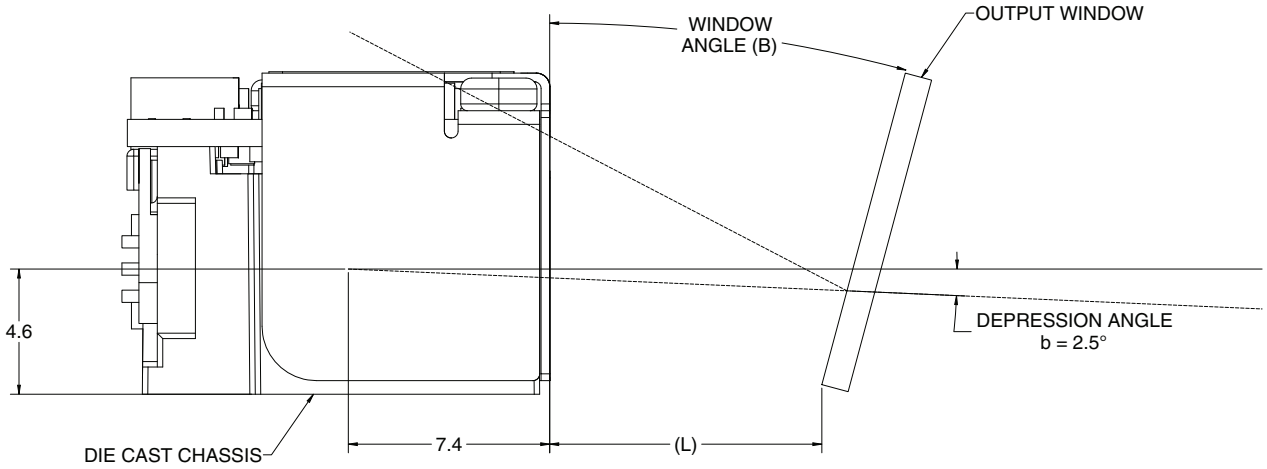
Positive Exit Beam Angle Tolerance



Units = mm

Minimum Projected Distance (mm) from the Engine's Base to the Window's Internal Surface (L)	Minimum Window Angle B
5.0	35°
10.0	16.5°
15.0	12°
20.0	9.5°
25.0	8°
30.0	7°
35.0	6.5°
40.0	6°
45.0	5.5°
50.0	5.5°

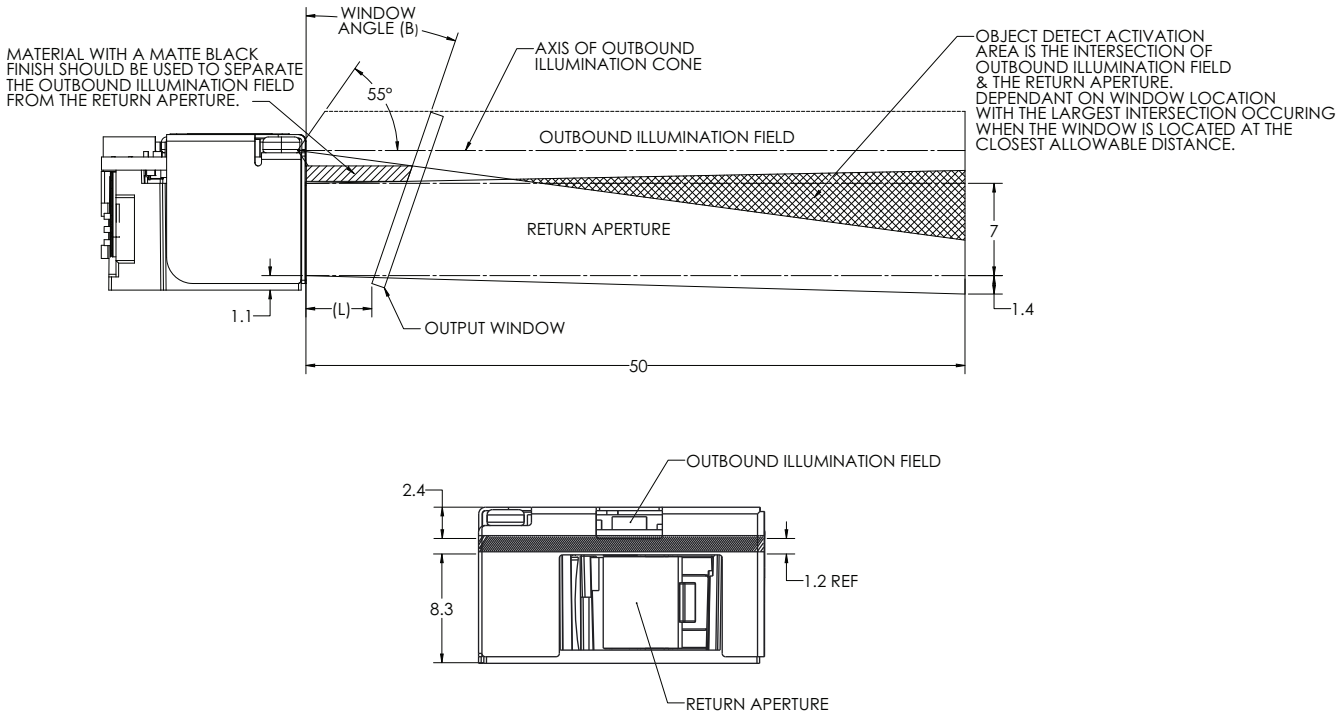
Negative Exit Beam Angle Tolerance



Units = mm

Minimum Projected Distance (mm) from the Engine's Base to the Window's Internal Surface (L)	Minimum Window Angle B
5.0	19°
10.0	13°
15.0	10°
20.0	8.5°
25.0	7°
30.0	6.5°
35.0	6°
40.0	5.5°
45.0	5°
50.0	5°

Object Detection Window Placement



Bar Code Presentation Angle

Bar codes printed on glossy or laminated paper are best read at angles greater than 5° in relation to the Laser Engine. This prevents bright illumination reflections from being returned to the Laser Engine.

Laser Safety Standard for N431X Engines

Please refer to Product Agency Compliance (page 2) for safety information and for incorporation of the warning label on the Class 2 Laser Product.

Depth of Field

The depth of field measurements used the following parameters:

- Distances are measured from the front of the engine.
- +23°C (+73°F),<1,600 lux
- Photographic quality codes

Standard Range

	Typical			Guaranteed		
Symbology	**Near Distance (in/mm)**	**Far Distance (in/mm)**	**Delta (in/mm)**	**Near Distance (in/mm)**	**Far Distance (in/mm)**	**Delta (in/mm)**
4 mil Code 39	4.3 (109)	5.9 (149)	1.6 (40)	4.6 (117)	5.6 (141)	0.9 (24)
5 mil Code 39	3.7 (94)	7.9 (201)	4.2 (107)	4.2 (106)	7.5 (190)	3.3 (84)
7.5 mil Code 39	2.7 (68)	12.0 (305)	9.3 (237)	3.6 (92)	11.1 (281)	7.4 (189)
10 mil Code 39	2.2 (55)	15.0 (381)	12.8 (326)	2.6 (66)	14.6 (371)	12.0 (305)
13 mil 100% UPC	2.0 (52)	18.0 (457)	16.0 (405)	2.0 (52)	18 (457)	15.9 (405)
15 mil Code 39	1.77 (45)	21.5 (547)	19.73 (502)	1.77 (45)	21.5 (547)	19.8 (502)
20 mil Code 39	1.7 (43)	26.8 (680)	25.1 (637)	1.7 (43)	26.8 (680)	25.1 (637)
40 mil Code 39	3.4 (85)	35.1 (891)	31.7 (806)	3.8 (96)	29.1 (734)	25.3 (642)
55 mil Code 39	4.7 (119)	38.4 (976)	33.7 (857)	5.3 (135)	34.3 (872)	29 (737)

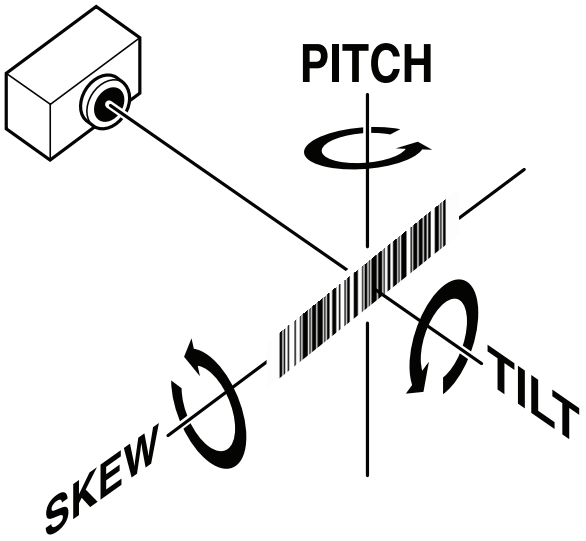
High Density (HD)

	Typical			Guaranteed		
Symbology	**Near Distance (in/mm)**	**Far Distance (in/mm)**	**Delta (in/mm)**	**Near Distance (in/mm)**	**Far Distance (in/mm)**	**Delta (in/mm)**
3 mil Code 39	2.4 (60)	3.9 (100)	1.5 (40)	2.6 (65)	3.7 (93)	1.1 (28)
3.5 mil Code 39	2.2 (57)	4.6 (118)	2.4 (61)	2.5 (63)	4.3 (108)	1.8 (45)
4 mil Code 39	2.2 (55)	5.3 (135)	3.1 (80)	2.4 (61)	4.9 (124)	2.5 (63)
5 mil Code 39	1.9 (49)	6.4 (162)	4.5 (113)	2.1 (54)	5.8 (147)	3.7 (93)
7.5 mil Code 39	1.5 (37)	7.9 (200)	6.7 (163)	1.7 (42)	7.2 (183)	5.5 (141)
10 mil Code 39	1.3 (33)	8.9 (225)	7.6 (192)	1.6 (41)	8.2 (209)	6.6 (168)
13 mil 100% UPC	1.4 (35)	9.1 (232)	7.7 (197)	1.6 (41)	8.5 (215)	6.9 (174)
20 mil Code 39	1.7 (22)	12.4 (315)	10.7 (293)	2.0 (51)	11.3 (288)	9.3 (237)

Note: *Performance may be impacted by bar code quality and environmental conditions.*

Bar Code Reading Angles

Note: *The following angles are not cumulative.*



Standard Range

Specular Reflection Angle: ±5°

Pitch: ±60 degrees typical for 2.9-inch wide 15-mil C128 (uncontrolled, can be demand printed)

Skew: ±65 degrees typical for 100% UPC at 5-inch distance

Tilt: ±35 degrees typical

High Density (HD)

Specular Reflection Angle: ±5°

Pitch: ±50 degrees typical for 2.9-inch wide 15-mil C128 (uncontrolled, can be demand printed)

Skew: ±50 degrees typical for 100% UPC at 5-inch distance

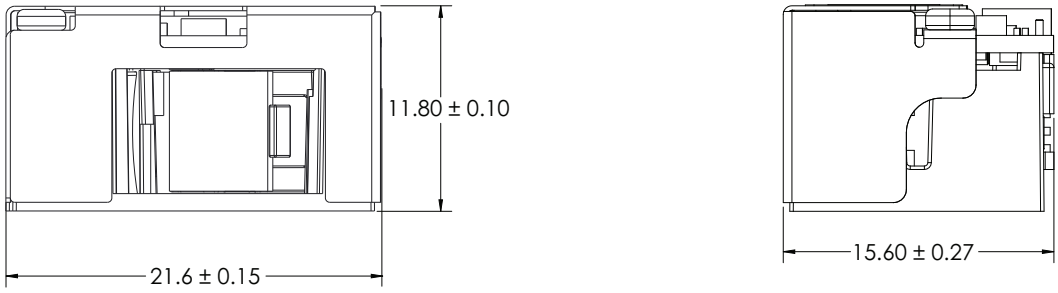
Tilt: ±35 degrees typical

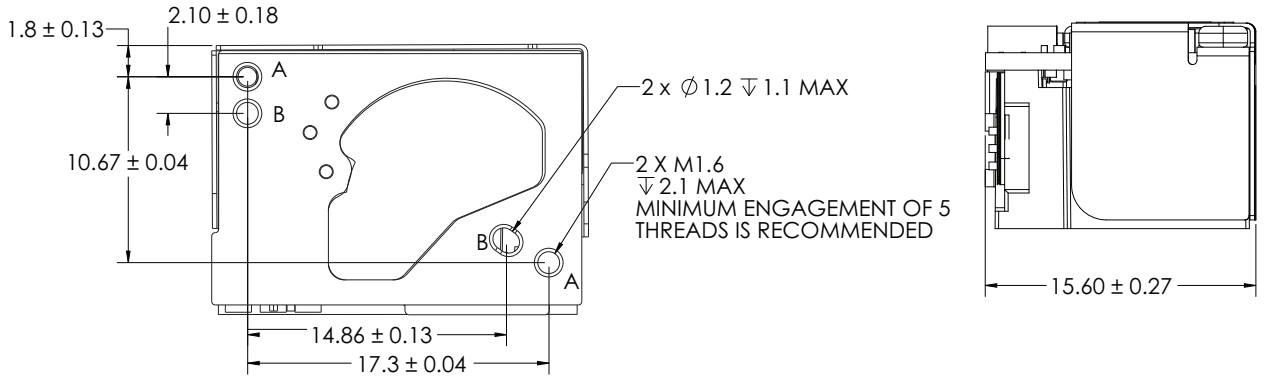
CHAPTER

5 MECHANICAL SPECIFICATIONS

N431X Engine

The illustrations below show the mechanical mounting dimensions for the N431X:





Units = mm

Mounting Considerations

- Do not install any magnetic objects near the N431X. Doing so may interfere with scanning performance.
- Use M1.6X4mm pan head, Steel, Nylox self-tapping screws, or equivalent.
- Do not exceed 1.75+0.5in-lb. (2.02 +6cm-kg) of torque during screw installation.
- Use a minimum mount thickness of 0.3mm.
- Use safe ESD practices when handling and mounting the engine.

Protecting the Engine from Movement

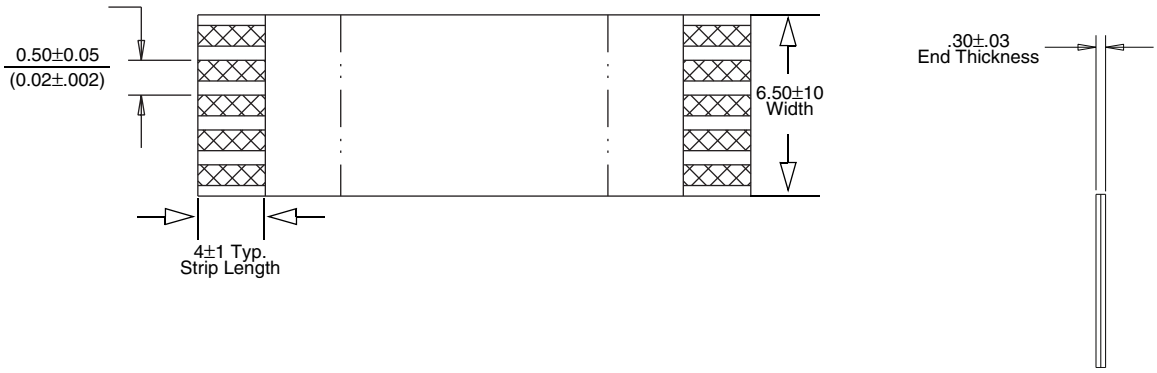
Care should be taken to mount the Laser Engine in a configuration that does not allow relative movements between the flex connector and the flex strip within the connector. Such movements could cause fretting corrosion and lead to intermittent connections. The Laser Engine should be protected so that no external forces are placed on the optics module during shock and vibration events that might cause the relative movement mentioned above. The flex strip should have a sufficient service loop that prevents this relative movement. In addition, the flex strip design should be consistent with the connector manufacturer's recommendations including the manufacturer's recommendations for flex strip thickness, contact material, and geometry.

Host Interface Connector

The host interface connector is a Molex 52559-1252 (Gold), 12 pin, .02 in. (.5mm) pitch vertical surface mount FFC/FPC connector. See Molex catalog for details.

Host Flex Circuit/Strip

The host interface flex should be compatible with a 10003754 (gold plated, lead free) style connector. The following is an example of a flex circuit:



Units = mm

Recommended characteristics:

Trace Width .01 in. (.25 mm)
Copper Weight 1 oz. (28.4 g)

Consult the connector manufacturer for the required thickness of the flex.

Also see Design Considerations on page 33.

APPENDIX

A DESIGN CONSIDERATIONS / TEST RESULTS

EMI Considerations

Electro-magnetic interference is a concern in all electronic designs. The effects of EMI are enhanced as designs become more digital and the digital circuits' speed increases. The N431X is no exception.

The N431X does not preclude end product integrations from obtaining regulatory and safety standards. The OEM integrator will need to verify compliance as implemented in their host system.

The N431X product is comprised of two major components, each with its own base frequencies.

The Engine

The engine is based on a 12MHz crystal that is used to generate a 96MHz clock. There are a number of other frequencies that may be generated at any given time depending on what interface the decoder board is set up to use or various intermittent signatures that occur in a decode process.

Design Considerations

There are several considerations that must be made when designing a system to utilize the N431X. When integrating the N431X to other components in the system, ensure that a clean power supply is being used and that there is good signal ground integrity (the quieter the better). The other major consideration in any system is interconnects. The N431X uses flex strips/flex circuits for its interconnect to the host system. Proper flex strip design is critical to achieving adequate EMI results. The length, impedance, shape, and routing path of the flex can play big roles in the EMI signature of a product. A short list of considerations when designing with flexes follows:

Impedance - flexes have specifications for impedance and resistance per unit length. Try to make sure your impedance is matched to the typical 50 ohms of a CMOS circuit and keep the resistance as low as possible.

Grounding - Keep the ground traces on the flex strip as low resistance as possible.

Length - shorter is better. Flexes tend to act like antennas; the longer they are, the more EMI transmission and reception can occur.

Routing - keep the flex from passing over other high frequency components or input/output paths. This helps to reduce coupling in or out of the flex. Also, as a rule, avoid loops in the flex. Loops can add to the antenna effect.

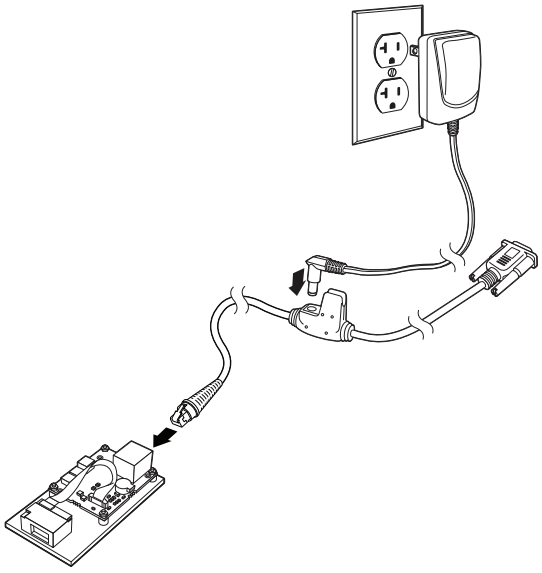
Test Results

The N431X is designed to meet EN 55022 B emission levels. The N431X has been tested for compliance using a representative models.

Corded Unit in TTL-232 Mode (RJ45/RS232)

- The N431X is mounted on the Honeywell demo board.
- The demo board is connected to the host via a 2.9 meter long, straight, TTL level 232 cable.
- The N431X is operating in TTL serial-232 mode.

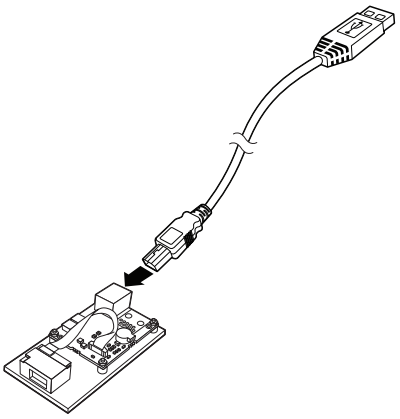
The illustration below shows a unit similar to the unit tested:



Corded Unit in USB Mode (RJ45/USB)

- The N431X is mounted on the Honeywell demo board.
- The demo board is connected to the host via a 2.9 meter long, straight, USB cable.
- The N431X is operating in USB mode.

The illustration below shows a unit similar to the unit tested:



This system passed FCC, CISPR 22, and VCCI class B limits at all tested frequencies.

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