Honeywell

N568X/N569X Decoded

Image Engines

Integration Manual

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Contact Customer Support

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For our latest contact information, see www.honeywellaidc.com/locations.

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Limited Warranty

For warranty information, go to www.honeywellaidc.com and click **Resources** > **Warranty**.

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Product Agency Compliance

For agency models: N5680, N5683, N5690, and N5693.

Note: It is the OEM manufacturer's responsibility to comply with applicable regulation(s) in regard to standards for specific equipment combinations.

Refer to www.honeywellaidc.com/compliance to review and download any publicly available documentation pertaining to the certification of this product in a given country.

CB Scheme

IEC 60950-1 Second Edition

UL/C-UL (Recognized component)

UL 60950-1 Second Edition

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

D-Mark Statement

Certified to EN 60950-1 Information Technology Equipment product safety.

LED Safety Statement

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

Laser Safety Standard

LASER has been tested and classified as a "Class 2 LASER Product" to the standard IEC 60825-1 (2007) Second Edition.

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.

Note: This warning states that altering the inner parts of the laser engine in a way not specified in the user guide may cause light levels to exceed Class 2 limits. It is not an issue when using under normal conditions.

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.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
条码阅读器 (scan engine)	x	o	o	o	o	o

本表格依据 SJ/T 11364 的规定编制。

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/T 26572 标准规定的限量要求以下。

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/T 26572 标准规定的限量要求。

1

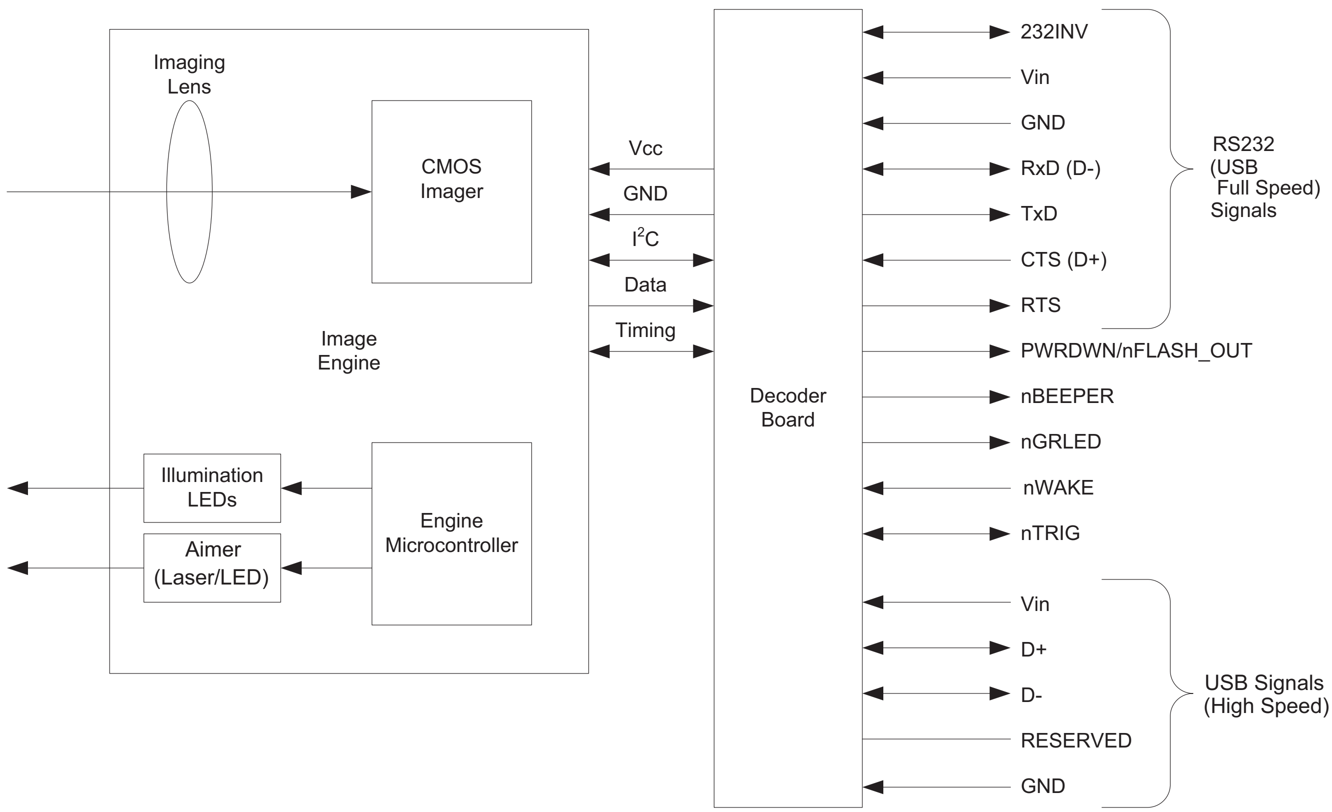
Introduction and Installation

About the N56XX Decoded Out Image Engines

The N56XX decoded out engine is a miniature, CMOS imager-based (black/white or color) image capture and bar code imaging module device. It is configured to be sold as a bracketed module or as the optics module and decoder board separately. The modules are designed for easy integration into an OEM portable device.

The firmware implements an automatic shutter control to provide operation over a wide range of ambient light conditions. The decoder board uses a high-speed microprocessor and memory system to support reading of 1D bar codes, 2D bar codes, and OCR as well as image capture and transfer.

All models are of a modular design consisting of an optics module and a decoder board. The optics module consists of an array sensor, imaging optics, and A/D converter to create a digital representation of the optical signal to be stored in RAM.



The systems may be ordered assembled with a mounting bracket or as separate components for custom mounting. The following information is presented to assist you in integrating the N56XX module into an OEM application.

The following parts allow you to assemble your own unbracketed configuration:

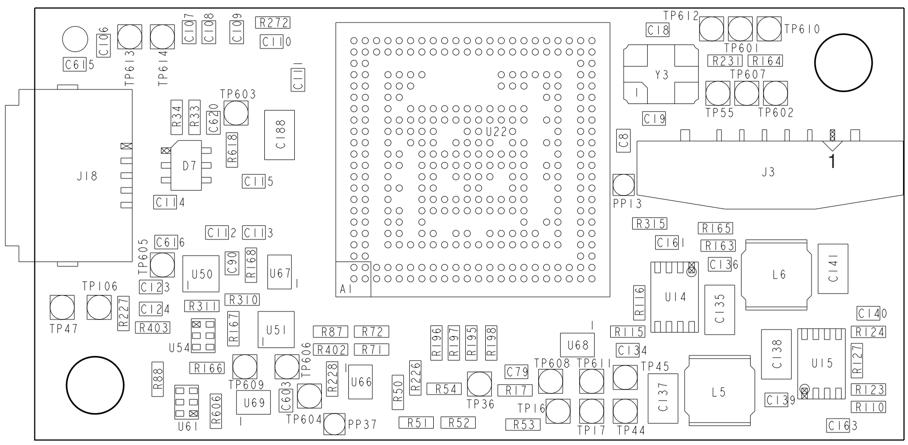
Description	Part Number
1.2" flex from the engine to the decoder PCB	100008340
2.2" flex from the engine to the decoder PCB	100008341
USB Decoder Board, USB Full-Speed interface	N56XX DB USB1
USB Decoder Board, USB Hi-Speed interface	N56XX DB USB2
232 Decoder Board, TTL-232 interface	N56XX DB 232

Optics Module to Decoder Board Connector

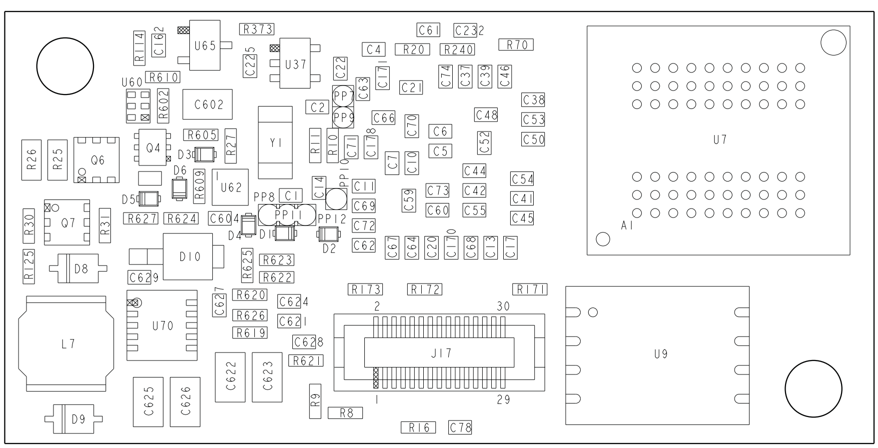
The imager flex circuit is a custom component. There are two flex circuit options available; one for bracketed and non-bracketed applications and a longer one for non-bracketed applications only. The flex coming *across* the decoder board and connecting to the *top* of (not across) the engine is the recommended orientation. This orientation allows the pixel clock to sit between two grounds, which helps with EMI. See Optics Module to Decoder Board Flex Circuit on page 5-8 for details.

Decoder Board to Host Interface Connectors

The interface connector is a Molex 0.5mm vertical surface mount FFC/FPC connector (part number 52559-1252). See Decoder Board Interface Connector on page 5-8 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.

⚠ ***Warning! Do not connect the flex strip to or disconnect the flex strip from the host interface connector when power is present. This could damage the image engine.***

⚠ ***Warning! When using the Micro-B connector (mentioned below), DO NOT apply power through the Flex connector (Pin 2 - Vin). Doing so can cause harm to either the host or image engine.***

Host Interface Signal Descriptions

Note: Do not connect unused pins to GND.

TTL Level 232 Interface

Pin	Signal	I/O	Description
1	232 Inv[1]	Input	TTL level 232 polarity control with 68k ohm pull-up. Connect to ground for UART to UART serial signal polarity and override internal polarity control. This signal can also be driven to a logic low level internally and tying or pulling this input to Vcc is not recommended.
2	Vin	Power	Supply voltage input. Refer to specified input values on page 3-1.
3	GND	Power	Supply and signal ground.
4	(n)RXD[2,4]	Input	TTL level 232 receive data (default) and not receive data. (Polarity is menu selectable.)
5	(n)TxD[2]	Output	TTL level 232 transmit data (default) and not transmit data. (Polarity is menu selectable.)
6	(n)CTS[2,3,4,5]	Input	TTL level 232 Clear to Send signal (default) and not Clear to Send. (Polarity is menu selectable.)
7	(n)RTS[2]	Output	TTL level 232 Request to Send (default) and not Request to Send. (Polarity is menu selectable.)
8	PWRDWN/ nFLASH_OUT	Output	Open drain, 100K pull up on engine; PWRDWN (active high) indication that the N56XX is in power off mode. nFLASH_OUT (active low) notification when the unit is exposing. (Operation is menu selectable.)
9	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.
10	nGoodRead	Output	Open drain, 100K pull up on engine; active low signal for driving a low current Good Read LED circuit.
11	nWAKE	Input	100K pull up on engine; when in power off mode active low wake up signal to the N56XX.
12	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.Signal can be driven internally to a logic low level by software configuration.

2.Signal polarity is selectable using pin 1 or via software configuration.

3.Signal operation is determined by software configuration.

4.For N56XXX-XXX-XX5 (USB Hi-Speed): 100k ohm pull-up resistor populated in this configuration.

5.For N56XXX-XXX-XX2 (RS232): 100k ohm pull-up resistor populated in this configuration.

USB Interface

Pin	Signal	I/O	Description
1	<no connection>	-	-
2	Vin	Power	Supply voltage input. Refer to specified input values on page 3-1.
3	GND	Power	Supply and signal ground.
4	D-	Input/ Output	USB D- differential data signal.
5	<reserved>	Output	-
6	D+	Input/ Output	USB D+ differential data signal.
7	<reserved>	Output	-
8	PWRDWN/ nFLASH_OUT[1]	Output	Open drain, 100K pull up on engine; PWRDWN (active high) indication that the N56XX is in power off mode. nFLASH_OUT (active low) notification when the unit is exposing. (Operation is menu selectable.)
9	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.
10	nGoodRead	Output	Open drain, 100K pull up on engine; active low signal for driving a low current Good Read LED circuit.
11	nWAKE	Input	100K pull up on engine; when in power off mode active low wake up signal to the N56XX. Not used in USB - leave floating.
12	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 N56XXX-XXX-XX5 (USB Hi-Speed): 100k ohm pull-up resistor populated in this configuration.

Micro-B Connector

Pin	USB (high-speed)	I/O
1	Vin	-
2	D-	I/O
3	D+	I/O
4	Reserved/NC	-
5	GND	-

USB High-Speed Compliant Signals

Signal	Description
Vin	Power – Supply voltage input. Refer to specified input values supplied in Absolute Maximum Ratings (T=23°C) on page 3-2.
D-	USB D- differential data signal.
D+	USB D+ differential data signal.
GND	Power – supply and signal ground.

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 a menu command or externally through the 232INV signal. The default menu setting for the polarity setting is TTL level 232 logic. 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 N56XX 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 N56XX supports the following USB Low-Speed and Hi-Speed compliant client interfaces:

Keyboard

The bar code data is sent as it would be typed. The scanner can be configured to send certain keystrokes before and after the bar code. Typical speed is 10-15ms per character. This interface cannot be used to transfer images to the host.

COM Port Emulation

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

HIDPOS

The N56XX 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 N56XX supports four basic trigger modes: Manual/Serial, Low Power Manual Trigger, Presentation Mode, and Streaming 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 N56XX 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

Low Power Manual Trigger (Power Off Mode)

Note: This selection is only valid in the TTL-232 Configuration (N56XXX-XXX-XX2).

Lower power trigger mode causes the N56XX to power off between scans. A manual trigger activation causes the power to be turned on. The trigger line is controlled on the N56XX with a pullup so the line must be left floating to successfully enter the low power modes. The Aim/nWake line must be idle high at the time of power down, otherwise the unit will not go into stop mode. The scanner scans until a timeout or a decode, indicating the appropriate status (beeper and good read LED), outputs the data, and, if the trigger has been released, turns off the power. See Thermal Considerations on page 2-1.

Presentation Mode

Presentation Mode uses ambient light to detect bar codes. The LEDs are dimmed for ambient conditions until a change occurs in the imager's field of view. Then the LEDs become brighter automatically to read the code. If the light level in the room is not high enough, Presentation Mode may not work properly. See Thermal Considerations on page 2-1.

Streaming Presentation Mode

When in Streaming Presentation mode, the scan illumination remains on all the time to continuously search for bar codes. Three modes are available; Normal, Enhanced, and Cell Phone. Normal mode offers good scan speed and the longest working ranges (depth of field). Enhanced mode gives you the highest possible scan speed but slightly less range than Normal mode. Enhanced mode is best used when you require a very fast scan speed and don't require a long working range. Cell Phone mode optimizes the engine to read bar codes from mobile phone or other LCD displays. When this mode is enabled, however, the speed at which printed bar codes may be scanned might be slightly slower. See Thermal Considerations on page 2-1.

Status Indicators

Good Read LED (Pin 10)

The N56XX provides a pin on the host interface connector (nGRLED) that can be used to drive an LED to indicate a Good Read status. This signal is driven by an Open Drain NC7WZ07 device with a V_{Omax} = 5.5V through the 100K pull up resistor on the engine. It is capable of sinking 32 mA at Vin = 4.5V (N56XX supply voltage) or 24mA at Vin = 3.3V.

Beeper (Pin 9)

The N56XX provides a pin on the host interface connector (nBEEPER) 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.

This signal is driven by an Open Drain NC7WZ07 device with a V_{Omax} = 5.5V through the 100K pull up resistor on the engine. It is capable of sinking 32 mA at Vin = 4.5V (N56XX supply voltage) or 24mA at Vin = 3.3V.

Power Down/nFlash Out (Pin 8)

The N56XX provides a pin on the host interface connector (PWRDWN/nFLASH_OUT) that provides an indication when the device is powered down (active high) or allow external illumination to be synced with the sensor's exposure (active low), respectively.

When configured for PWRDWN (GPIOFO0), the signal is designed to be used as an indication to the host that the engine is currently powered down. The ability to power down the unit is limited to RS232 Low Power Mode (TERMID0;TRGMOD2).

When configured (enabled using GPIOFO1), the nFLASH_OUT signal is designed to be used as an indication to the host to turn on (not drive) an external illumination source. It reflects the state of the sensor's exposure.

Note: If GPIOFO1, nFLASH_OUT will operate with or without engine illumination (SCNLED). However, if FLACON is also used (value > 0), Engine Illumination will not be enabled.

To optimize the performance of the external illumination, verification of the time it takes to enable the external illumination in response to the nFLASH_OUT control signal is recommended. Based on the results, FLACON can be configured to ensure that illumination will be ON just before integration (exposure). This will ensure that illumination is not turned ON too prematurely, resulting in inefficient use of power, or too late, resulting in inadequate illumination during integration time. The FLACON value ranges from 0 to 127, where Start-up Time = FLACON * 16.7 µs. Please note, that this Start-up Time can be set in increments, which are not linear for steps less than 10. For example: 5 steps ~ 75 µs delay, 4 steps ~ 49 µs delay, 3 steps ~ 36 µs, and 2 steps ~ 24 µs delay. Setting FLACON to 0 or 1 is the equivalent of having no Start-up Time.

An example of this follows:

If it takes 2 ms for the illumination to be full-on, in response to nFLASH_OUT, FLACON should be configured to 127 (2 ms = 127 * 16.7 µS).

This signal is driven by an Open Drain NC7WZ07 device with a V_{Omax} = 5.5V through the 100K pull up resistor on the engine. It is capable of sinking 32 mA at Vin = 4.5V (N56XX supply voltage) or 24mA at Vin = 3.3V. It is not advised nor conceivable to allow this signal to act as the drive source for external illumination.

2

Power Control

Illumination/Aimer Control

The image engine illumination 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.

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

- Turn off the aiming and illumination LEDs whenever possible.
- Applications where the illumination is not needed use the menu command SCNLED0. application where the aimer is not needed use the menu command SCNAIM0.
- When auto-trigger operation is required, use presentation mode since this mode has “built-in” thermal management features.
- Set the SDRTIM menu command to allow the processor to enter its power saving mode quickly after a bar code decode. (See the SDRTIM description below.)
- Provide air flow to the image engine, when possible.
- Allow ambient light to assist the image engine in bar code decoding, thereby reducing the on-time of the illumination LEDs.

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

SDRTIMxxx Menu Settings

The menu setting SDRTIMxxx can be used to improve the trigger to decode time of the N56XX image engine in certain use cases. However, in other use cases, the performance of the imager can be degraded substantially if this parameter is incorrectly set. This section defines the SDRTIMxxx setting and discusses when it should be changed from its default configuration.

Definition of SDRTIMxxx

SDRTIM is an abbreviation for "Scan Driver Timeout". The setting is used to configure the length of time that the imager is allowed to keep running after it is untriggered (either by a removal of the trigger signal, or by the successful decoding of a bar code). The parameter xxx is the time, in milliseconds, that the imager continues to run. For example, if the parameter SDRTIM200 is sent to the image engine, the imager continues to gather images with the illumination LEDs off, and the decoder board will continue to store those images into memory for 200 ms after the imager is untriggered. When the SDRTIM setting expires, the image engine transitions to standby mode to conserve power until it is triggered once again.

Negative Ramifications of Long SDRTIM Settings

Caution must be used when setting SDRTIM to a very long time period. Since the image engine never enters the power saving standby mode, significant internal heating of the image engine can occur. In high ambient temperature situations, this can result in elevated N56XX internal temperatures that can cause signal to noise degradation of the images. Consequently, the images from the image engine can be unacceptable for human viewing, and bar code reading may no longer be possible. Additionally, since the imager never enters standby mode, the battery life of battery operated systems will be reduced.

Recommendations

It is not advisable to change the SDRTIM command from its default configuration, which is 1 ms (SDRTIM1). Please do not change this setting from its default conditions without consulting a Honeywell Solutions Architect.

3

Electrical

DC Characteristics

Operating Voltage

Configuration	Min	Nominal	Max	Unit
RS232 Only[1]	3.0	3.3	5.5	V
USB (Full Speed) Only[2,3]	4.75	5.0	5.25	V
USB (High Speed) Only[2,3]	4.75	5.0	5.25	V

1.At least 3.0V must be maintained at the N56XX input connector during scanning.

2.At least 4.75V must be maintained at the N56XX input connector during scanning.

3.No RS232 option available.

⚠ ***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 image engine.***

⚠ ***Warning! When using the Micro-B connector, DO NOT apply power through the Flex connector (Pin 2 - Vin). Doing so can cause harm to either the host or image engine.***

Absolute Maximum Ratings (T=23°C)

Parameter	Min	Typ	Max	Unit
V_{Input}	-0.5		5.5	V
V_{Output}	-0.5		Vcc +0.5	V

DC Operating

(Vcc +3.3V, T= 23° C)

Parameter	Signals	Min	Typ	Max	Unit
V_{IL}	nRXD, nCTS			1.0	V
V_{IH}		2.31			V
V_{IL}	nWAKE			0.6	V
V_{IH}		2.47			V
V_{OL}	PWRDWN, nBEEPER, nGRLED			0.55	V
V_{OH}		100K to VCC			V
V_{OL}	nTXD, nRTS (I_O = 16mA)			0.55	V
V_{OH}		2.3			V

(Vcc +5V, T= 23° C)

Parameter	Signals	Min	Typ	Max	Unit
V_{IL}	nRXD[1], nCTS[1]			1.5	V
V_{IH}		3.51			V
V_{IL}	nWAKE			1.0	V
V_{IH}		3.35			V
V_{OL}	PWRDWN, nBEEPER, nGRLED			0.55	V
V_{OH}		100K to VCC			V
V_{OL}	nTXD, nRTS (I_O = 32mA)			0.55	V
V_{OH}		3.8			V

1.For USB Hi-Speed: 100k ohm pull-up resistors are populated in this configuration.
For USB Full-Speed: No additional pull-ups 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: Idle, Standby and Power Off power modes are controlled by the SDRTIM, 232LPT, TRGLPT, and TRGMOD settings. Idle mode is entered when the SDRTIM time-out expires. Standby mode is entered when the SDRTIM and 232LPT time-outs expire. Power Off mode is entered when the SDRTIM, 232LPT and TRGLPT time-outs expire. Use TRGMOD2 to enable Power Off mode.

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_{Inrush}	Maximum current spike seen when power is applied to the N56XX or when the engine turns on for the first time	610mA	500mA	500mA
I_{Peak}	Peak current draw when the engine is scanning (Manual Trigger)	650mA (975mA)[3]	433mA (499mA)[3]	458mA (498mA)[3]
$I_{OperatingAverage}$	Average current draw when the engine is scanning (Manual Trigger)	530mA (677mA)[3]	350mA (396mA)[3]	385mA (402mA)[3]
	Average current draw when the engine is scanning (Streaming Presentation Mode PAPSPN)	310mA (310mA)[3]	200mA (218mA)[3]	230mA (230mA)[3]
I_{Idle} (imager powered on)[1,2]	Maximum current draw while not scanning or decoding, but power is applied to the imager. Controlled by the menu commands SDRTIM and IMGPWR.	120mA	81mA	88mA
I_{Idle} (imager powered off)[1,2]	Maximum current draw while power is not applied to the imager. Controlled by the menu command IMGPWR.	72mA	54mA	64mA
$I_{Standby}$[1,2]	Maximum current draw while in standby mode. For RS232, Standby mode is entered when the menu command 232LPT expires while in Idle mode. (This mode is only available in a 232 configuration). For USB, Standby mode is entered when USB suspends.	3.0mA	2.5mA	2.5mA
$I_{Power Off}$[1,2]	Current draw while in Power Off mode (PWRDWN signal is high). Mode is entered when the menu command TRGLPT expires while in both Standby and Manual Low Power (TRGMOD2) modes. (This mode is only available in a 232 configuration).	.001mA	.001mA	n/a

Note: The N56XX is compliant with USB power specifications.

1. Average Value
2. Modified interface board with beeper/LED removed used for this measurement, also disconnect 232 cable while measuring
3. Values in parentheses are for white illumination; the rest of values are for red illumination.

Power Conditioning and Interruptions

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

Warning! Connecting the imager to live power ("hot plugging") may damage the electronic components of the imager.

A clean and stable power source is required for the imager. Momentary power interruptions or fluctuations put the imager into Power Off mode.

AC Characteristics

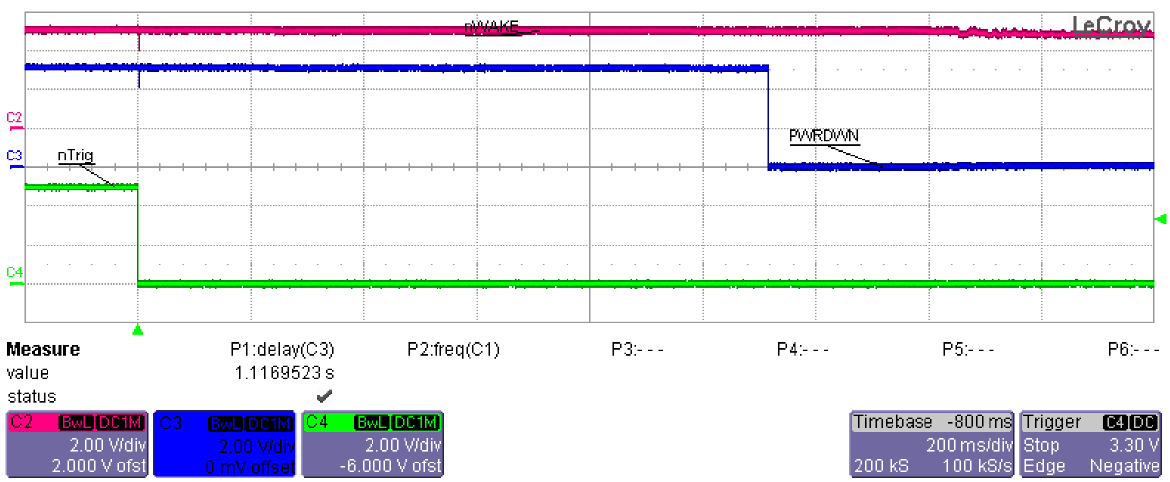
The following diagrams indicate the typical timing for the Power-up and Power-off.

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

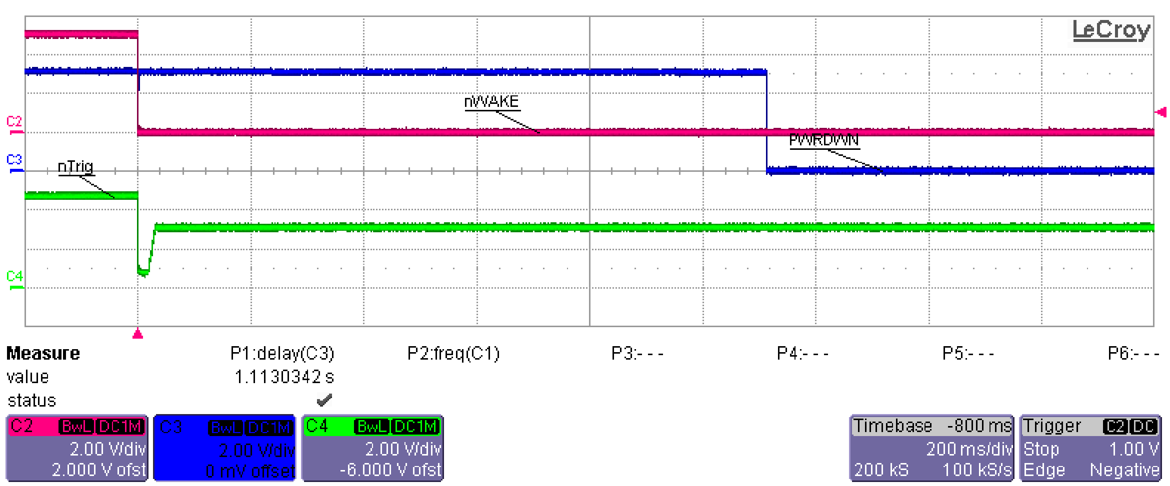
Power Up From Power Off State (Low Power Mode)*

The PWRDWN signal goes low ~1.1ms after the wake up event occurs, indicating that the device is powered up and ready to start scanning.

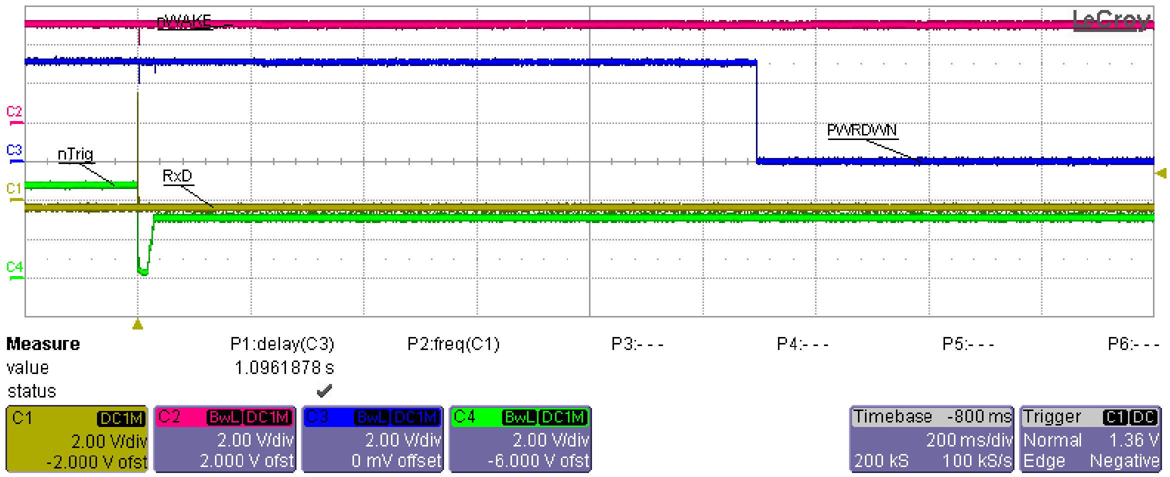
nTrig - Activating the trigger*



nWake - Toggling nWake*



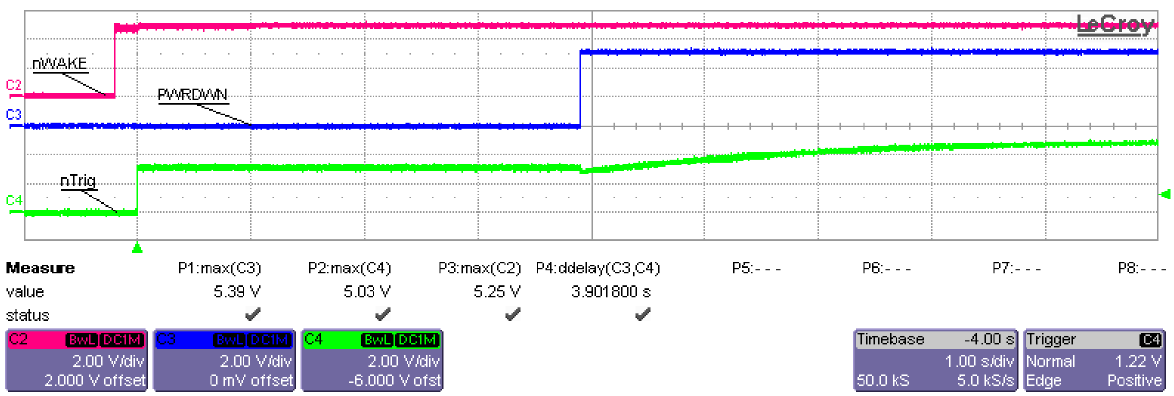
Tx - Sending data from the host*



*Note: * The following settings were used to capture the above plots: DEFALT;TERMID0;TRGLPT2;232LPT2;TRGMOD2.*

*Power Off Timing (Low Power Mode)**

After nWAKE and nTRIG are released it takes about 6 seconds for the PWRDWN signal to go high (hardware time-out) with the lowest setting for TRGLPT (TRGLPT1 - low power time-out of 1 second). Below is a representation of the power off sequence.



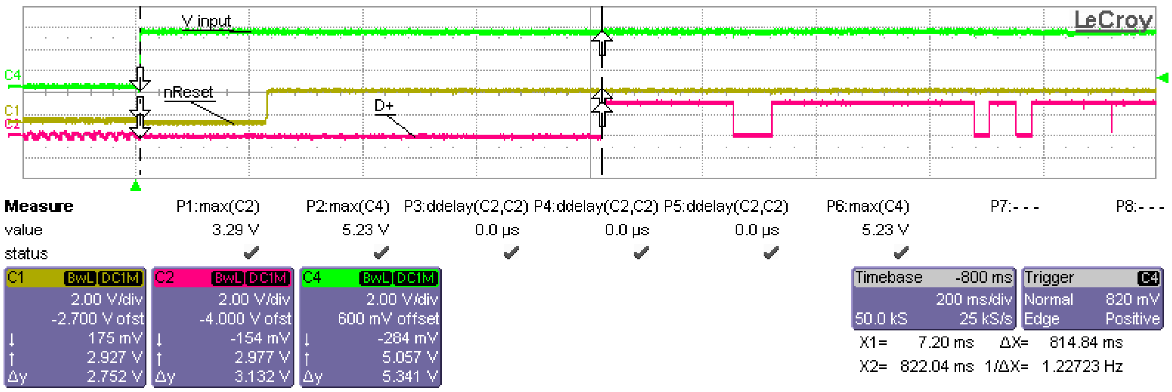
* The following settings were used to capture the above plots: DEFALT;TERMID0;TRGLPT1;TRGMOD2.

USB Enumeration Timing

Note: USB enumeration timing varies depending on the host.

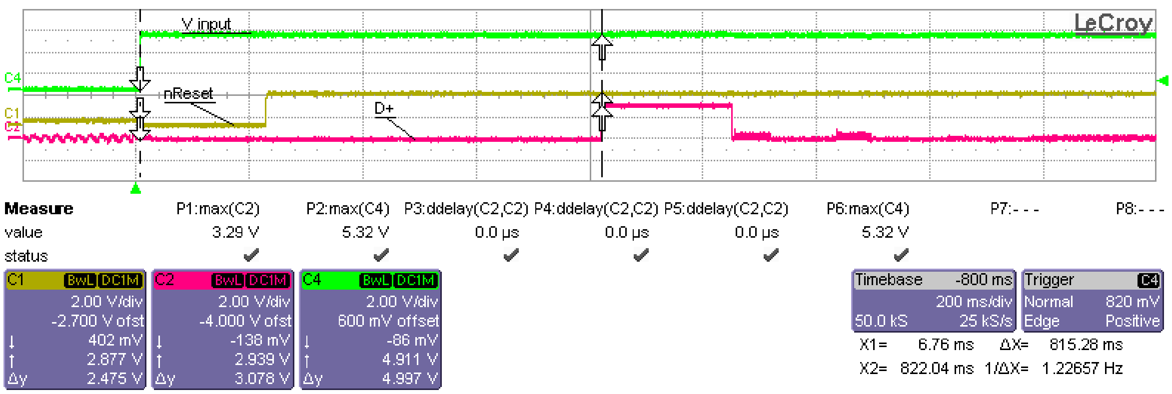
USBSPD0 -- Full Speed

Showing Vin, nRESET and D+.



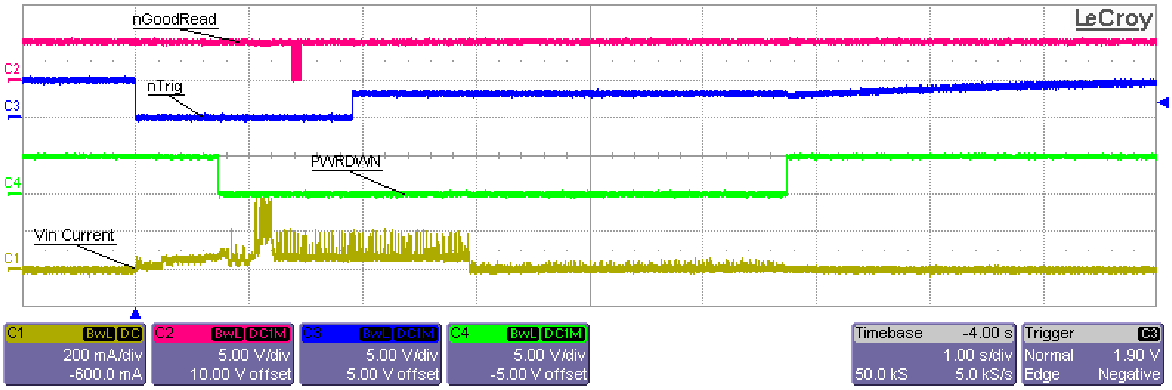
USBSPD1 -- High Speed

Showing Vin, nRESET and D+.

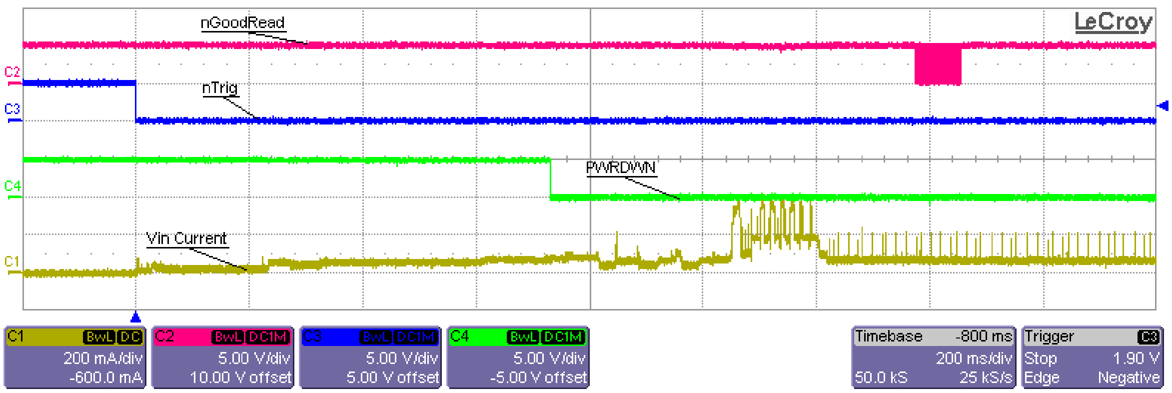


Interleaved Mode

Typical current profile from power up to power off - showing Vin current, nTRIG, nGOODREAD, PWRDWN



Typical current profile from power up - showing Vin current, nTRIG, nGOODREAD, PWRDWN - ZOOMED in



Environmental Specifications

Parameter	Specification
Temperature Ranges (non-condensing):	
Operating	-13° F to 122° F (-25° C to 50° C)
Storage	-40° F to 158° F (-40° C to 70° C)
Humidity (Operating and Storage)	Up to 95% RH, non-condensing at 122° F (50° C)
Shock	The Image Scanning Engine optics modules function properly after being subjected to 18 shocks of 2,000 Gs for 0.7msec and 18 shocks of 2,500 Gs for 0.7 msec at 73.4° F (23° C) applied via the mounting surface.
Vibration	The Image Scanning Engine module withstands a sinuosity vibration of 0.20" (5.1mm) p-p displacement from 5Hz to 20Hz, 5G acceleration over a frequency range of 22Hz to 300Hz. The frequency sweep will be linear in one direction and will be 15 minutes in duration. The test will continue along each of 3 mutually perpendicular axes for a period of 2 hours per axis.
MTBF	Image 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.

4

Optics and Illumination

Sensor

Proprietary Color CMOS sensor with global shutter and 844 x 640 pixel resolution; 60 frames per second.

Illumination Wavelength

624 nm Red LED (B/W Sensor) or Broadspectrum White LED (Color Sensor).

Aiming Wavelength

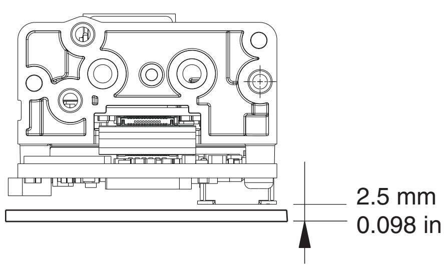
N5680/N5690 Imager: 528 nm visible green LED.

N5683/N5693 Imager: 650 nm high-visibility red laser; maximum output 1 mW Class 2 Laser.

Window Placement

Distance from Window

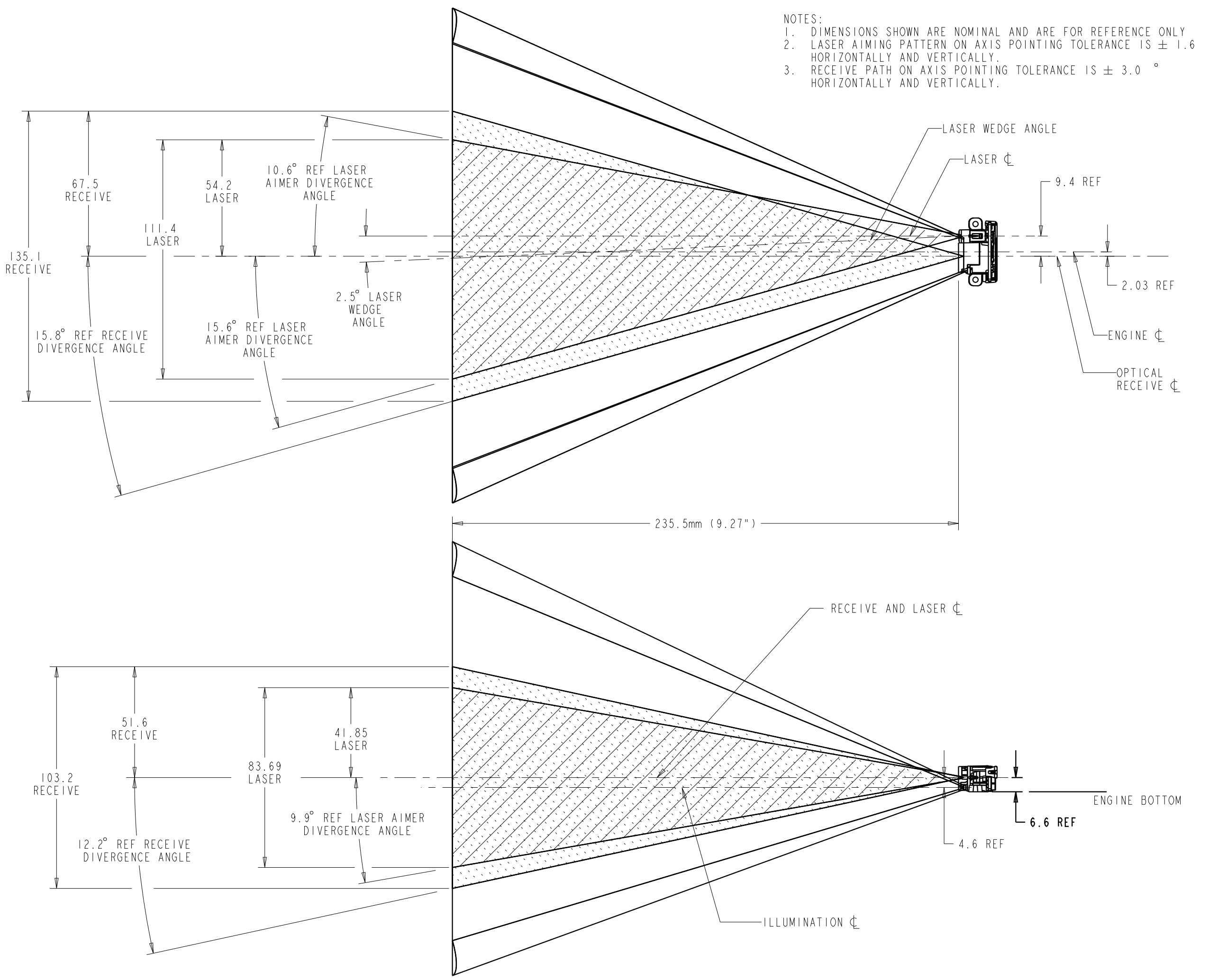
The window should be mounted as close as possible to the front of the Image Engine (parallel, no tilt). The distance measured from the front of the imager light gasket to the closest surface of the window should not exceed 1.0mm. Since unwanted reflections can occur at either surface and the window thickness can vary, the distance from the front of the imager light gasket to the far side of the glass should not exceed 2.5mm. For windows thicker than 1.5mm, the distance should be decreased so that the far side of the window does not exceed 2.5mm from the front surface of the engine. If the glass thickness is increased from 1.5mm to 2mm, the distance from the front of the engine to the near surface of the window needs to be decreased by 0.5mm to maintain the maximum distance of 2.5mm from the front of the engine to the far side of the window.



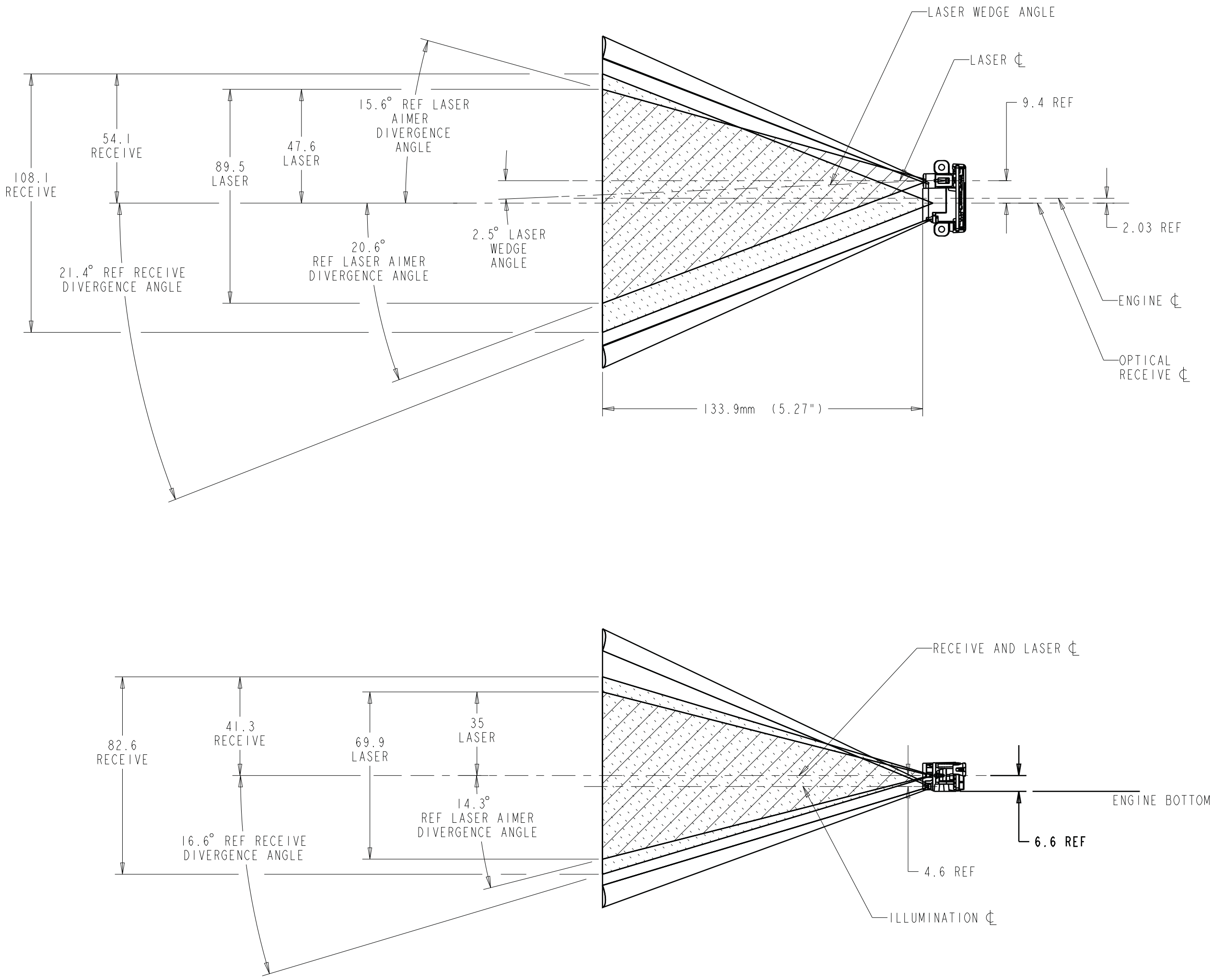
Window Size and Material Requirements

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. A minimum thickness of 0.03 inches (0.762 mm) is recommended for this window, with a maximum allowable thickness of 0.062 inches (1.57mm). These dimensions prevent reflections from the window that can be seen by the camera.
3. Window clear aperture shown in the following Window Size Diagram is for the location shown. The window size must increase as it is moved away from the optics module to accommodate the aiming and illumination envelopes shown.

N56XX Laser Aimer (ER lens at 9.27") Window Size Diagram



N56XX Laser Aimer (SR and HD lens at 5.27”) Window Size Diagram



Reflective Materials in the Imager’s Field of View

Highly reflective objects in the imager’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 imager into fixed mount applications, keep highly reflective machine components out of the imager’s field of view. If such components must be within the imager’s field of view, blacken or shield them to prevent this problem from occurring.

Bar Code Presentation Angle

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

Laser/LED Safety Standard for N56XX Engines

Please refer to Product Agency Compliance (page 2-1) for safety information and for incorporation of the warning label on the Class 2 Laser Product.

Depth of Field Specifications—Guaranteed

All distances are measured from the front of the engine, +23°C (+73°F), in the dark (0 lux) and using photographic quality codes.

Note: Values for HD and SR models are valid from revision AA and higher (see product label for revision). For older revision, see the depth of field specifications in the N56XX Integration Manual Rev F (P/N N56XX-IM Rev F).

Guaranteed—Red Illumination

Monochrome and monocolor sensors.

Focus	**High Density (HD)**		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/cm)**	**Delta (in/cm)**
3 mil C39	1.5 (3.8)	4.1 (10.5)	2.6 (6.7)
5 mil C39	1.6 (4.1)	5.1 (13.0)	3.5 (8.9)
10 mil C39	1.7 (4.2)	7.3 (18.6)	5.7 (14.4)
15 mil C39	1.2 (3.1)	10.6 (27.0)	9.4 (23.8)
7.5 mil C128	1.1 (2.9)	5.0 (12.7)	3.9 (9.8)
100% UPC	1.8 (4.7)	7.2 (18.3)	5.3 (13.6)
5 mil PDF417	1.5 (3.8)	4.1 (10.5)	2.7 (6.8)
10 mil PDF417	1.5 (3.9)	5.9 (14.9)	4.3 (11.0)
5 mil Data Matrix	2.0 (5.0)	3.3 (8.3)	1.3 (3.2)
10 mil Data Matrix/Aztec	1.1 (2.9)	4.6 (11.7)	3.4 (8.7)
10 mil QR	1.0 (2.5)	4.9 (12.4)	3.9 (9.8)
20 mil QR	2.0 (5.0)	7.5 (19.1)	5.5 (14.1)

Focus	**Standard Range (SR)**		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/cm)**	**Delta (in/cm)**
5 mil C39	2.3 (5.9)	7.0 (17.7)	4.6 (11.8)
10 mil C39	1.0 (2.6)	15.6 (39.5)	14.5 (36.9)
15 mil C39	1.4 (3.5)	21.7 (55.1)	20.3 (51.5)
20 mil C39	2.4 (6.1)	22.0 (55.8)	19.6 (49.7)
7.5 mil C128	1.4 (3.6)	8.0 (20.4)	6.6 (16.8)
100% UPC	1.9 (4.9)	16.0 (40.8)	14.1 (35.9)
5 mil PDF417	2.7 (6.8)	4.9 (12.5)	2.2 (5.7)
10 mil PDF417	1.8 (4.6)	10.7 (27.1)	8.9 (22.5)
10 mil Data Matrix/Aztec	2.1 (5.3)	7.4 (18.9)	5.3 (13.6)
20 mil Data Matrix	2.2 (5.7)	13.3 (33.8)	11.1 (28.1)
10 mil QR	1.8 (4.6)	7.0 (17.9)	5.2 (13.3)
20 mil QR	1.5 (3.8)	14.6 (37.2)	13.1 (33.4)

Focus	Extended Range (ER)		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/ cm)**	**Delta (in/cm)**
5 mil C39/128	5.8 (14.7)	8.8 (22.4)	3.0 (7.6)
7.5 mil C39/128	4.4 (11.2)	13.0 (33.2)	8.6 (21.8)
10 mil C39/128	3.2 (8.1)	16.1 (40.9)	12.9 (32.8)
15 mil C39/128	2.0 (5.1)	19.0 (48.3)	17.0 (43.2)
20 mil C39/128	3.1 (7.9)	22.8 (57.9)	19.7 (50.0)
100% UPC	2.8 (7.1)	19.0 (48.3)	16.2 (41.2)
5 mil PDF417	6.1 (15.5)	7.4 (18.8)	1.3 (3.3)
6.7 mil PDF417	4.7 (11.9)	9.8 (24.9)	5.1 (13.0)
10 mil PDF417	2.4 (6.1)	14.9 (37.8)	12.5 (31.8)
10 mil Data Matrix/Aztec	5.3 (13.5)	10.0 (25.4)	4.7 (11.9)
20 mil Data Matrix	4.0 (10.2)	16.0 (40.6)	12.0 (30.5)
10 mil QR	4.3 (10.9)	10.4 (26.4)	6.1 (15.5)
20 mil QR	2.1 (5.3)	17.7 (45.0)	15.6 (39.6)
32 mil Maxicode	4.2 (10.7)	17.7 (45.0)	13.5 (34.3)

Guaranteed—White Illumination

Monocolor sensor only.

Focus	High Density (HD)		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/ cm)**	**Delta (in/cm)**
3 mil C39	1.5 (3.8)	4.1 (10.5)	2.6 (6.7)
5 mil C39	1.6 (4.1)	5.1 (13.0)	3.5 (8.9)
10 mil C39	1.5 (3.9)	7.8 (19.9)	6.3 (16.0)
15 mil C39	1.5 (3.9)	10.3 (26.1)	8.7 (22.2)
7.5 mil C128	1.2 (3.0)	4.5 (11.5)	3.3 (8.4)
100% UPC	1.8 (4.7)	7.2 (18.3)	5.3 (13.6)
5 mil PDF417	1.5 (3.8)	4.1 (10.5)	2.7 (6.8)
10 mil PDF417	1.6 (4.0)	5.2 (13.2)	3.6 (9.2)
5 mil Data Matrix	2.0 (5.0)	3.3 (8.3)	1.3 (3.2)
10 mil Data Matrix/Aztec	1.1 (2.9)	4.7 (11.7)	3.4 (8.7)
10 mil QR	1.0 (2.6)	4.4 (11.1)	3.3 (8.5)
20 mil QR	2.0 (5.0)	7.5 (19.1)	5.5 (14.1)

Focus	Standard Range (SR)		
Symbology	Near Distance (in/cm)	Far Distance (in/ cm)	Delta (in/cm)
5 mil C39	2.2 (5.6)	6.7 (17.1)	4.5 (11.5)
10 mil C39	1.0 (2.5)	14.1 (35.8)	13.1 (33.3)
15 mil C39	1.3 (3.4)	20.7 (52.6)	19.4 (49.2)
20 mil C39	2.0 (5.5)	19.7 (50.9)	17.7 (45.4)
7.5 mil C128	1.4 (3.5)	7.7 (19.6)	6.3 (16.1)
100% UPC	1.9 (4.9)	13.9 (35.3)	12.0 (30.4)
5 mil PDF417	2.4 (6.2)	5.0 (12.7)	2.5 (6.4)
10 mil PDF417	1.8 (4.6)	10.3 (26.3)	8.5 (21.7)
10 mil Data Matrix/Aztec	1.9 (4.9)	7.1 (18.1)	5.2 (13.3)
20 mil Data Matrix	1.7 (4.4)	11.1 (28.3)	9.4 (23.9)
10 mil QR	1.6 (4.1)	6.4 (16.3)	4.8 (12.2)
20 mil QR	1.5 (3.7)	12.1 (30.7)	10.6 (27.0)

Focus	Extended Range (ER)		
Symbology	Near Disance (in/ cm)	Far Distance (in/ cm)	Delta (in/cm)
5 mil C39/128	5.8 (14.7)	8.5 (21.6)	2.7 (6.9)
7.5 mil C39/128	4.4 (11.2)	12.2 (31.0)	7.8 (19.8)
10 mil C39/128	3.2 (8.1)	15.3 (38.9)	12.1 (30.7)
15 mil C39/128	2.0 (5.1)	18.3 (46.5)	16.3 (41.4)
20 mil C39/128	3.1 (7.9)	21.0 (53.3)	17.9 (45.5)
100% UPC	2.8 (7.1)	18.3 (46.5)	15.5 (39.4)
5 mil PDF417	6.1 (15.5)	7.2 (18.3)	1.1 (2.8)
6.7 mil PDF417	4.7 (11.9)	9.5 (24.1)	4.8 (12.2)
10 mil PDF417	2.4 (6.1)	14.5 (36.8)	12.1 (30.7)
10 mil Data Matrix/Aztec	5.3 (13.5)	9.7 (24.6)	4.4 (11.2)
20 mil Data Matrix	4.0 (10.2)	15.5 (39.4)	11.5 (29.2)
10 mil QR	4.3 (10.9)	9.7 (24.6)	5.4 (13.7)
20 mil QR	2.1 (5.3)	16.0 (40.6)	14.9 (37.8)
32 mil Maxicode	4.2 (10.7)	17.2 (43.7)	13.0 (33.0)

Depth of Field Specifications—Typical

All distances are measured from the front of the engine, +23°C (+73°F), 200/250 lux, and using photographic quality codes. Extended reading range active for Code 39 for HD and SR models.

Typical—Red Illumination

Monochrome and monocolor sensors.

Focus	**High Density (HD)**		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/cm)**	**Delta (in/cm)**
3 mil C39	1.2 (3.1)	4.5 (11.4)	3.3 (8.3)
5 mil C39	1.3 (3.4)	5.5 (13.9)	4.1 (10.4)
7.5 mil C128	0.8 (2.1)	5.4 (13.7)	4.6 (11.6)
5 mil PDF	1.2 (3.1)	4.3 (11.6)	3.1 (8.5)
5 mil Data Matrix	1.7 (4.4)	3.5 (8.9)	1.8 (4.6)

Focus	**Standard Range (SR)**		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/cm)**	**Delta (in/cm)**
5 mil C39	1.8 (4.7)	7.7 (19.6)	5.9 (14.9)
10 mil C39	0.6 (1.5)	17.2 (43.8)	16.6 (42.3)
100% UPC	1.5 (3.8)	17.0 (43.3)	15.6 (39.6)
5 mil PDF	2.0 (5.3)	5.1 (13.2)	2.7 (7.9)
10 mil Data Matrix	1.5 (3.9)	7.8 (19.9)	6.3 (16.0)

Focus	**Extended Range (ER)**		
Symbology	**Near Distance (in/cm)**	**Far Distance (in/cm)**	**Delta (in/cm)**
10 mil C39/128	2.4 (6.1)	17.4 (44.2)	15.0 (38.1)
15 mil C39/128	1.5 (3.8)	21.6 (54.9)	20.1 (51.1)
100% UPC	2.4 (6.1)	21.0 (53.3)	18.6 (47.2)
10 mil PDF417	2.2 (5.6)	15.6 (39.6)	13.4 (34.0)
32 mil Maxicode	3.1 (7.9)	20.8 (52.8)	17.7 (44.9)

Typical—White Illumination

Monocolor sensors only.

Focus	High Density (HD)		
Symbology	Near Distance (in/cm)	Far Distance (in/cm)	Delta (in/cm)
3 mil C39	1.2 (3.1)	5.7 (14.4)	3.3 (8.3)
5 mil C39	1.3 (3.4)	5.5 (13.9)	4.1 (10.4)
7.5 mil C128	0.9 (2.2)	4.8 (12.2)	3.9 (10.0)
5 mil PDF	1.2 (3.1)	4.3 (11.6)	3.1 (8.5)
5 mil Data Matrix	1.7 (4.4)	3.5 (8.9)	1.8 (4.6)

Focus	Standard Range (SR)		
Symbology	Near Distance (in/cm)	Far Distance (in/cm)	Delta (in/cm)
5 mil C39	1.8 (4.5)	7.6 (19.4)	5.9 (14.9)
10 mil C39	0.6 (1.5)	16.4 (41.7)	15.8 (40.2)
100% UPC	1.5 (3.8)	7.5 (19.2)	13.9 (35.4)
5 mil PDF	1.6 (4.8)	5.1 (13.2)	3.1 (8.4)
10 mil Data Matrix	1.4 (3.5)	7.6 (19.3)	6.2 (15.8)

Focus	Extended Range (ER)		
Symbology	Near Distance (in/cm)	Far Distance (in/cm)	Delta (in/cm)
10 mil C39/128	2.4 (6.1)	16.8 (42.7)	14.4 (36.6)
15 mil C39/128	1.5 (3.8)	21.6 (54.9)	20.1 (51.1)
100% UPC	2.4 (6.1)	21.0 (53.3)	18.6 (47.2)
10 mil PDF417	2.2 (5.6)	15.6 (39.6)	13.4 (34.0)
32 mil Maxicode	3.1 (7.9)	20.8 (52.8)	17.7 (44.9)

Field of View/Resolution

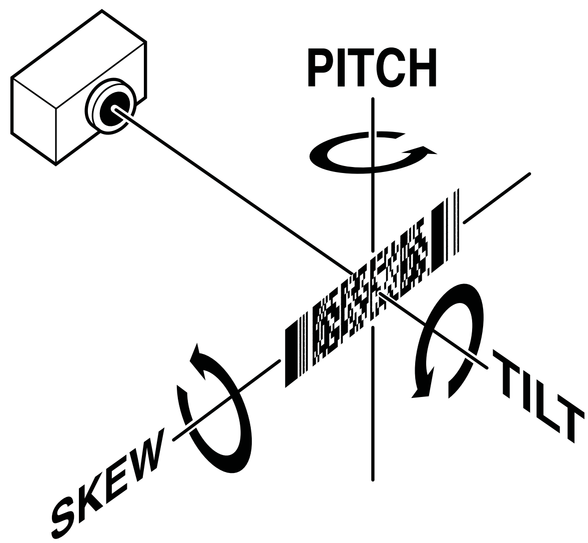
Focus	High Density (HD)	Standard Range (SR)	Extended Range (ER)
Horizontal Field Angle (degrees)	±20.7	±21.2	±15.8
Vertical Field Angle (degrees)	±16.1	±16.5	±12.2

Note: DPI can be calculated based on the following formula:
Horizontal DPI = 840 pixels/width of horizontal field of view (inches)
Vertical DPI = 640 pixels/width of vertical field of view (inches)

Bar Code Reading Angles

Note: The following angles are not cumulative.

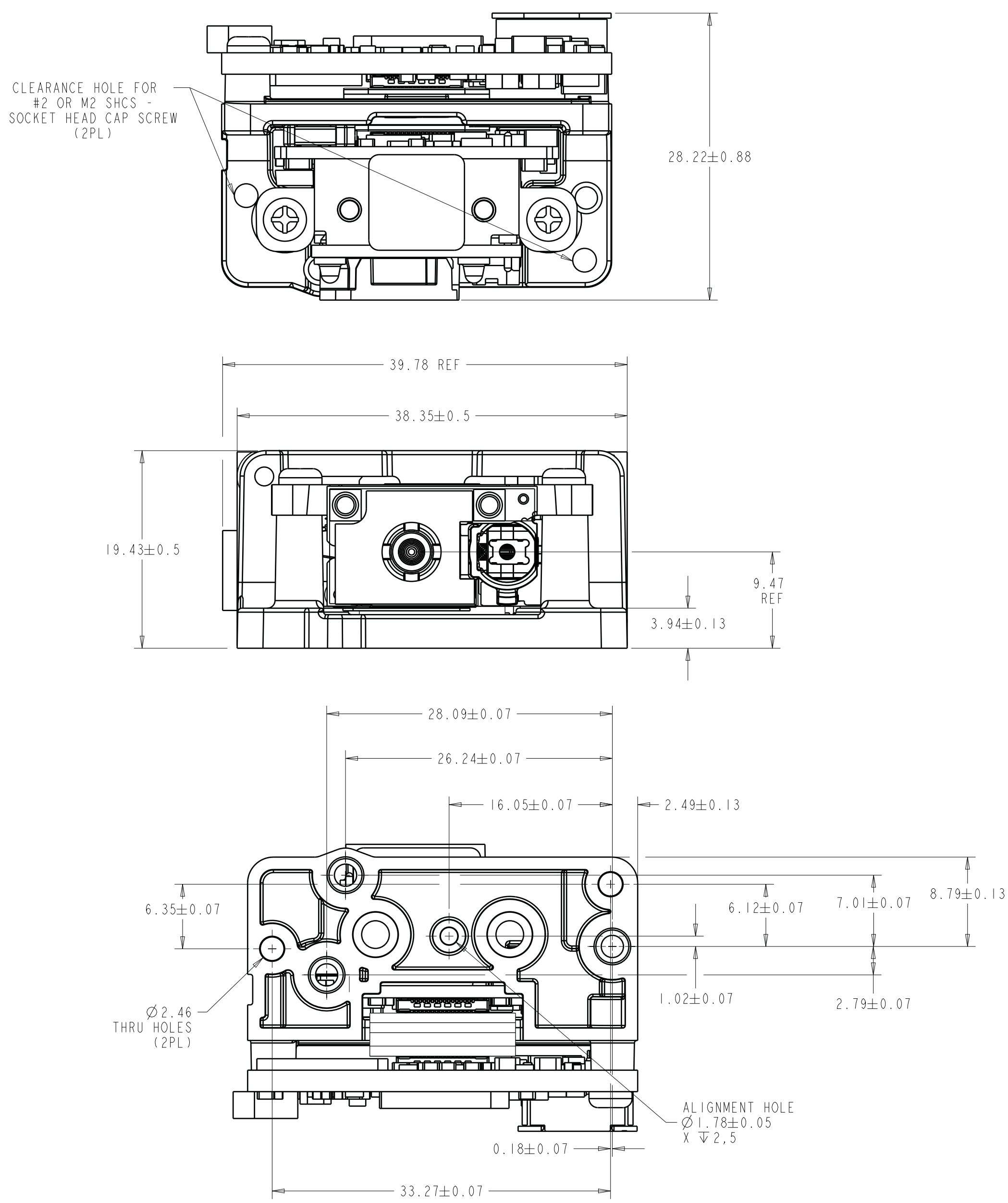
Parameter	Specification
Specular Reflection Angle	±5°
Pitch	±45 degrees typical for 2.9-inch wide 15-mil C128 (uncontrolled, can be demand printed) ±45 degrees typical for MaxiCode (SR, ER at 6.3”, HD at 4.8”)
Skew	±65 degrees typical for 1-inch tall 15-mil C128 (uncontrolled, can be demand printed) ±45 degrees typical for MaxiCode (SR, ER at 6.3”, HD at 4.8”)
Tilt	360° (HD, SR at 6.3”, and ER at 7.3”) 1D code also depends on length of code - up to 360° 2D code 360°



5 Mechanical Specifications

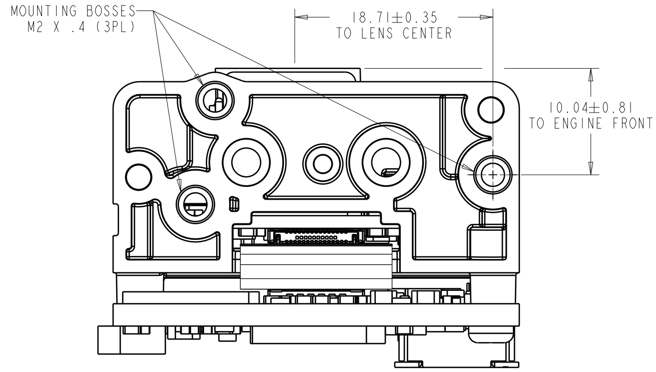
N56XX Engine Bracketed Mounting

The illustrations below show the mechanical mounting dimensions for the N56XX:



Units = mm

The illustration below shows the lens center dimensions for the N56XX:

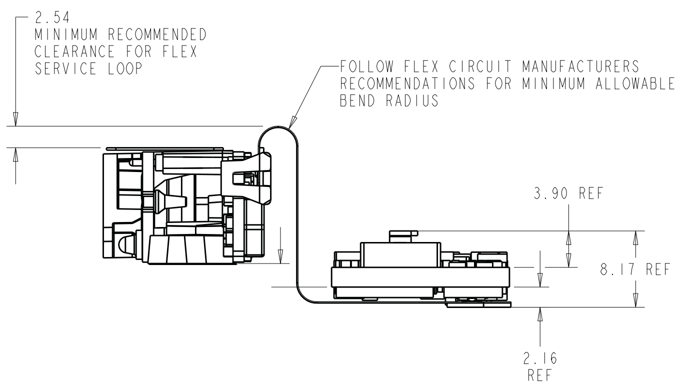


Units = mm

Note: M2 mounting screws should be sized so that they do not protrude above the mounting surface.

N56XX Unbracketed Mounting

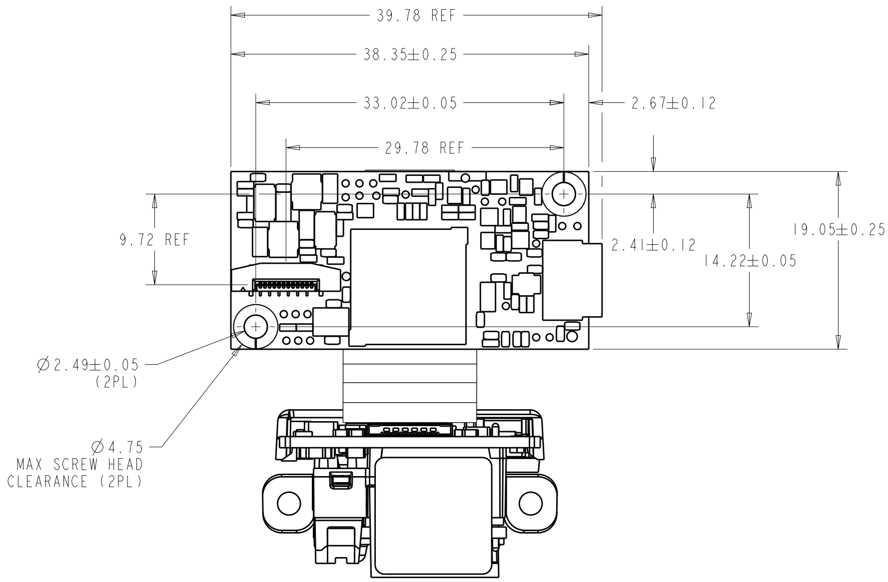
We recommend to not use a bending radius of less than 1.5 mm for single layer flex cables.



Units = mm

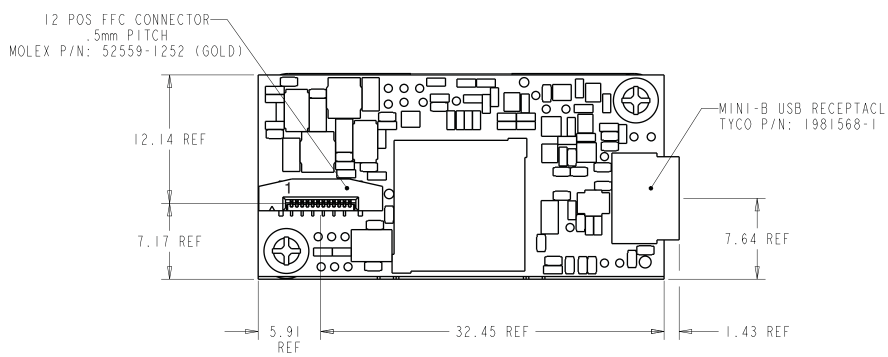
Note: Vertical location of PCB subassembly relative to the optics module is dependent on the integrator's requirements.

The illustration below shows the N56XX optics module, flex connector, and decoder board in a non-bracketed orientation:



Units = mm

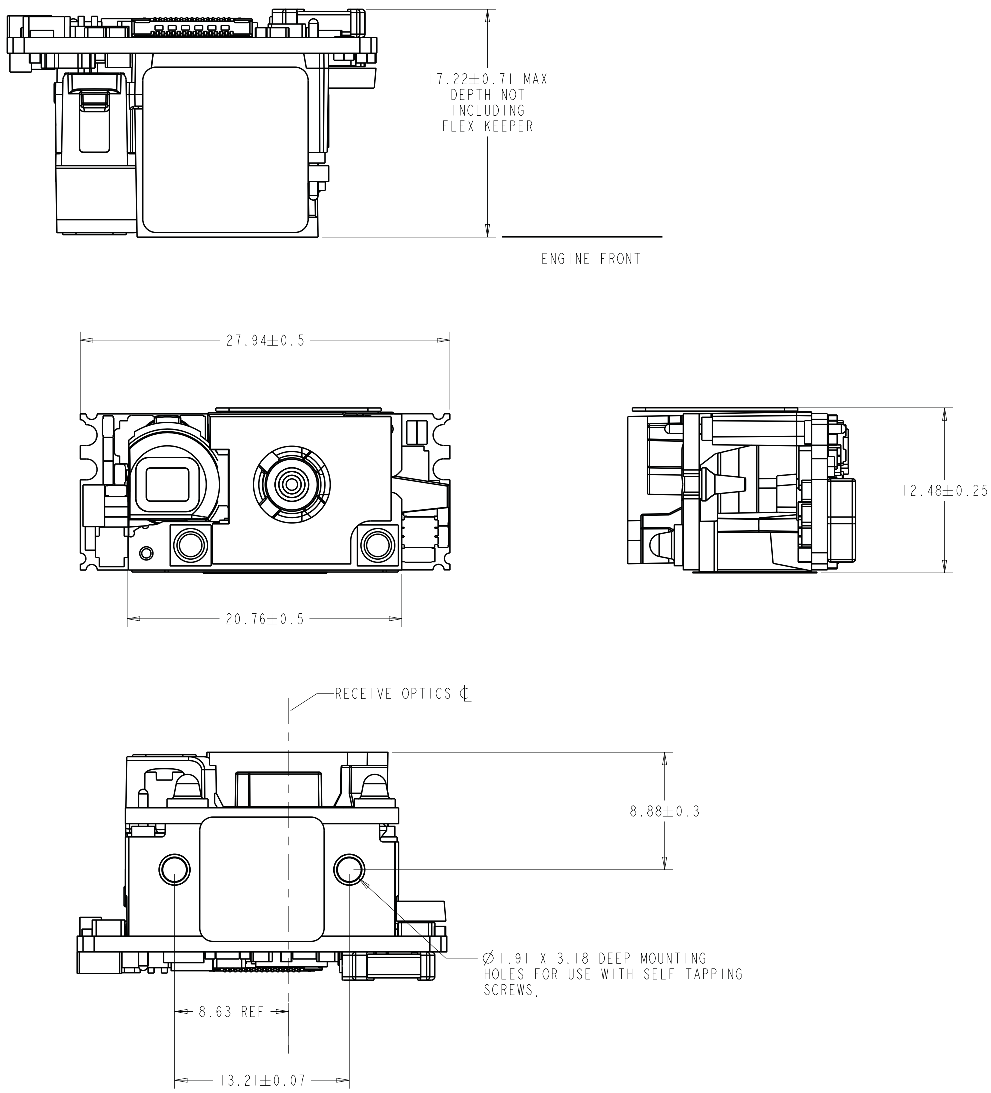
N56XX Connector Position



Units = mm

Mounting Configuration for N56XX (Laser Aimer) Optics Module without Ears

The illustration below shows a N56XX bottom flush mount with self tapping screws:

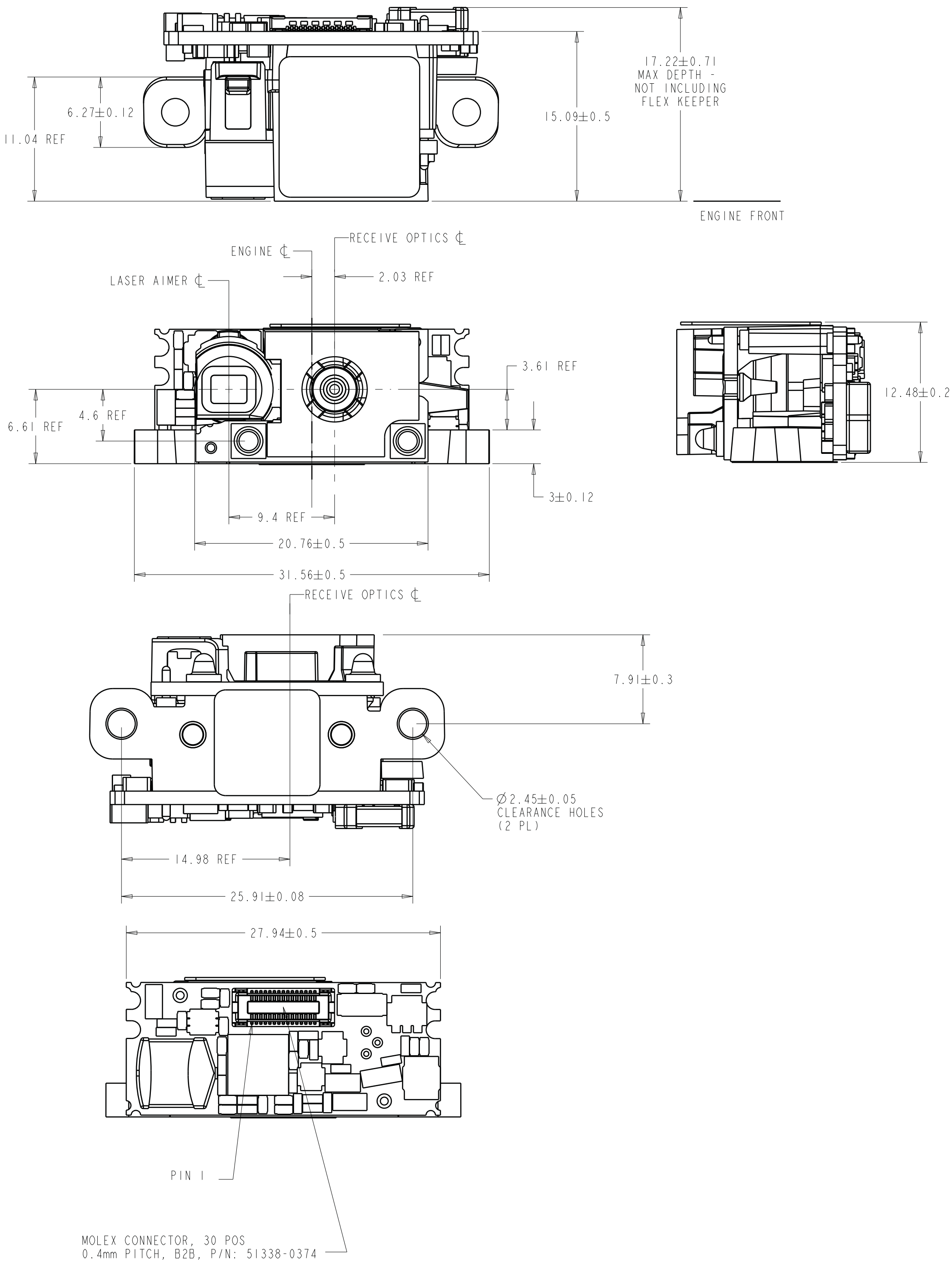


Note: Self-tapping screws are recommended at a torque of 2.02±0.6 KG-CM (1.75±0.5 In-LB). The recommended self-tapping screws are: Textron Plastite 48-2, #2-28 screw or Textron Delta Pt 22, M2.3 screw. Any screw should be tested to verify proper fit and performance with the module.

Units = mm

Mounting Configuration for N56XX (Laser Aimer) Optics Module with Ears

The illustration below shows the N56XX mounting tabs:

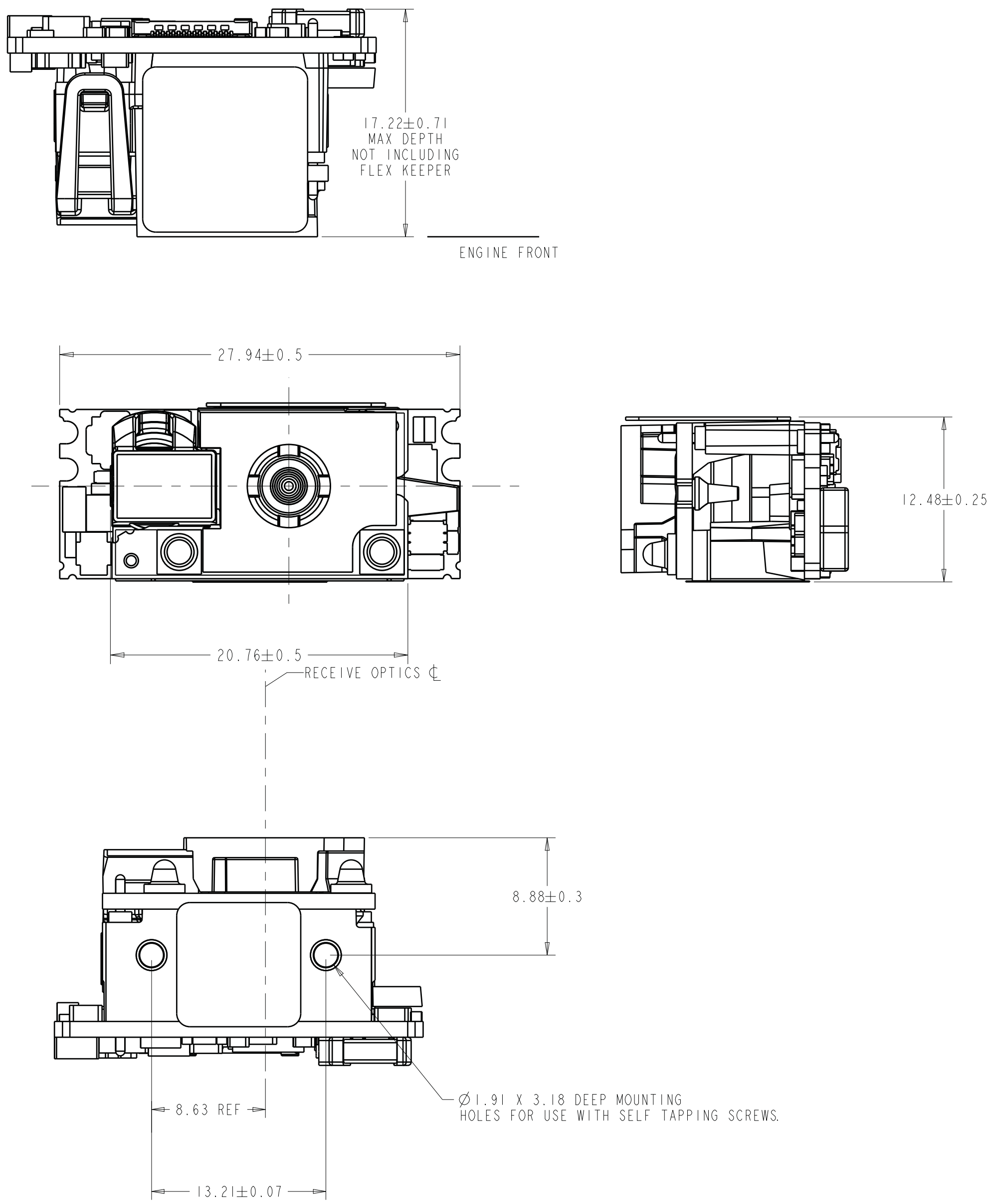


Units = mm

Note: *Lock washers (or some other method of preventing screw loosening) are recommended with any fastening method used.*

Mounting Configuration for N56XX (LED Aimer) Optics Module without Ears

The illustration below shows a N56XX bottom flush mount with self tapping screws:

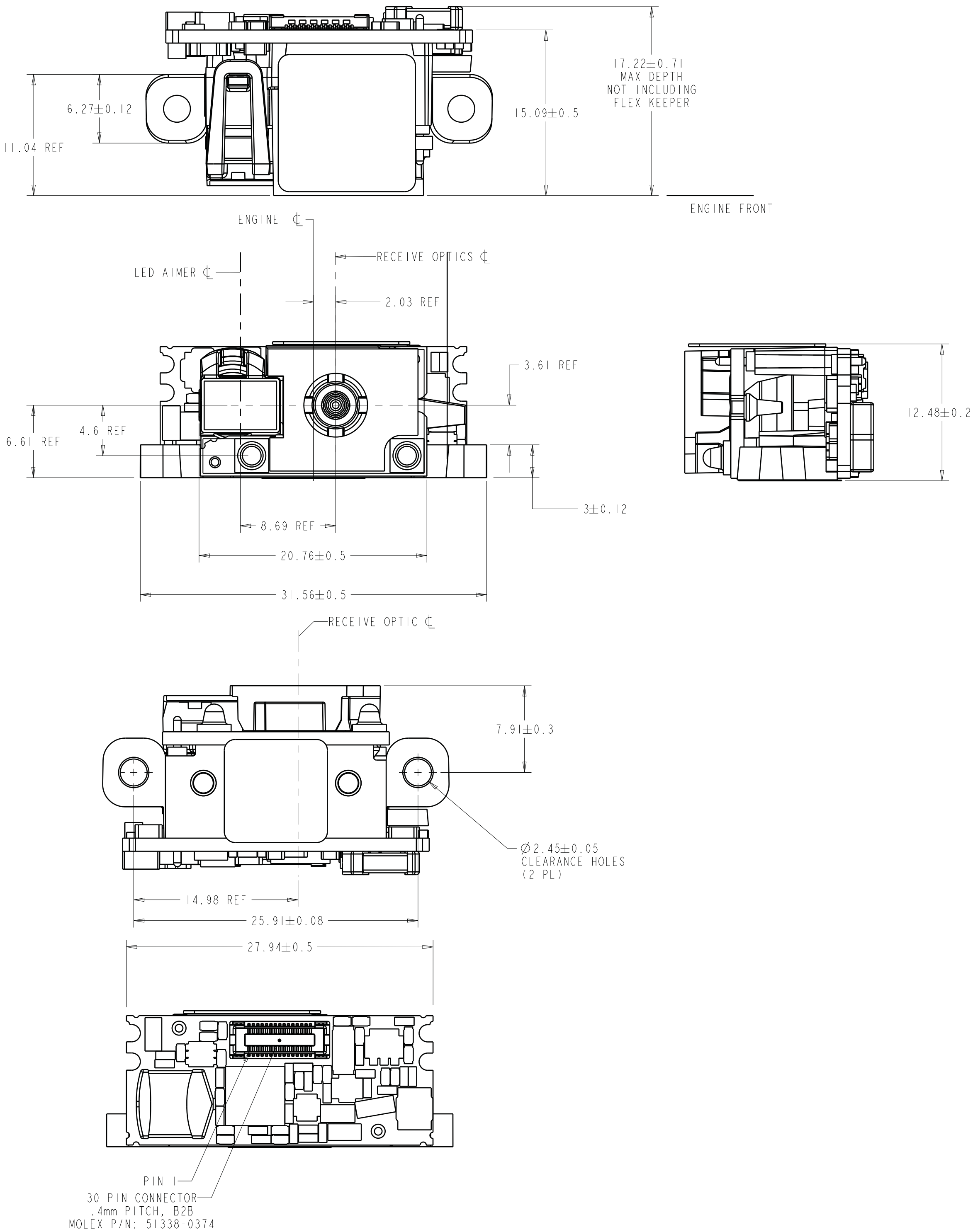


Note: Self-tapping screws are recommended at a torque of 2.02±0.6 KG-CM (1.75±0.5 In-LB). The recommended self-tapping screws are: Textron Plastite 48-2, #2-28 screw or Textron Delta Pt 22, M2.3 screw. Any screw should be tested to verify proper fit and performance with the module.

Units = mm

Mounting Configuration for N56XX (LED Aimer) Optics Module with Ears

The illustration below shows the N56XX mounting tabs:



Units = mm

Note: Lock washers (or some other method of preventing screw loosening) are recommended with any fastening method used.

Protecting the Engine from Movement

Care should be taken to mount the Image 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 Image 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.

Optics Module Interface Connector

The Engine Interface Connector is a 0.4mm board-to-board Molex connector 51338-0374. See the Molex catalog for details.

Host Interface Connector

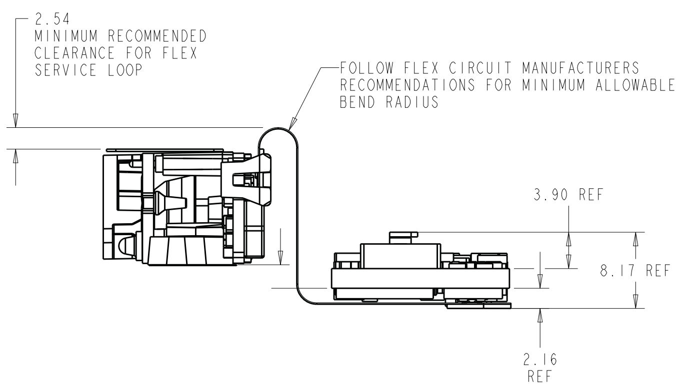
The host interface connector is a Molex 52559-1252 (Gold), 12 pin, 0.02 in. (.5mm) pitch vertical surface mount FFC/FPC connector. See Molex catalog for details.

Decoder Board Interface Connector

The connector used to mate the imager flex circuit to the decoder board is a Molex 51338-0374. This is the receptacle side of a board-to-board connector pair. The 55909-0374 is mounted on the flex circuit. See Molex catalog for details.

Optics Module to Decoder Board Flex Circuit

The imager flex circuit is a custom component. There are two flex circuit options available; one for bracketed and non-bracketed applications and a longer one for non-bracketed applications only.

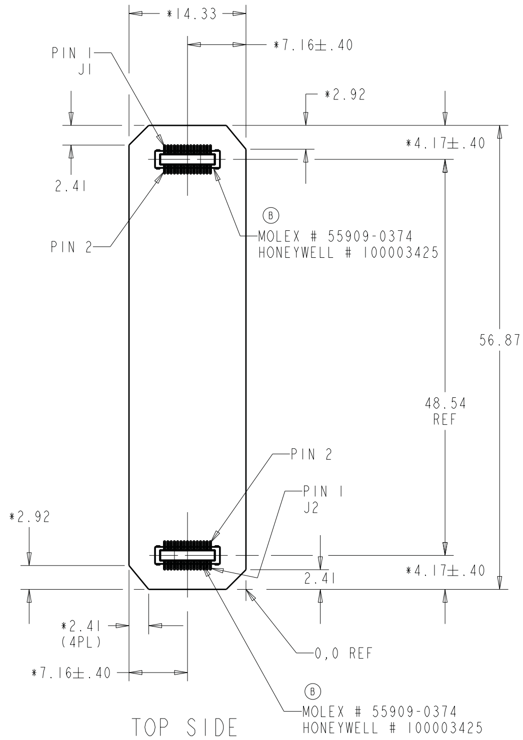


Units = mm

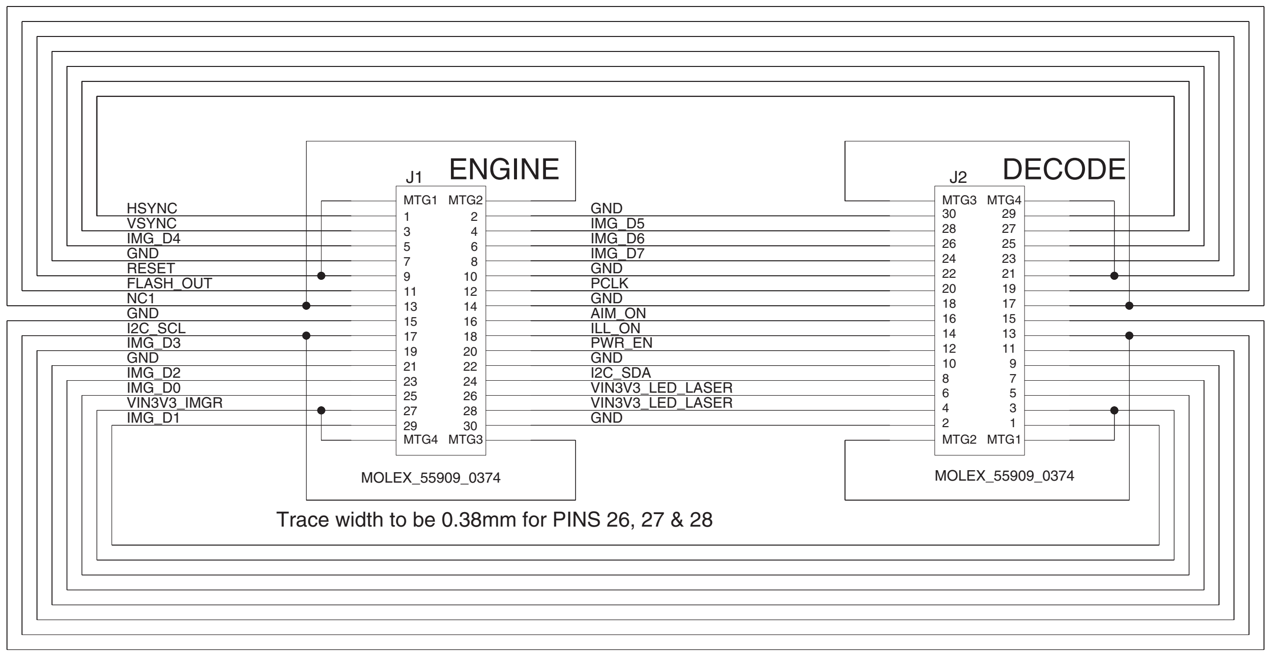
Warning! The above illustration shows the recommended orientation in which the flex comes across the decoder board. This orientation allows the pixel clock to sit between two grounds, which helps with EMI.

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 image engine.

The standard flex circuit/connector assembly, which is approximately .95 inches (24.00 mm) in length is illustrated below. This option is available in bracketed configurations only.



Units = mm



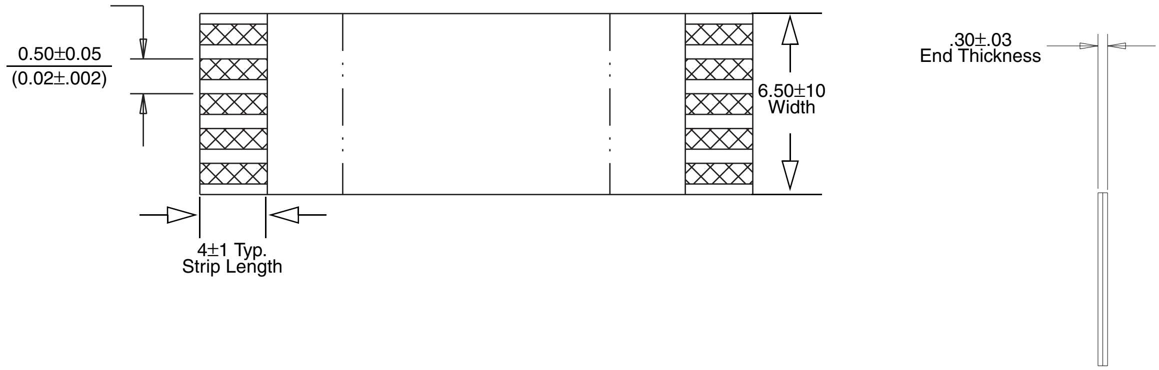
THIS FLEX STRIP IS NOT SYMMETRIC

ENGINE PINOUT

HSYNC_1V8	1	2	GND
VSYNC_1V8	3	4	IMG_D5_1V8
IMG_D4_1V8	5	6	IMG_D6_1V8
GND	7	8	IMG_D7_1V8
RESET	9	10	GND
FLASH_CTRL18	11	12	PCLK_1V8
N/C	13	14	GND
GND	15	16	AIM_ON
I2C_SCL	17	18	ILL_ON
IMG_D3_1V8	19	20	PWR_EN
GND	21	22	GND
IMG_D2_1V8	23	24	I2C_SDA
IMG_D0_1V8	25	26	VIN3V3_LED_LASER
VIN3V3_IMGR	27	28	VIN3V3_LED_LASER
IMG_D1_1V8	29	30	GND

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	0.01 in. (0.25 mm)
Copper Weight	1 oz. (28.4 g)

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

Also see Design Considerations / Test Results on page A-1.

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 N56XX is no exception.

The N56XX 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 N56XX product is comprised of two major components, each with its own base frequencies.

The Decoder Board

The decoder board is based on a 24KHz crystal in the decoder board section that is used to generate a 400MHz clock for the core and a 133MHz clock for the memory interface. 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 typical image capture and decode process. There are three switching power supplies on the decoder boards that operate between 1MHz and 1.6MHz.

The Image Engine

The imager runs based on a 48MHz pixel clock frequency. To reduce EMI, the pixel clock spread is determined by the spread setting of the spread spectrum device. The spread spectrum provides the 48MHz output with a down spread of -2% (default).

Design Considerations

There are several considerations that must be made when designing a system to utilize the N56XX. When integrating the N56XX 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 N56XX uses flex strips/flex circuits for its interconnect to the host system and between the decoder board and image engine. 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 N56XX is designed to meet EN55022 B emission levels. The N56XX has been tested for compliance using representative models.

Model 1 (page A-2) is based on a cabled platform (RS232):

- The N56XX is mounted on the Honeywell demo board.
- The demo board is connected to the host via an 8 foot long, coiled, TTL level 232 cable (42206422-01E).
- The N56XX is operating in TTL serial-232 mode.

Model 2 (page A-6) is an alternate cabled platform (USB Full Speed):

- The N56XX is mounted on the Honeywell demo board
- The demo board is connected to the host via a Honeywell 8 foot long, straight, USB cable (42206161-01E). A clamp-on ferrite (Fair-Rite p/n 0444164281) was added to USB cable on this configuration.
- The N56XX is operating in USB mode (USBSPD0).

Model 3 (page A-10) is an alternate cabled platform (USB High Speed):

- The N56XX is mounted and connected to the Honeywell demo board through the 12-pin flex.
- The engine is connected to the host via an 6 foot long, straight USB-A/Micro-B cable (Mouser 538-68784-0003). A clamp-on ferrite (Fair-Rite p/n 0431173951) was added to USB cable on this configuration.
- The N56XX is operating in USB mode (USBSPD1).

The following pages document the test results.

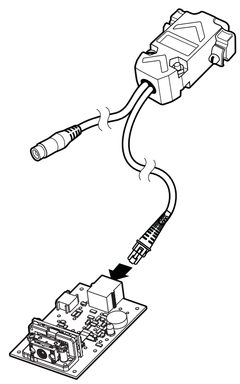
Note: The charts show the quasi-peak values, which are used to determine pass/fail, while the graphs show maximum hold values.

LEGEND

Maximum Hold
Instantaneous

Model 1: Corded Unit in TTL-232 Mode (RJ45/RS232)

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



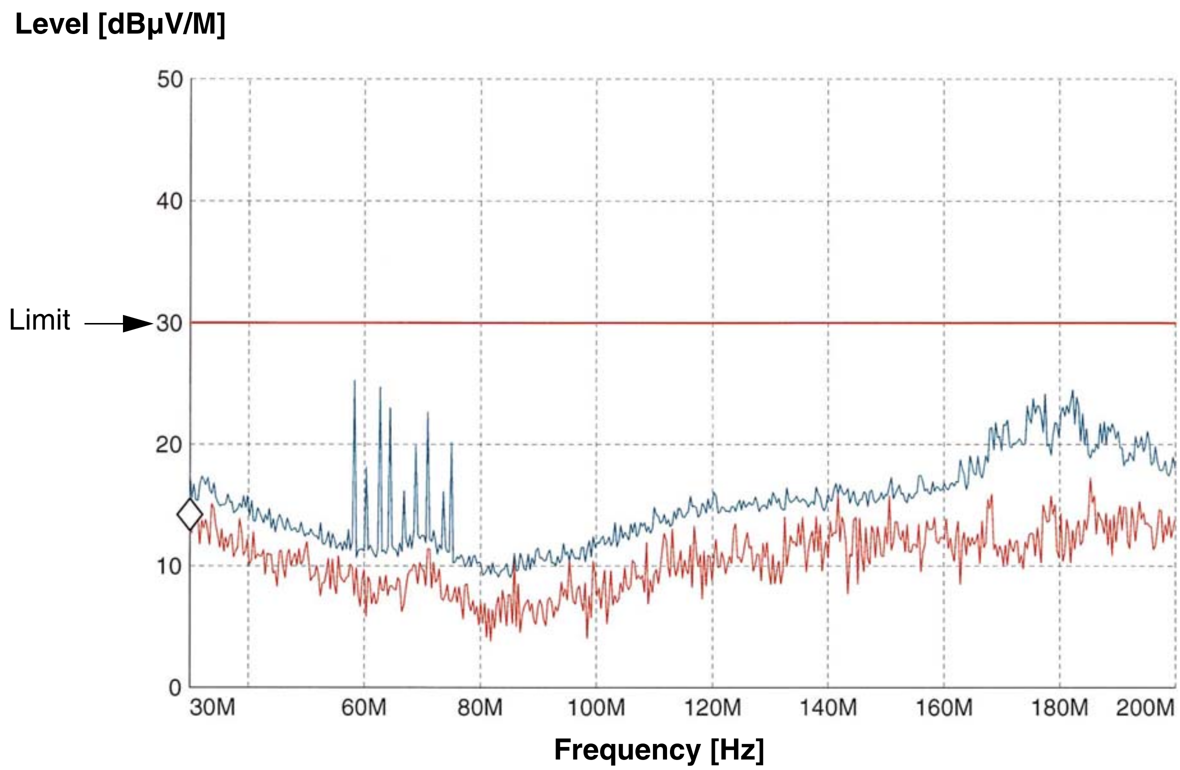
This system passed FCC class B limits at all tested frequencies. The test results are shown in the following charts.

Model 1 - Radiated Emissions Measurements 30-2000 MHz

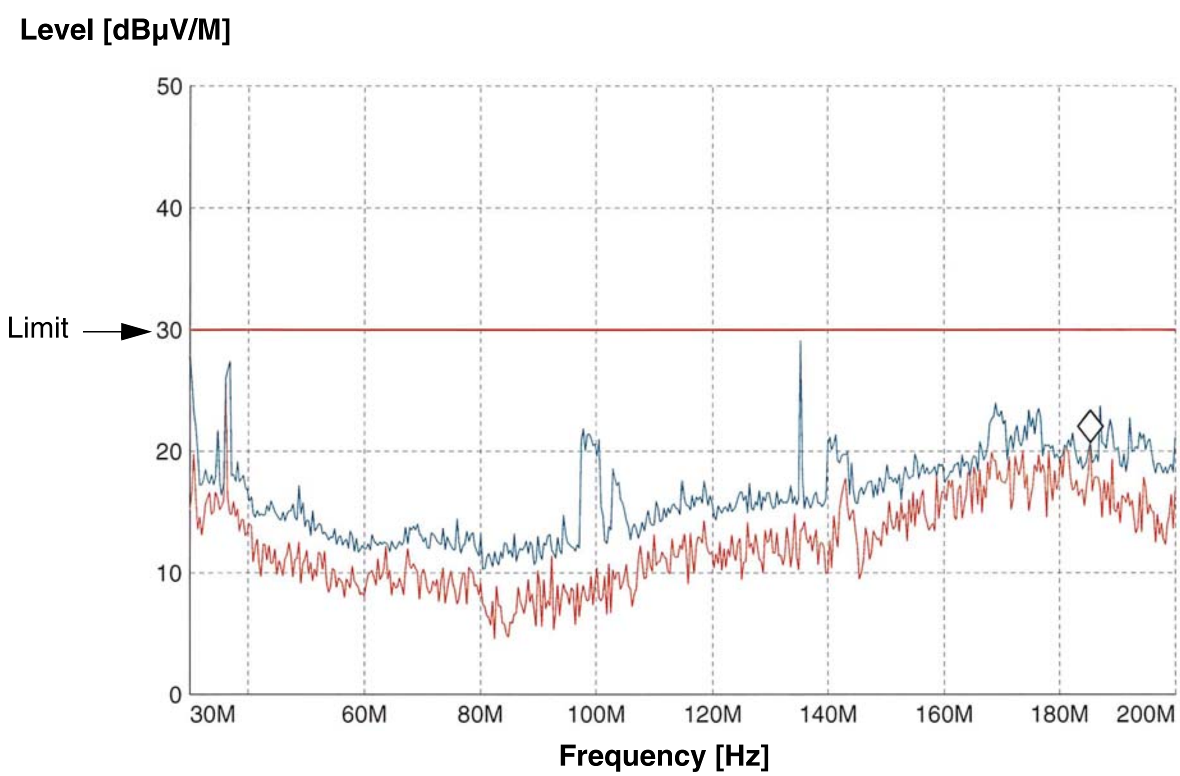
Frequency (MHz)	Antenna Height (Meters)	Antenna Polarity	EUT Angle (Degrees)	Corrected Reading* [db(μV/m)]	Margin	CFR 47 Part 15, EN55022 Class “B”, 10 Meter Limit [db(μV/m)]
35.71	1.00	V	291	23.8	-6.2	30
111.96	1.00	V	305	18.9	-11.1	30
167.98	1.03	V	229	23.2	-6.8	30
35.71	1.00	V	291	23.8	-6.2	30
111.96	1.00	V	305	18.9	-11.1	30
167.98	1.03	V	229	23.2	-6.8	30
666.00	2.40	V	214	34.5	-2.5	37
844.81	2.23	V	361	27.1	-9.9	37
960.11	1.00	V	361	29.0	-8.0	37
665.99	4.00	H	345	26.6	-10.4	37
847.50	2.89	H	75	26.8	-10.2	37
958.64	4.00	H	360	28.7	-8.3	37

* All readings are quasi-peak unless stated otherwise.

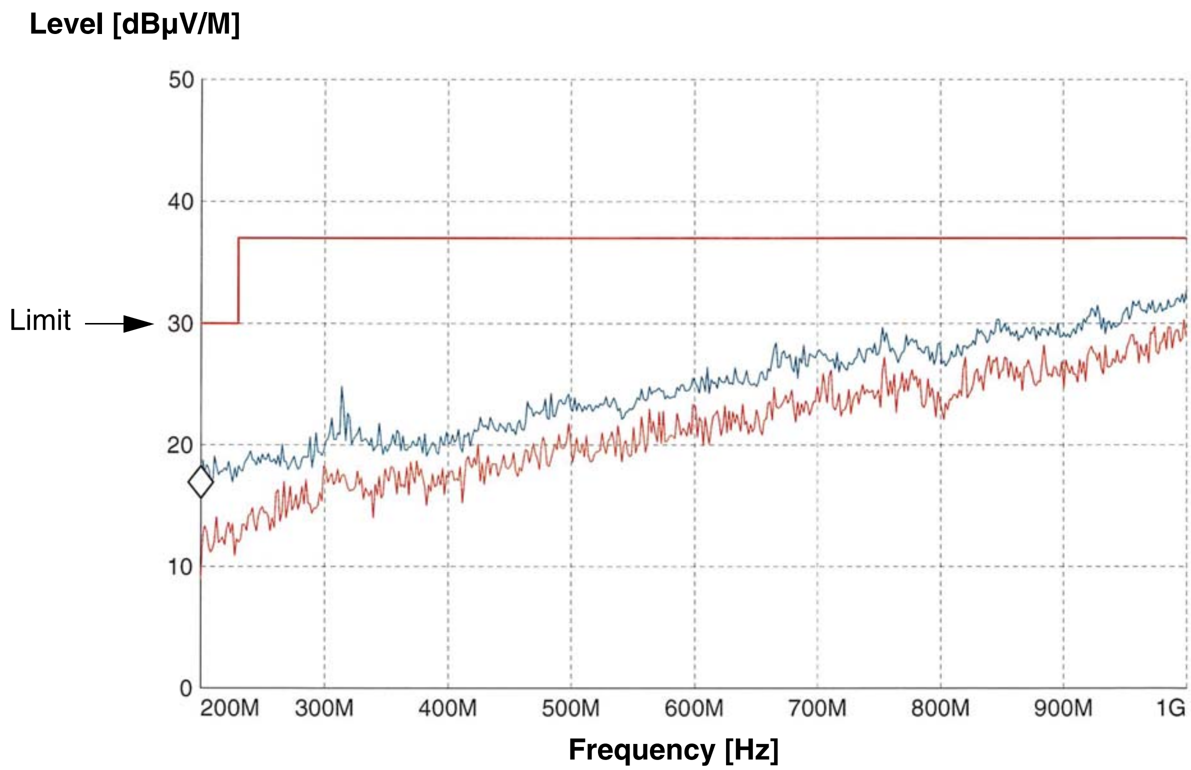
** Data gathered above 1000 MHz was at a 3m antenna distance with RF absorbing material on the ground plane per EN55022 A1:2007. No significant amplitudes across the frequency spectrum were measured.



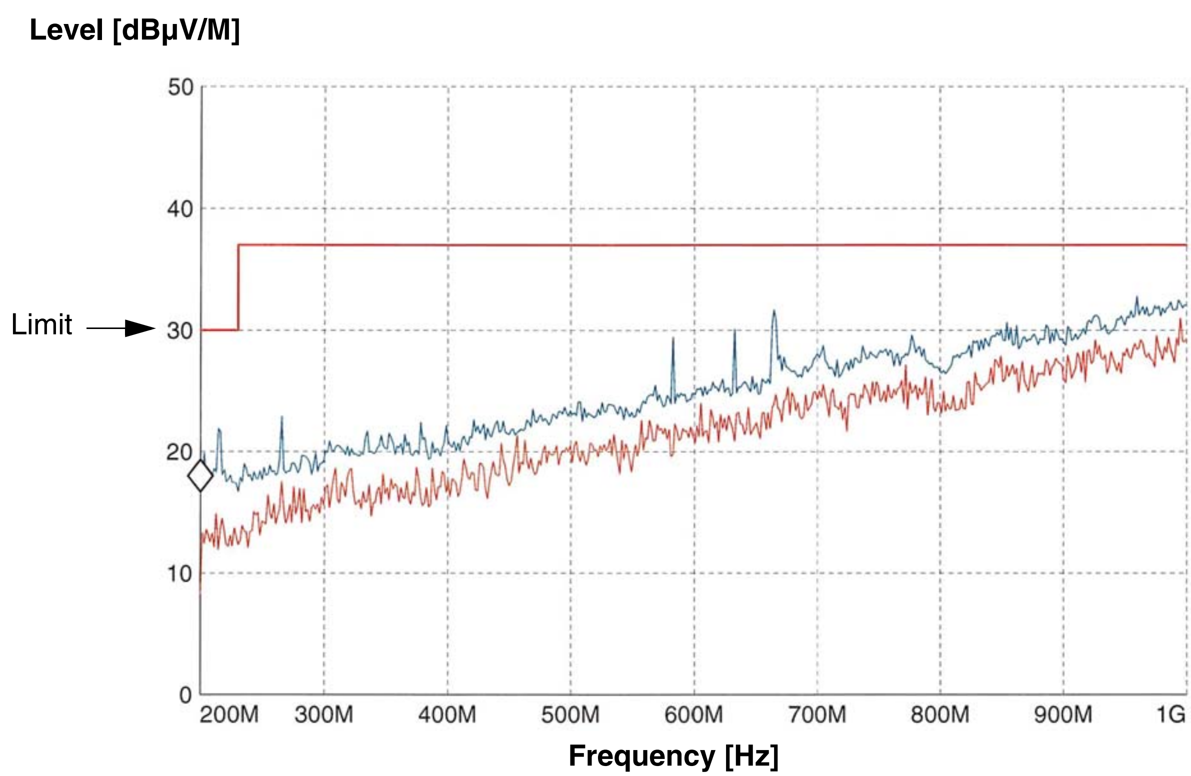
Antenna Polarity: Vertical
30MHz-200MHz Range



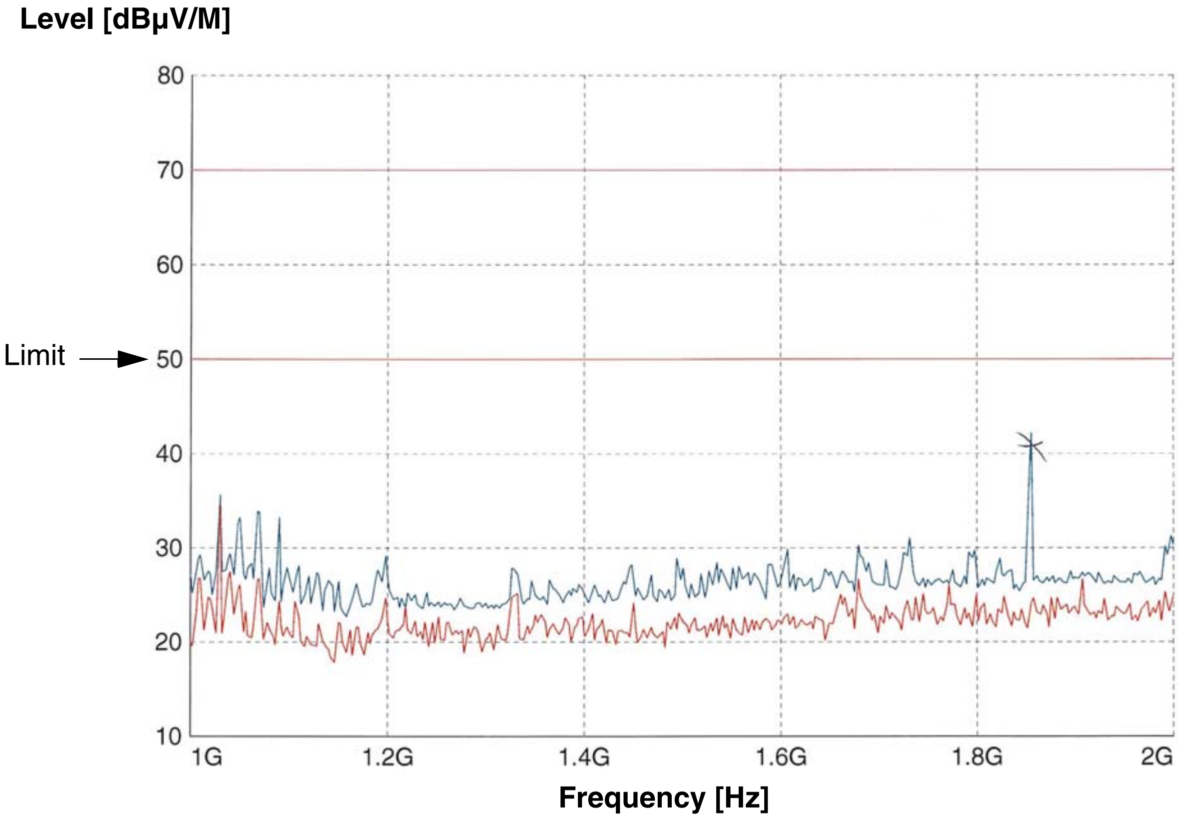
Antenna Polarity: Horizontal
30MHz-200MHz Range



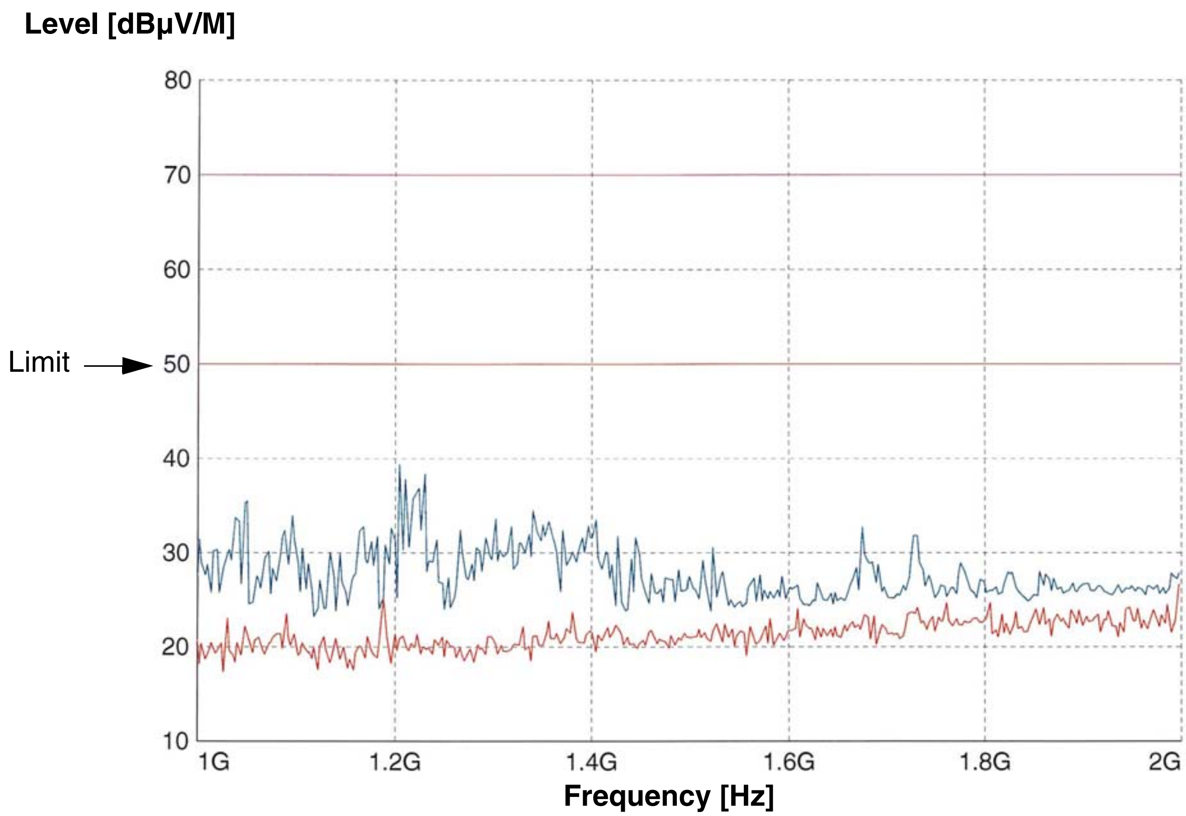
Antenna Polarity: Vertical
200MHz-1GHz Range



Antenna Polarity: Horizontal
200MHz-1GHz Range



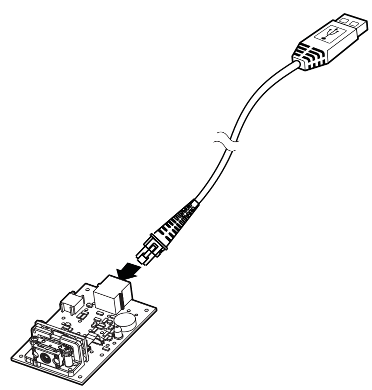
Antenna Polarity: Vertical
1GHz-2GHz Range



Antenna Polarity: Horizontal
1GHz-2GHz Range

Model 2: Corded Unit in USB Full-Speed Mode (RJ45/USB Standard A)

The illustration below shows a unit similar to the unit tested. A clamp-on ferrite (Fair-Rite p/n 0444164281) was added to the USB cable on this configuration.



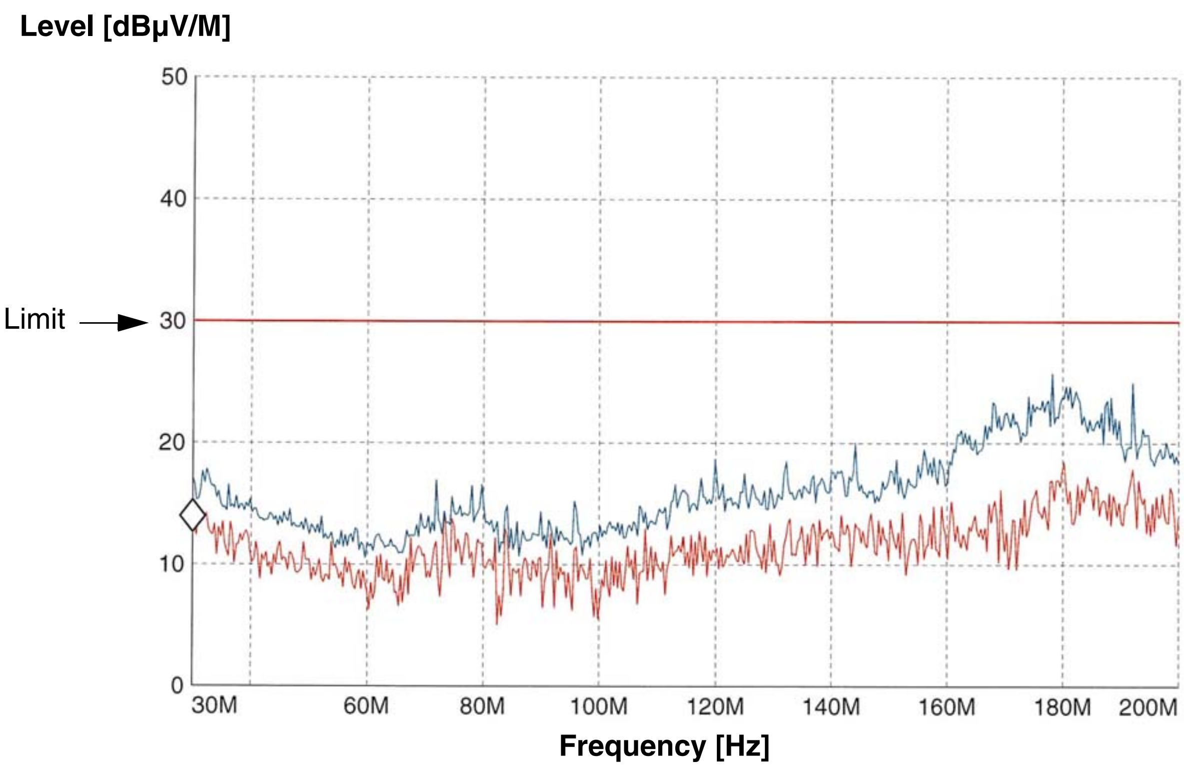
This system passed FCC Class B limits at all tested frequencies. The test results are shown in the following charts.

Model 2 - Radiated Emissions Measurements 30-2000 MHz

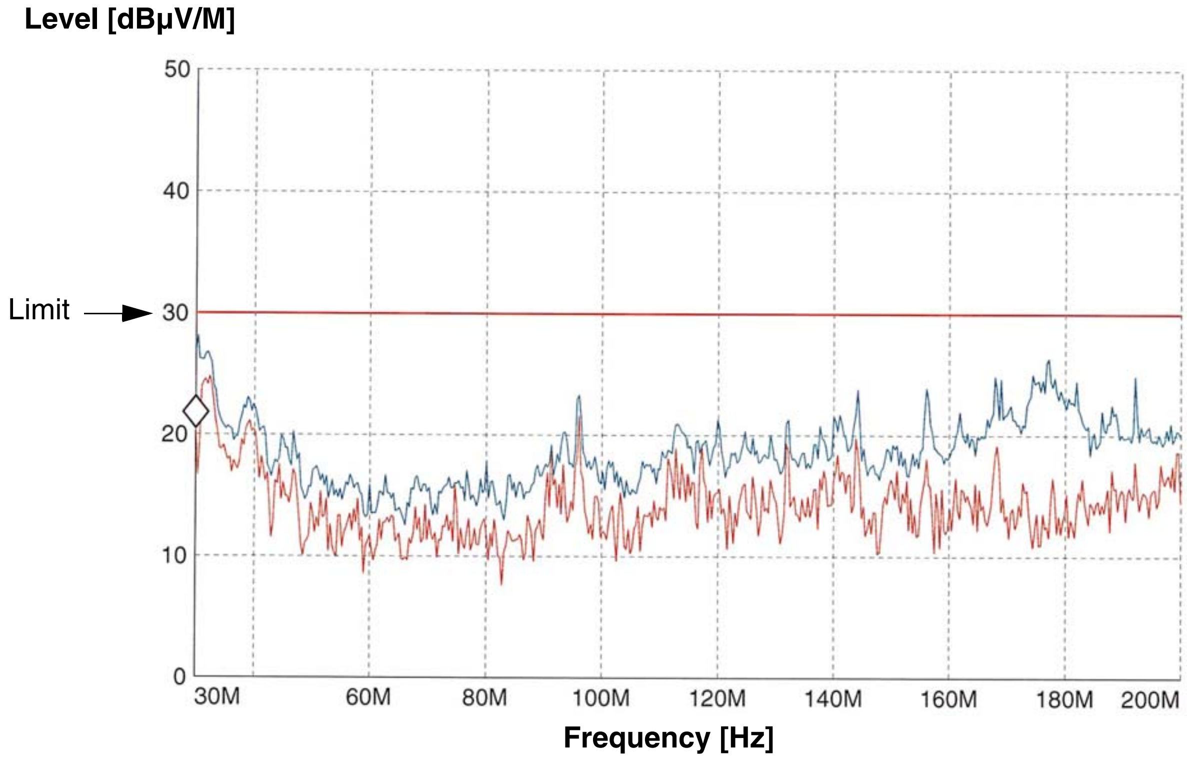
Frequency (MHz)	Antenna Height (Meters)	Antenna Polarity	EUT Angle (Degrees)	Corrected Reading* [db(μV/m)]	Margin	CFR 47 Part 15, EN55022 Class "B", 10 Meter Limit [db(μV/m)]
32.09	1.00	V	360	26.9	-3.1	30
95.99	1.56	V	212	24.3	-5.7	30
144.00	1.00	V	136	24.5	-5.5	30
191.99	1.00	V	158	25.9	-4.1	30
180.06	4.00	H	31	23.9	-6.1	30
191.99	4.00	H	92	25.4	-4.6	30
311.98	1.00	V	166	34.4	-2.6	37
407.97	1.00	V	-3	31.7	-5.3	37
666.00	2.45	V	203	34.1	-2.9	37
311.97	2.73	H	88	33.6	-3.4	37
347.99	2.99	H	102	31.1	-5.9	37
444.00	2.62	H	344	31.9	-5.1	37

* All readings are quasi-peak unless stated otherwise.

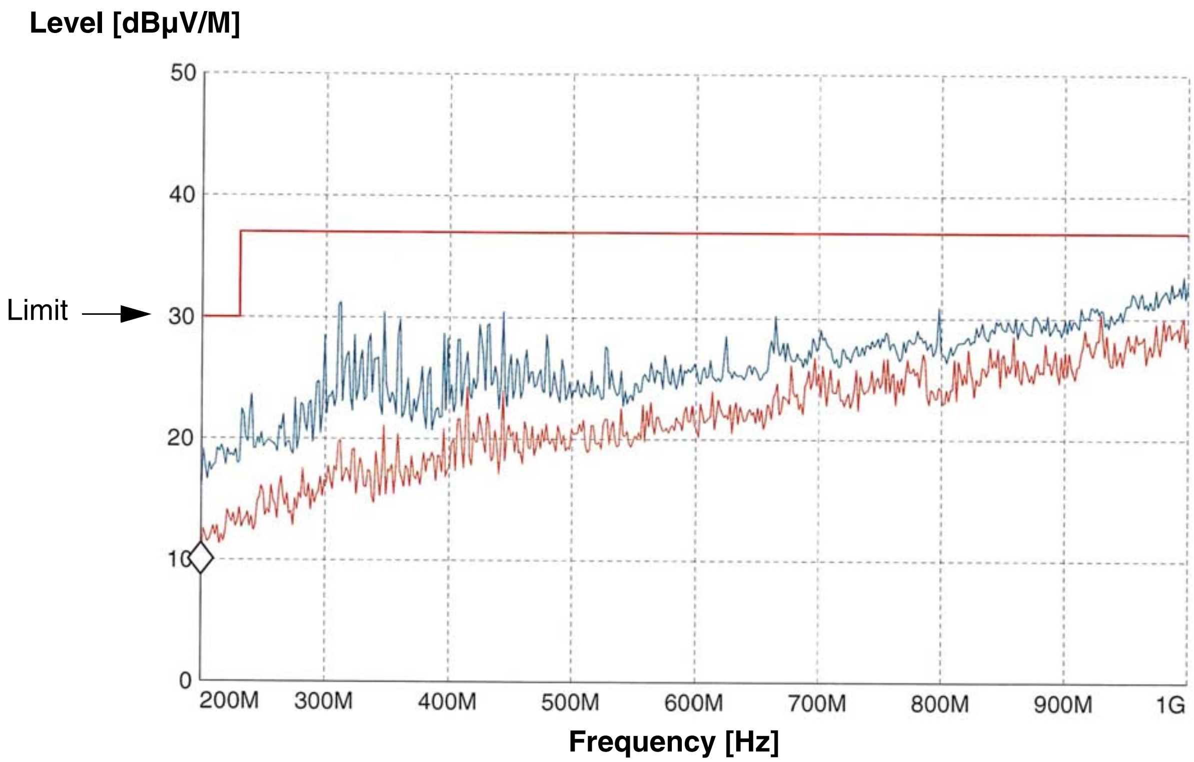
** Data gathered above 1000 MHz was at a 3m antenna distance with RF absorbing material on the ground plane per EN55022 A1:2007. No significant amplitudes across the frequency spectrum were measured.



Antenna Polarity: Vertical
30MHz-200MHz Range

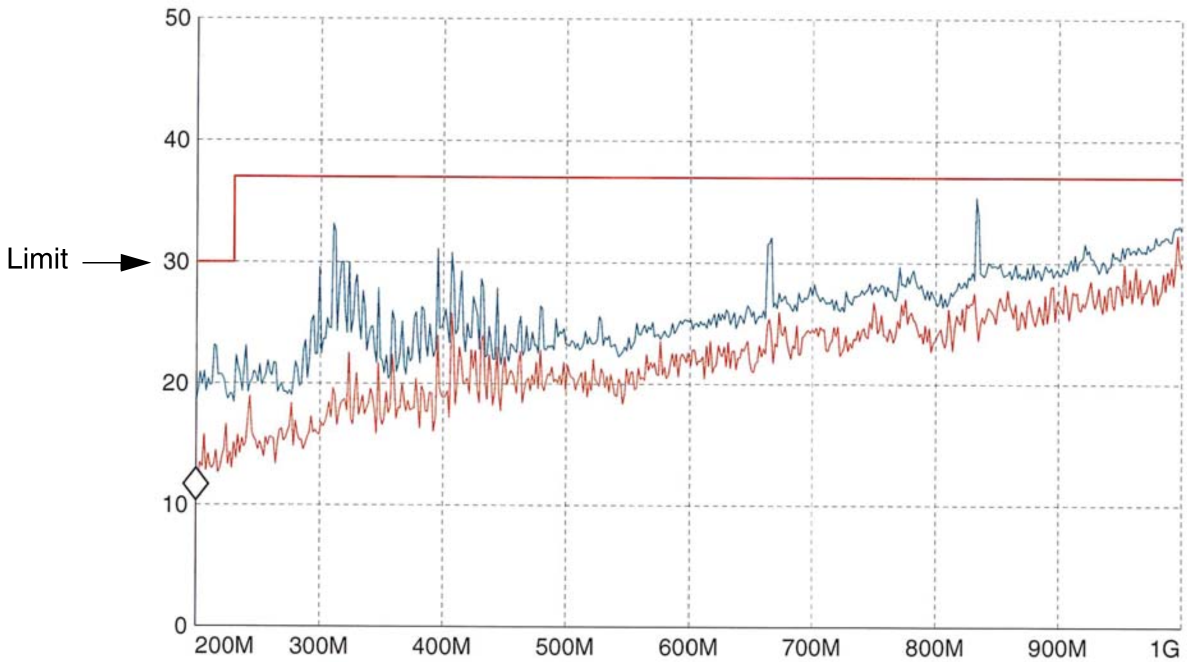


Antenna Polarity: Horizontal
30MHz-200MHz Range



Antenna Polarity: Vertical
200MHz-1GHz Range

Level [dBµV/M]



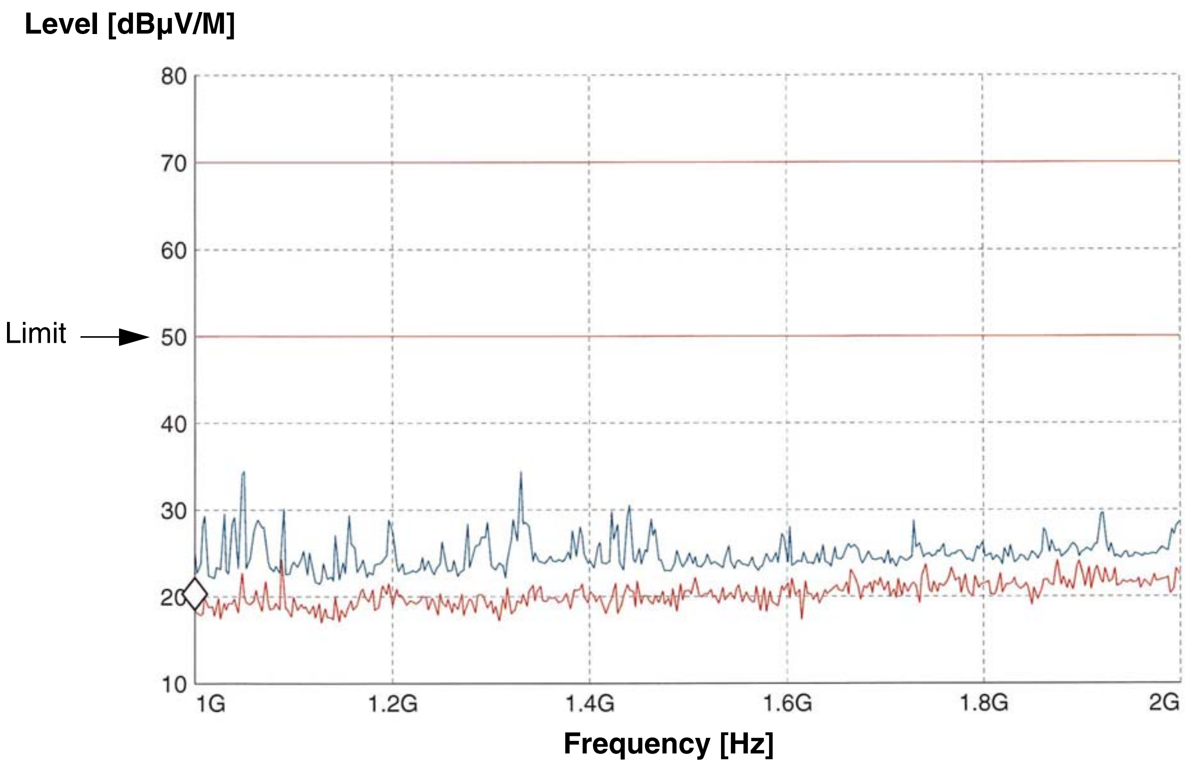
Frequency [Hz]

Antenna Polarity: Horizontal
200MHz-1GHz Range

Level [dBµV/M]

Frequency [Hz]

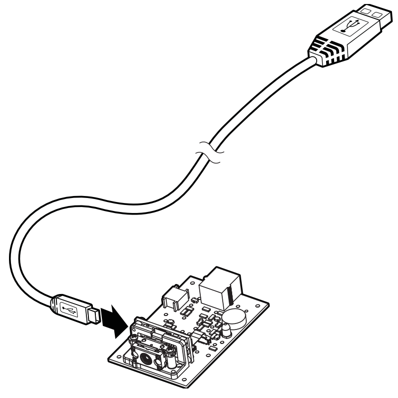
Antenna Polarity: Vertical
1GHz-3GHz Range



Antenna Polarity: Horizontal
1GHz-3GHz Range

Model 3: Corded Unit in USB High-Speed Mode (USB Micro-B/USB Standard A)

The illustration below shows a unit similar to the unit tested. A clamp-on ferrite (Fair-Rite p/n 0431173951) was added to the USB cable on this configuration.



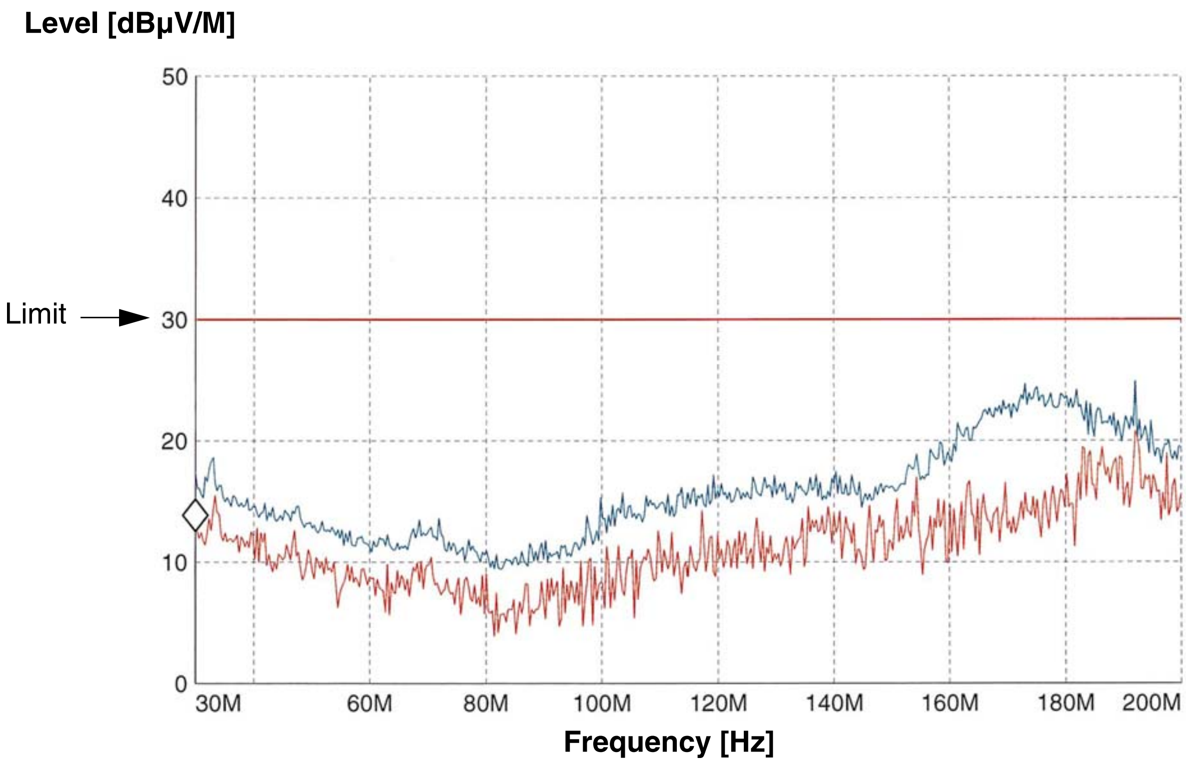
This system passed FCC Class B limits at all tested frequencies. The test results are shown in the following charts.

Model 3 - Radiated Emissions Measurements 30-2000 MHz

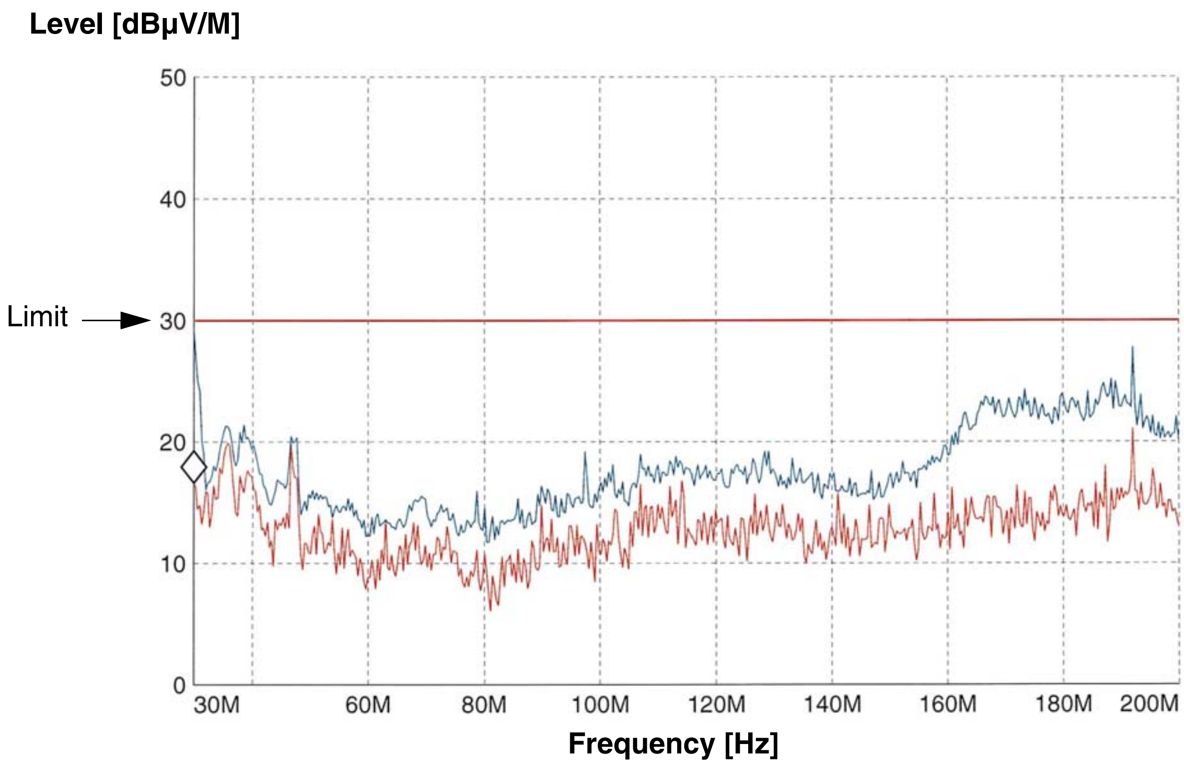
Frequency (MHz)	Antenna Height (Meters)	Antenna Polarity	EUT Angle (Degrees)	Corrected Reading* [db(µV/m)]	Margin	CFR 47 Part 15, EN55022 Class “B”, 10 Meter Limit [db(µV/m)]
35.80	1.00	V	360	19.7	-10.3	30
168.00	1.00	V	196	24.1	-5.9	30
191.99	1.00	V	174	27.4	-2.6	30
166.40	4.00	H	361	19.5	-10.5	30
168.00	4.00	H	322	22.6	-7.4	30
191.99	4.00	H	203	25.4	-4.6	30
399.01	1.00	V	193	29.6	-7.4	37
666.00	2.50	V	201	33.8	-3.2	37
960.00	1.00	V	327	30.1	-6.9	37
399.01	3.14	H	172	33.3	-3.7	37
478.58	2.06	H	178	29.0	-8.0	37
960.00	2.87	H	25	33.8	-3.2	37

* All readings are quasi-peak unless stated otherwise.

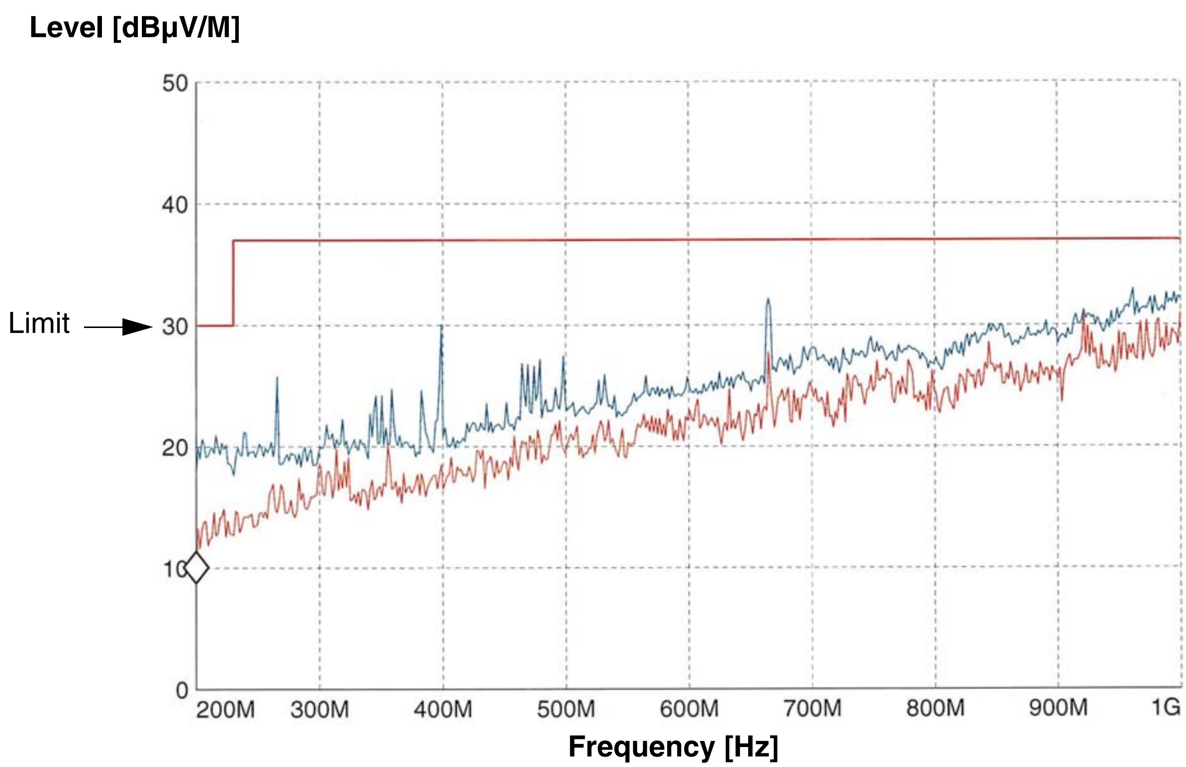
** Data gathered above 1000 MHz was at a 3m antenna distance with RF absorbing material on the ground plane per EN55022 A1:2007. No significant amplitudes across the frequency spectrum were measured.



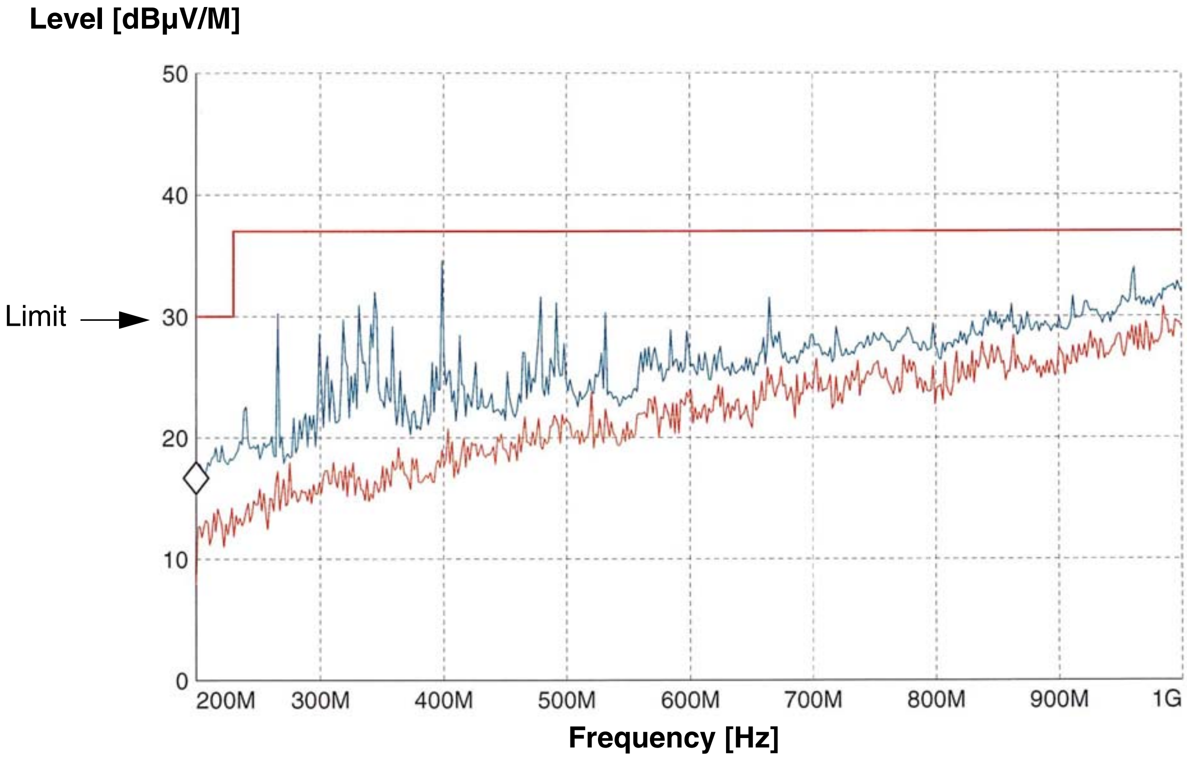
Antenna Polarity: Vertical
30MHz-200MHz Range



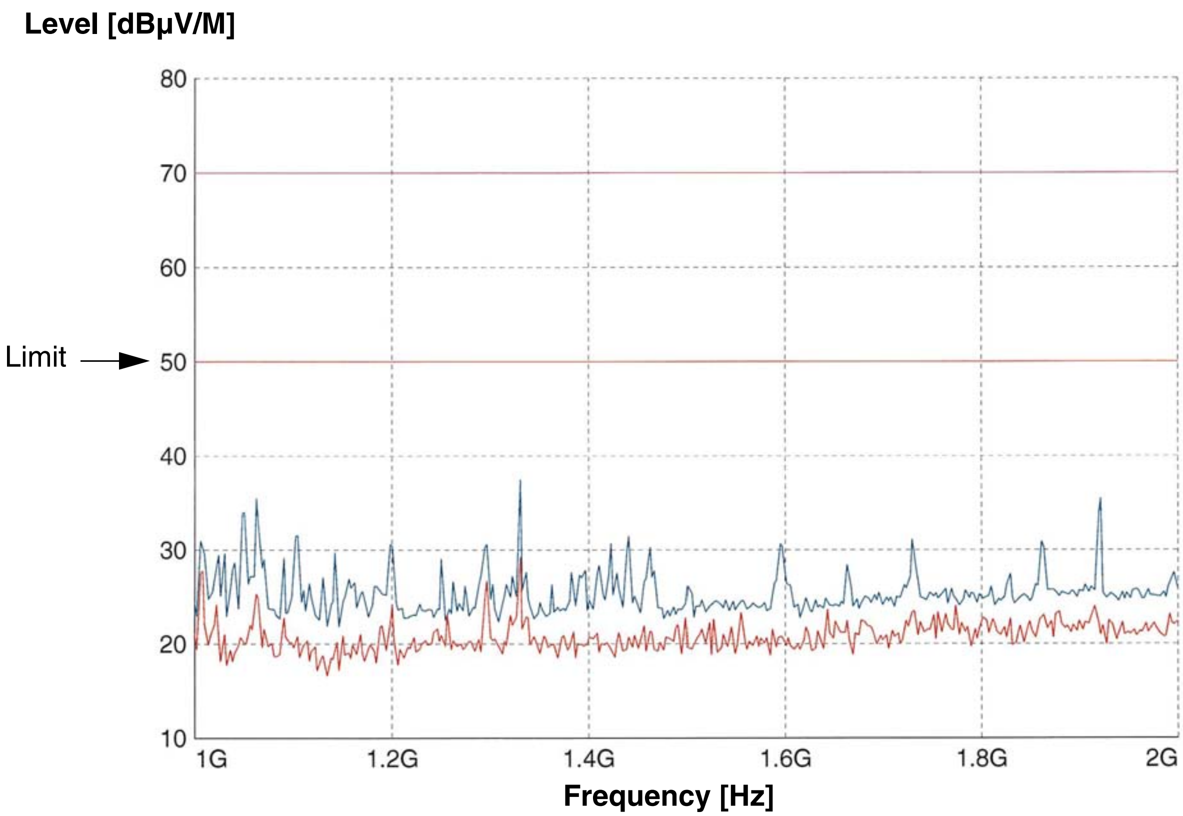
Antenna Polarity: Horizontal
30MHz-200MHz Range



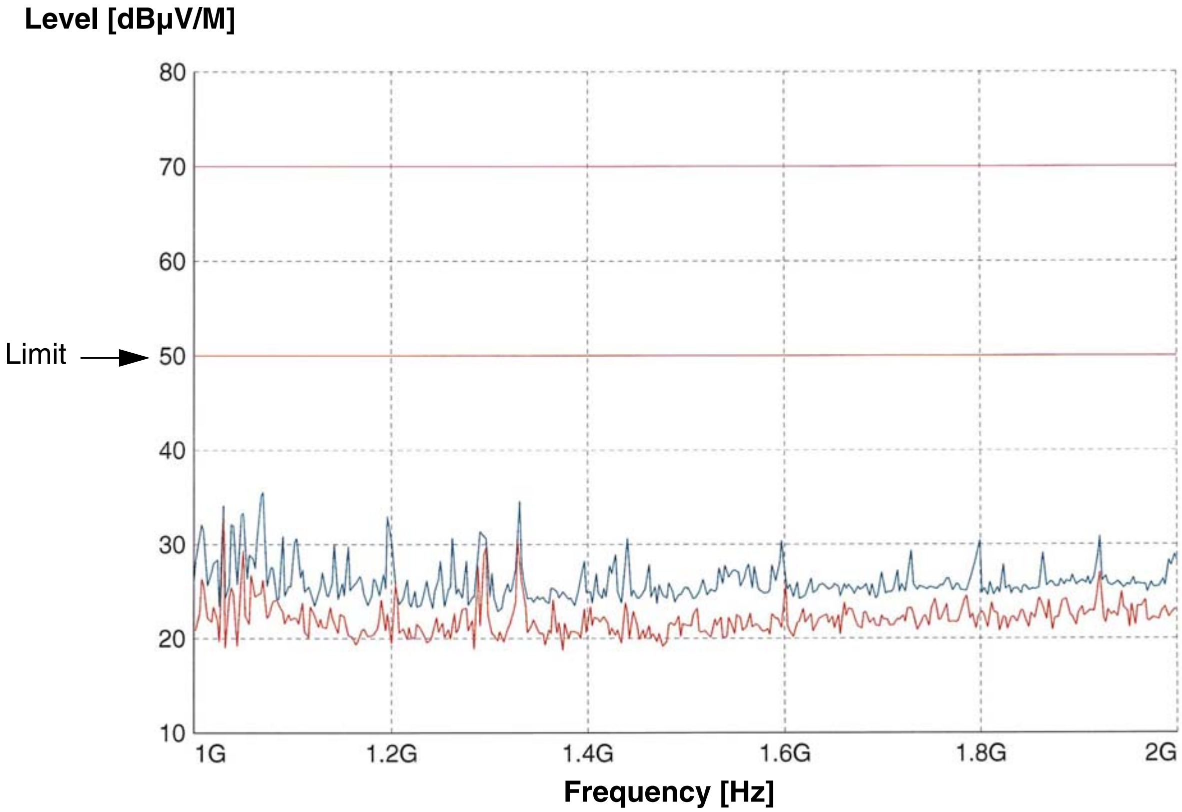
Antenna Polarity: Vertical
200MHz-1GHz Range



Antenna Polarity: Horizontal
200MHz-1GHz Range



Antenna Polarity: Vertical
1GHz-2GHz Range



Antenna Polarity: Horizontal
1GHz-2GHz Range

Laser Aimer Patterns

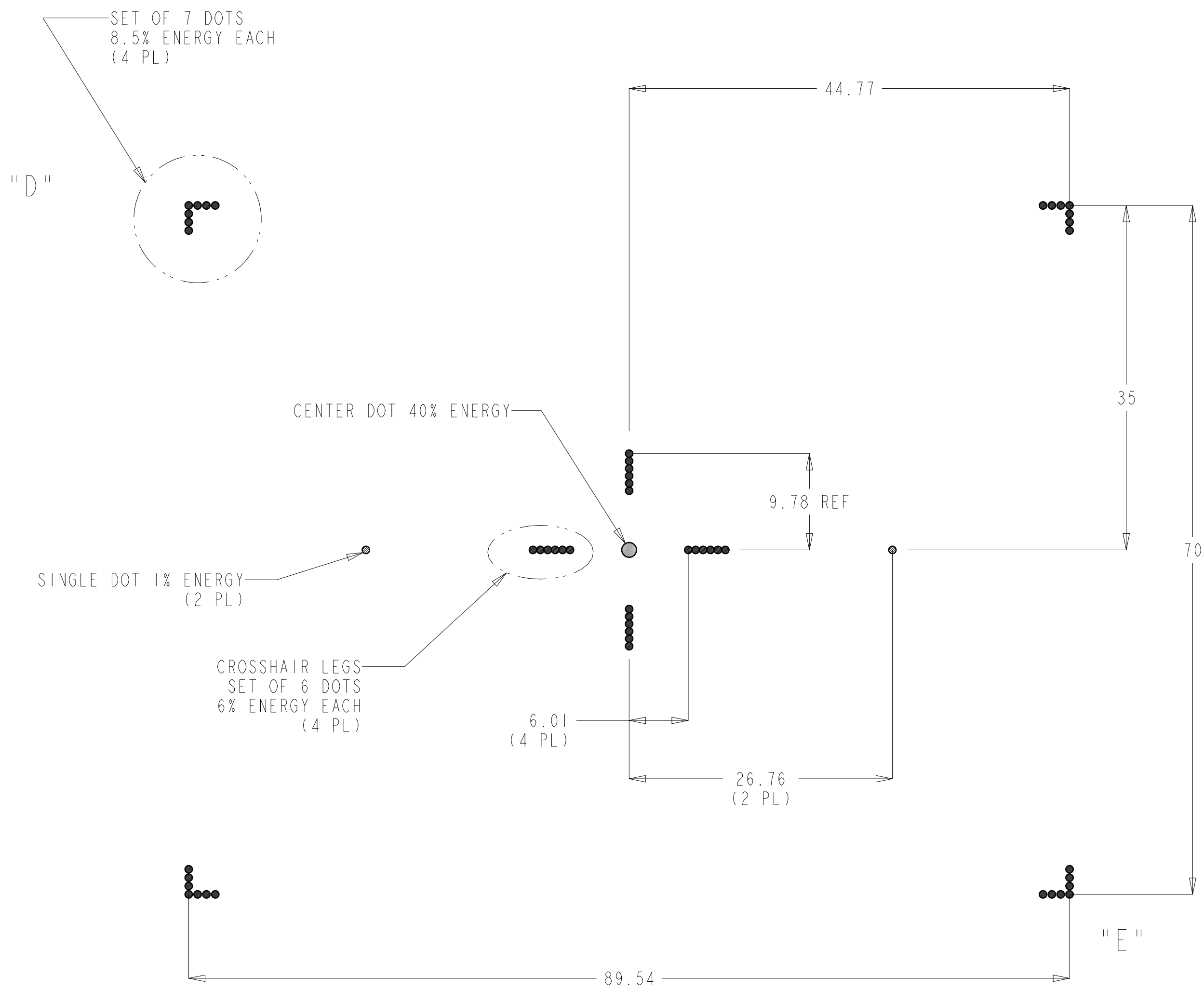
N56XX Laser Aimer Pattern

The following graphics display the laser aimer pattern, oriented in relation to the diffractive plate.

Pattern 11

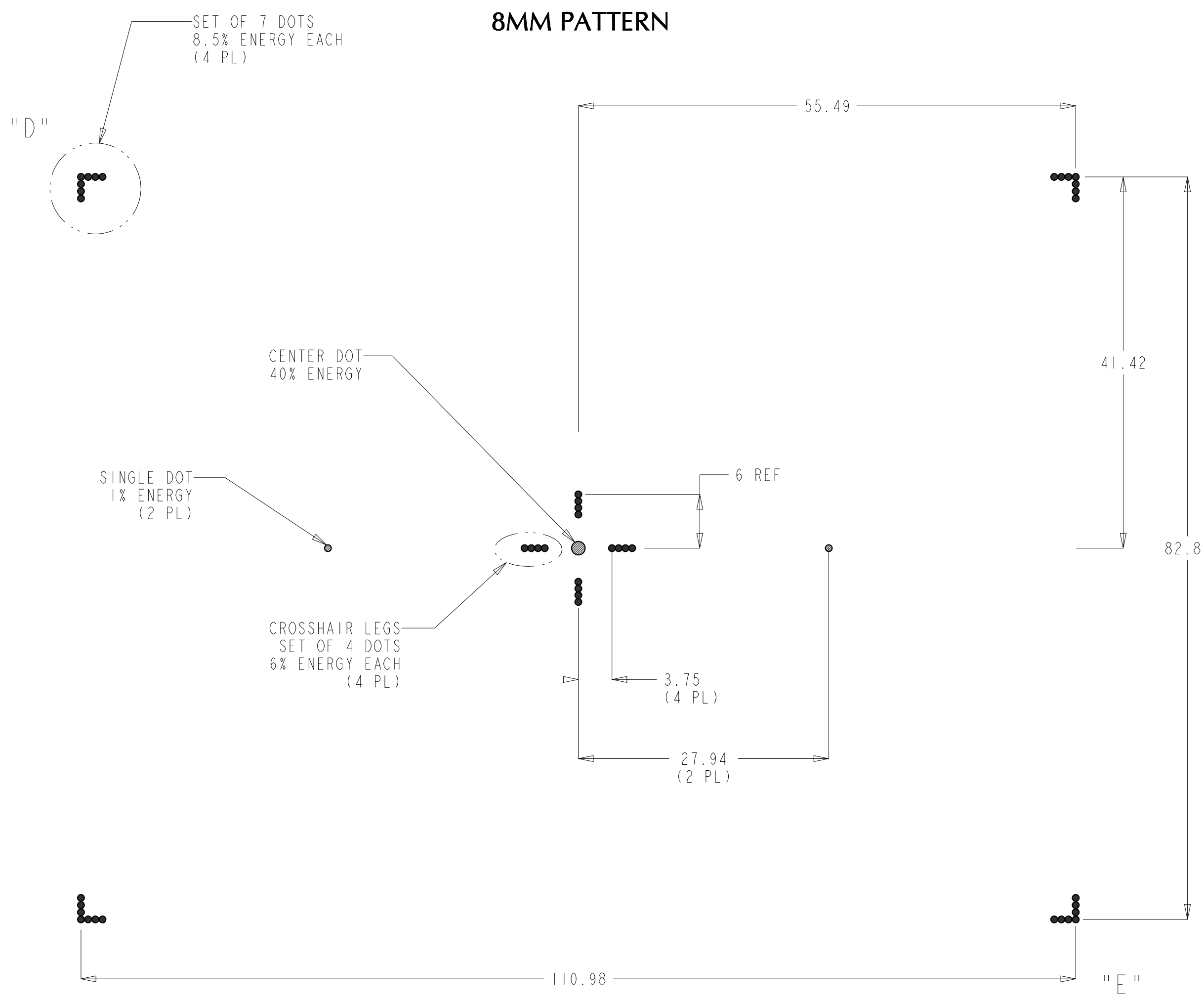
Size pattern at focus distance of 134.7mm from -C- orient with respect to diffractive plate as shown. (Reference “D” and “E” corners)

5.8MM PATTERN



Pattern 12

Size pattern at focus distance of 236.3mm from -C- orient with respect to diffractive plate as shown. (Reference “D” and “E” corners)



C

Customer Validation Testing

Temperature Test

To insure that the image engine stays within the operating limits of the specification, the following test must be done with the engine integrated into the designated enclosure.

1. Attach the thermocouple for each engine model as shown below.
2. Configure the scan engine in the desired triggering mode and scan per use case.

Note: Continuous scanning (with no downtime) can produce undesired results.

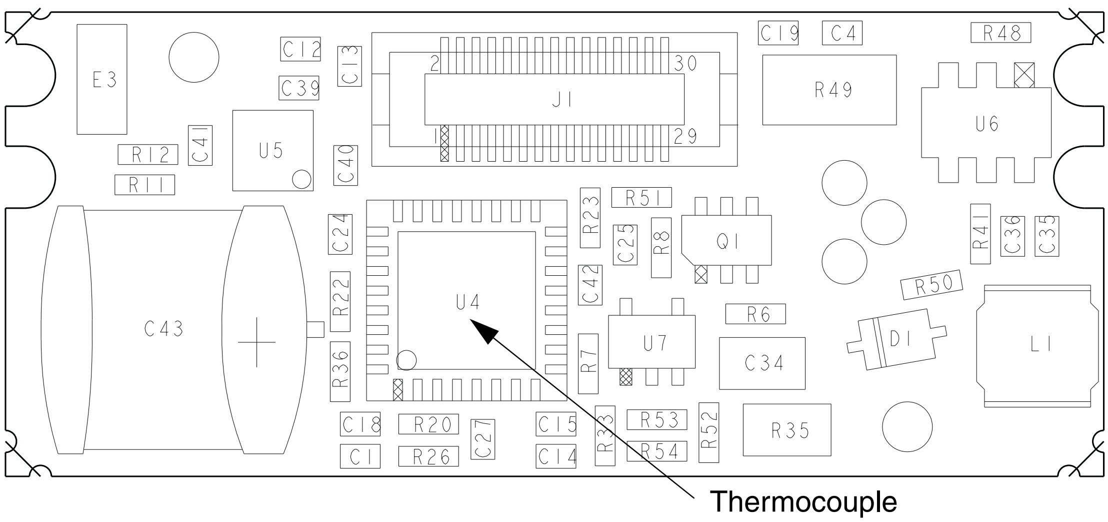
3. Place the integrated engine into the chamber at the maximum operating temperature (50°C).
4. Record the temperature at various intervals or after the temperature has stabilized.
5. Compare the results with the operating limits.

Note: Testing needs to be performed for each enclosure in which an engine will be used.

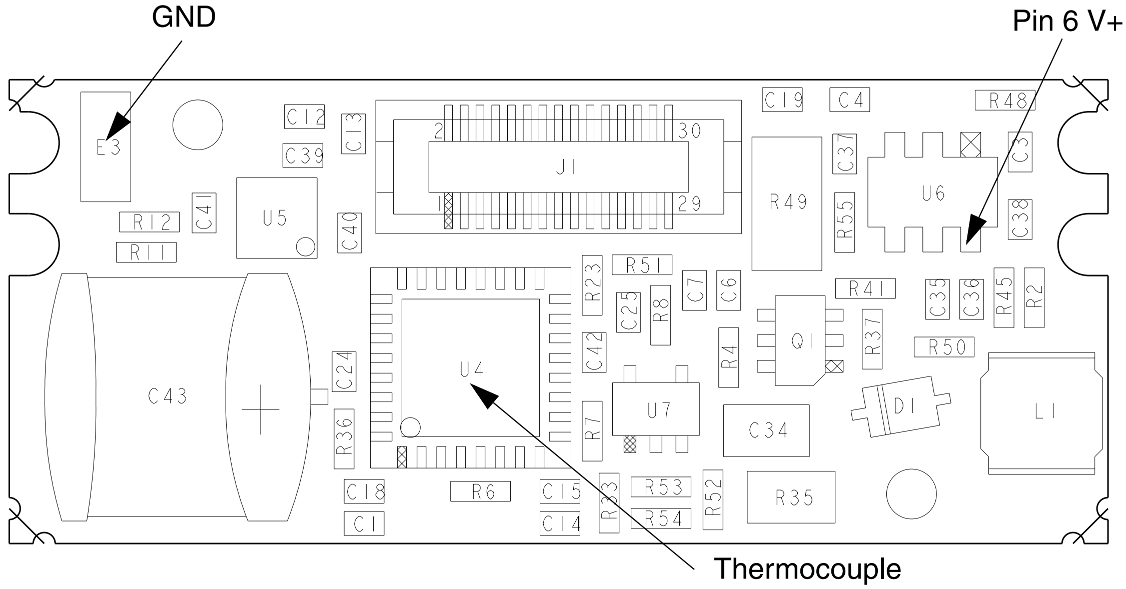
Operating Voltage

The operating voltage must be maintained within the engine's specified limits (see "Operating Voltage" on page 3-1).

Laser Aimer PCB Assembly



LED Aimer PCB Assembly



Honeywell
9680 Old Bailes Road
Fort Mill, SC 29707

www.honeywellaidc.com