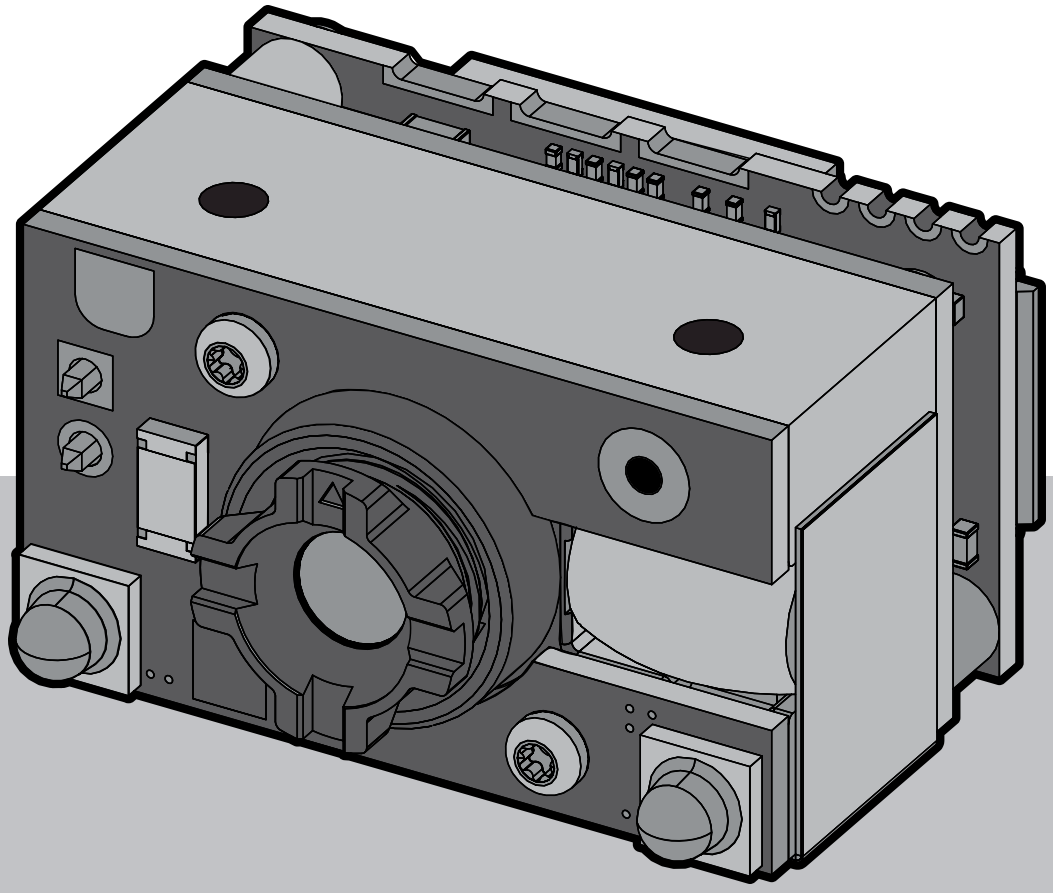
INTEGRATION GUIDE

CR822x Single Board Decoded Scan Engine



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Code Reader™ 822x Single Board Decoded Scan Engine Integration Guide

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1.1 – Product Overview

The Code Reader™ 822x (CR822x) is a patented, high performance, miniature barcode imaging engine. The CR822x is the smallest fully-decoded engine on the market, powered by Code's proprietary microprocessing platform, which delivers high-speed barcode reading at a low power point. The CR822x supports RS232 and USB interfaces for flexible integration into a variety of devices.

Applications for the CR822x include Medical Devices, ATMs, Price-Lookup, Lottery, Age Verification, Direct Part Marking, Point of Sale, Self-Service Kiosks and more.

1.2 – SKU Descriptions

The following table describes the options available for the CR822x engine. Any SKU (Part Number) can be built using the following table:

CR822#	S####	MT#	D##	C###
Communications Interface	Wide Field/High Density Field Focus	Mounting Options	Flex Cable	Ribbon Cable
1 = Single Board USB (Ribbon Cable)	0100 = Single Field Optics, Standard Focus	X = No Tabs	X = No Flex Cable	X = No Ribbon Cable
2 = Single Board RS232 (Ribbon Cable)	0300 = Single Field Wide-Angle Optics, Visible Pass Filter	1= With Tabs		800 = 2.0" Ribbon Cable
				801 = 6.0" Ribbon Cable
				802 = 12.0" Ribbon Cable

SKU: CR822# - S#### - MT# - D## - C###
EXAMPLE: CR822x USB with Standard Focus, Tabs, No Flex, 2.0" Ribbon Cable.

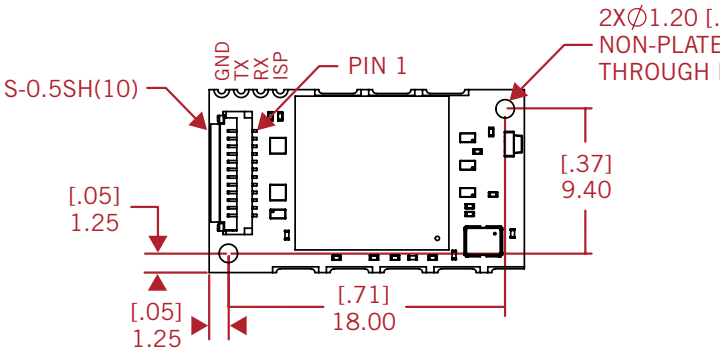
SKU = **CR8221-S0100-MT1-DX-C800**

Note: Additional Ribbon Cables, Flex Cables, and Focus options may be available for your application. Please contact your Code representative to discuss.

The CR822x can be ordered with or without scan engine mounting tabs.

2.1 – Decoded Scan Engine Components

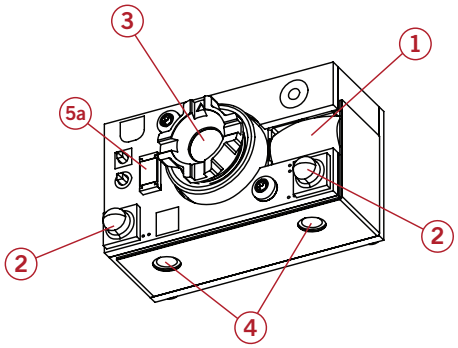
1. Imager
2. Spacers
3. Decode Board
4. Screws

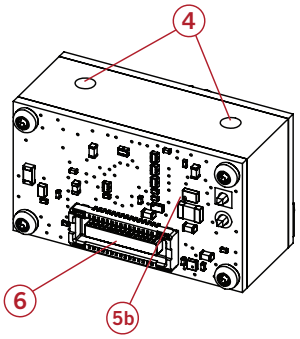


BACK VIEW

2.2 – Imager without Mounting Tab Components

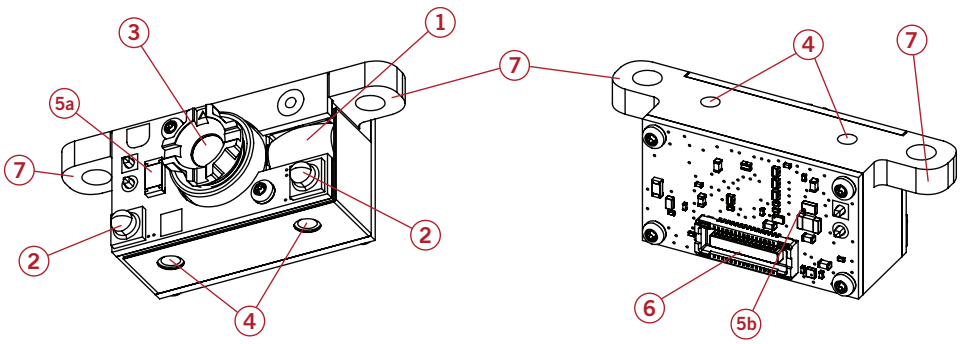
1. Blue LED Targeting Lens
2. Red LED Illumination Lens
3. Lens
4. Self-Tapping Screw Holes
5. a) Illumination Board; b)Imager Board
6. Connector, Receptacle, 30 pin, 0.4 mm pitch





2.3 – Imager with Mounting Tab Components

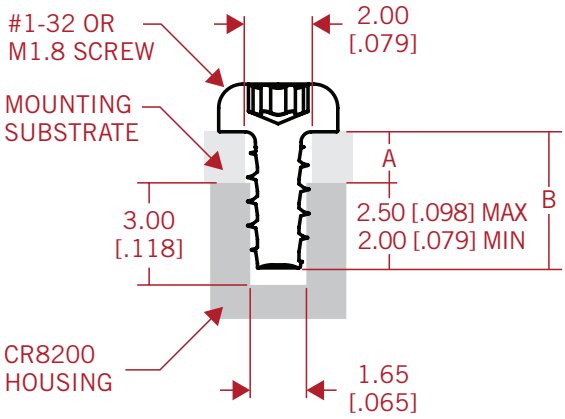
1. Blue LED Targeting Lens
2. Red LED Illumination Lens
3. Lens
4. Self-Tapping Screw Holes
5. a) Illumination Board; b)Imager Board
6. Connector, Receptacle, 30 pin, 0.4 mm pitch
7. Mounting Tabs

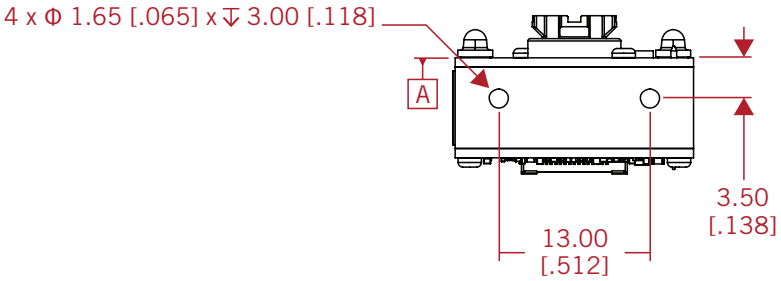


2.4 – Imager without Mounting Tab Mechanical Specifications

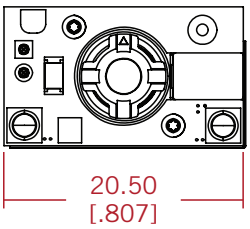
1. The Imager without mounting tabs has four blind holes (two on top and two on bottom) available for mounting with self-tapping screws.
2. Please use #1-32 Trilobular® thread forming screw or M1.8 Delta PT® thread forming screw, with the following dimensions:

	Minimum	Maximum
Thread Engagement	2.00 mm [.079”]	2.50 mm [.098”]
Length (B)	Mounting Substrate Thickness (A) + 2.00 mm	Mounting Substrate Thickness (A) + 2.50 mm
Torque	N/A	1.5 lbf-in

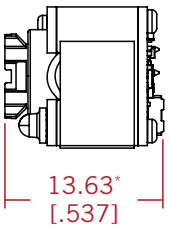




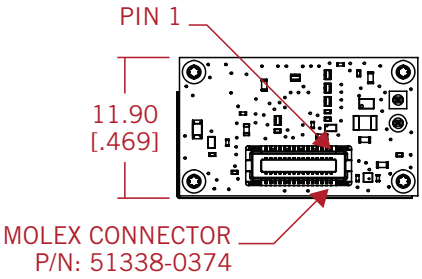
TOP VIEW



FRONT VIEW



SIDE VIEW



BACK VIEW

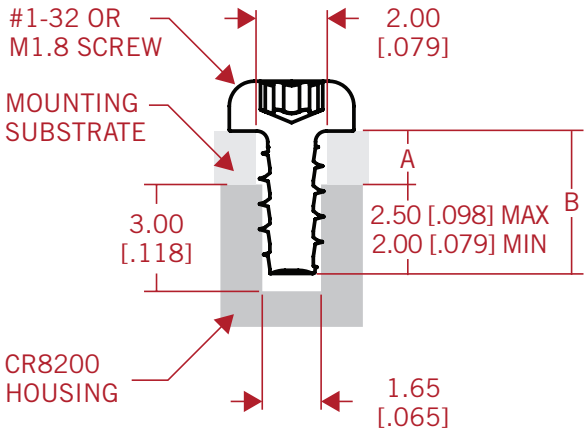
*Dimension will channge based on focus.
Decrease for far focus; increase for near focus.

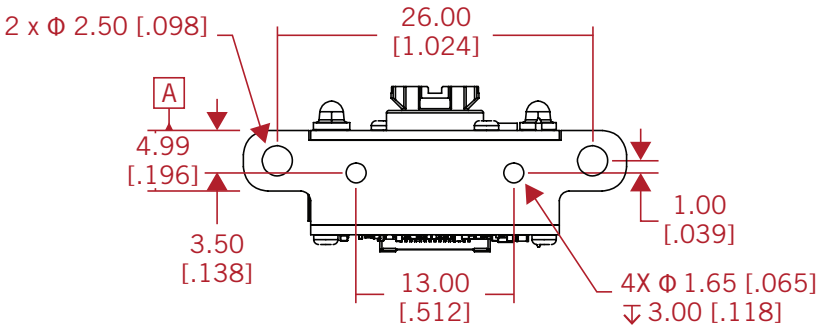
UNITS = MM[INCHES]

2.5 – Imager with Mounting Tab Mechanical Specifications

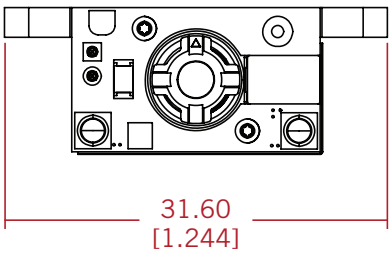
1. In addition to the four blind holes (two on top and two on bottom) available for mounting with self-tapping screws, the Imager with mounting tabs has two 2.50mm [.098"] clearance holes.
2. Please use #1-32 Trilobular® thread forming screw or M1.8 Delta PT® thread forming screw, with the following dimensions:

	Minimum	Maximum
Thread Engagement	2.00 mm [.079"]	2.50 mm [.098"]
Length (B)	Mounting Substrate Thickness (A) + 2.00 mm	Mounting Substrate Thickness (A) + 2.50 mm
Torque	N/A	1.5 lbf-in

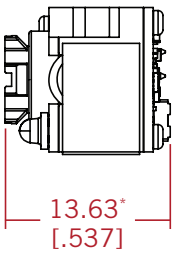




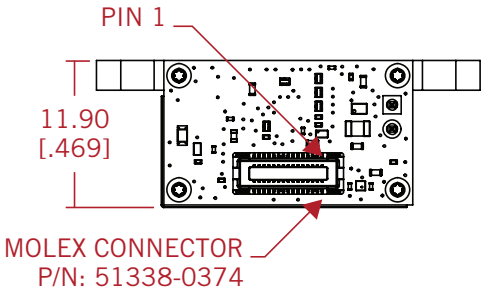
TOP VIEW



FRONT VIEW



SIDE VIEW



BACK VIEW

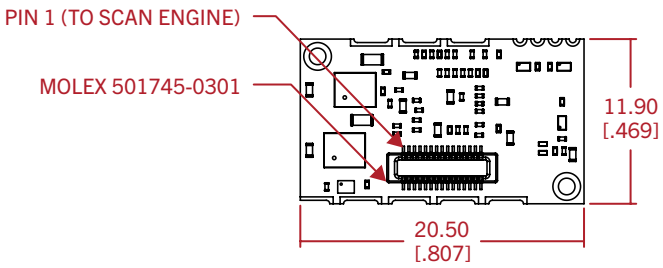
*Dimension will change based on focus.
Decrease for far focus; increase for near focus.

UNITS = MM [INCHES]

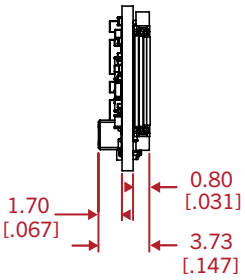
2.6 – Decode PCB Mechanical Specifications

DC822x

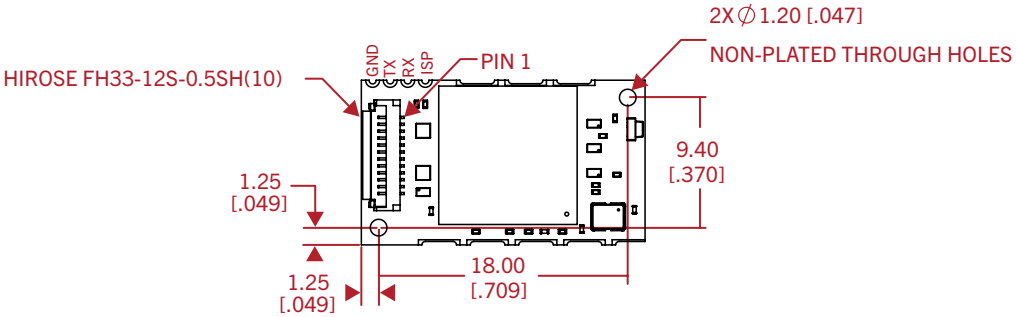
The DC822x mounts to the back of the CR8200 imager.



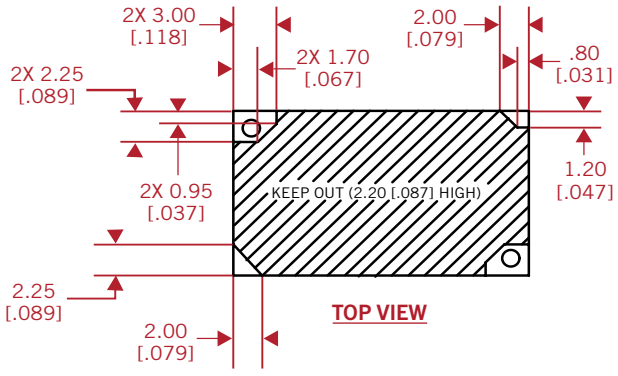
FRONT VIEW



SIDE VIEW



BACK VIEW



TOP VIEW

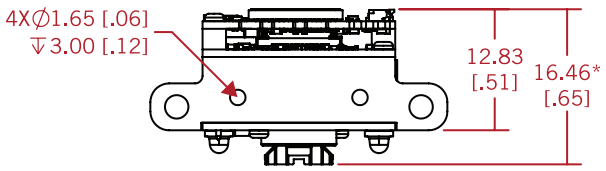
BOTTOM VIEW

UNITS = MM[INCHES]

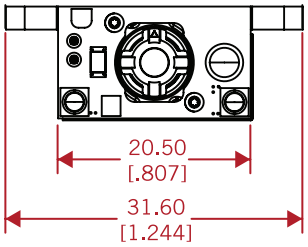
2.7 – Decoded Scan Engine Mechanical Specifications

The CR822x has 4 blind mounting holes for use with self-tapping screws.

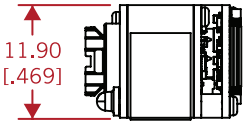
Overall Dimensions



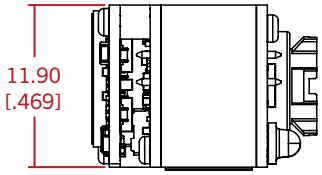
TOP VIEW



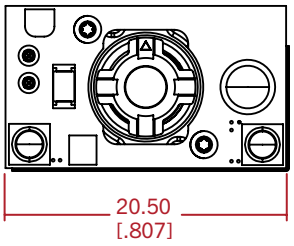
FRONT VIEW



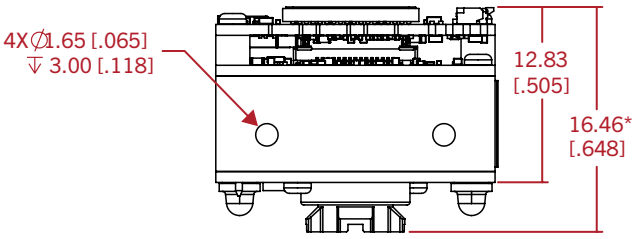
SIDE VIEW



SIDE VIEW



FRONT VIEW



*Dimension will change based on focus:
decrease for far focus, increase for near focus

TOP VIEW

UNITS = MM[INCHES]

2.8 – Enclosure Specifications

1. The enclosure for the CR822x should be large enough to accommodate the engine and designed to maintain the ambient air in contact with the CR822x within its operating limits (Note: special care should be taken to ensure the temperature at the image sensor does not exceed 70 ºC and the temperature at the processor does not exceed 100 ºC). The enclosure should minimize infiltration by airborne contaminants and foreign materials.
2. The CR822x must not come in contact with water.
3. The CR822x is sensitive to Electrostatic Discharge (ESD) and must be handled appropriately. Any individual who handles the CR822x should be grounded using a wrist strap and ESD protected work area and work surface.
4. The warranty of the CR822x is void if the recommendations above are not followed when handling or integrating the device.

3.1 – Window Requirements

When integrating the CR822x into your device or application, it may be necessary to install a window in front of the optics of the Imager. Although many different types of materials can be considered, Code makes the following recommendations.

Placement: Contact to 0.5 mm away from the face of the Imager, parallel to engine face

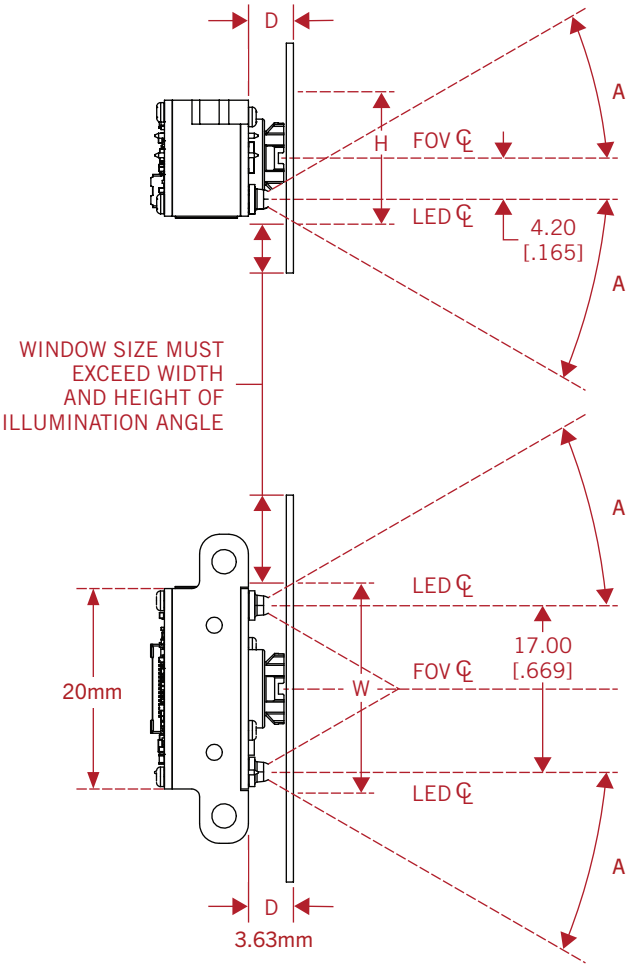
Material: Optically clear acrylic

Thickness: 1 mm or less

If your design constraints prevent the window from being mounted within 0.5 mm of the face of the engine, Code recommends an anti-reflective (AR) coating be applied to both window surfaces (front and back). The AR coating must have less than 3% reflectance from 400nm to 1000nm.

The window must be wide and tall enough so the surrounding enclosure does not block any of the illumination from the LEDs. The following diagram illustrates the field of illumination that must be unobstructed by the edges of the window aperture.

CR822x Field of Illumination Diagram



Dimension	Optics	
	0100	0300
A	30°	65°

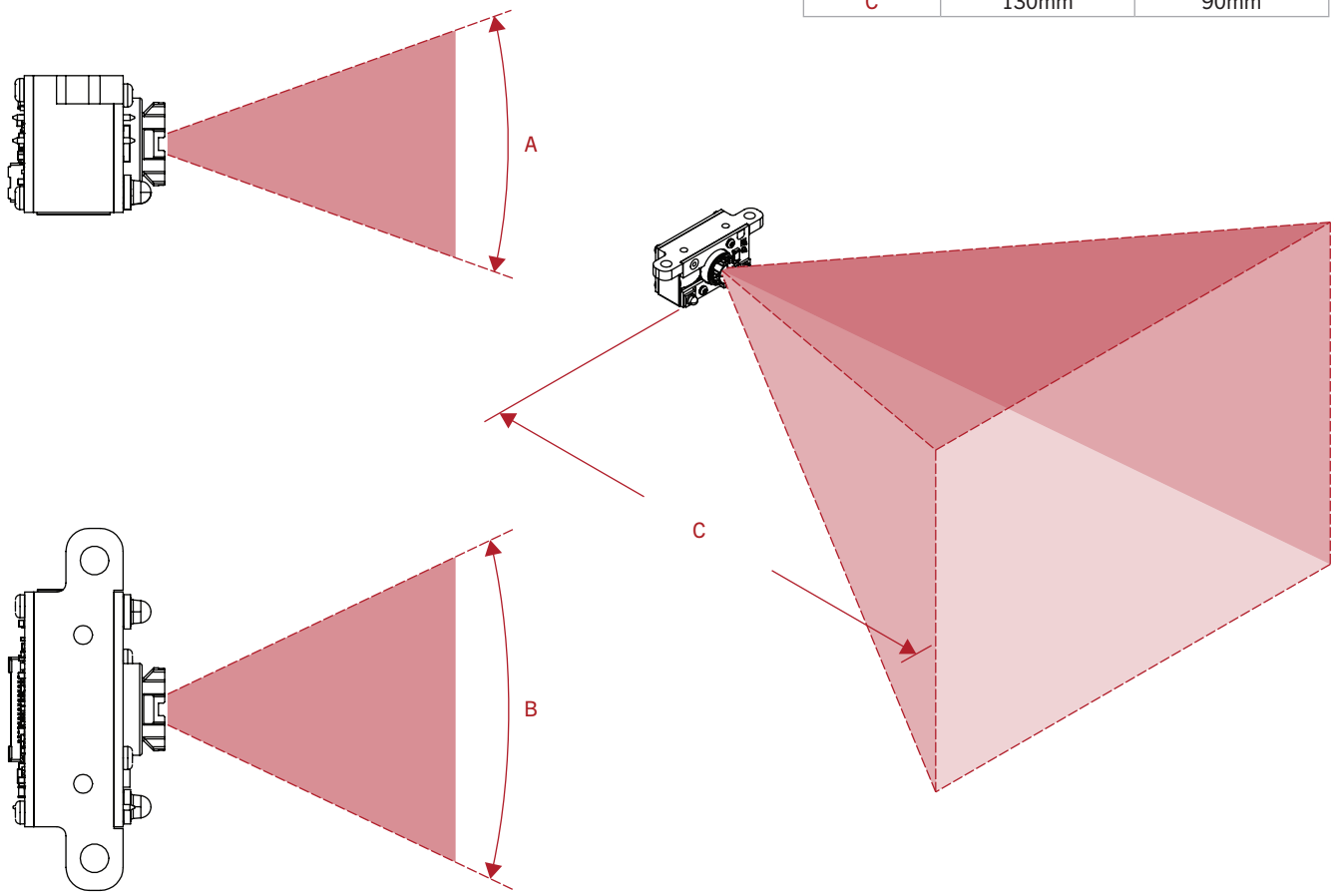
UNITS = MM[INCHES]

3.2 – Imager Field of View

The Field of View for the CR822x for Horizontal and Vertical positioning of the imager is shown below:

Dimension	Optics	
	0100	0300
A	39.4°	50°
B	51°	66.6°
C	130mm	90mm

CR822x Field of View Diagram



UNITS =
MM[INCHES]

4.1 – System Requirements

Power Supply: The CR822x is powered from the host via the VIN and Gnd pins. VIN must be within the range specified in section 4.13 when measured at the decode board. VIN must be maintained with varying loads, such as when the illumination is turned ON and OFF.

Host Ribbon Cable (FFC): The impedance of the cable for the USB data lines should be 90 ohm differential. For 3.3V operation, a ribbon cable of no more than 6.0" in length can be used with a 0.28 mm [.011"] trace width and 0.3 mm trace thickness. Longer cables can be used at higher voltages.

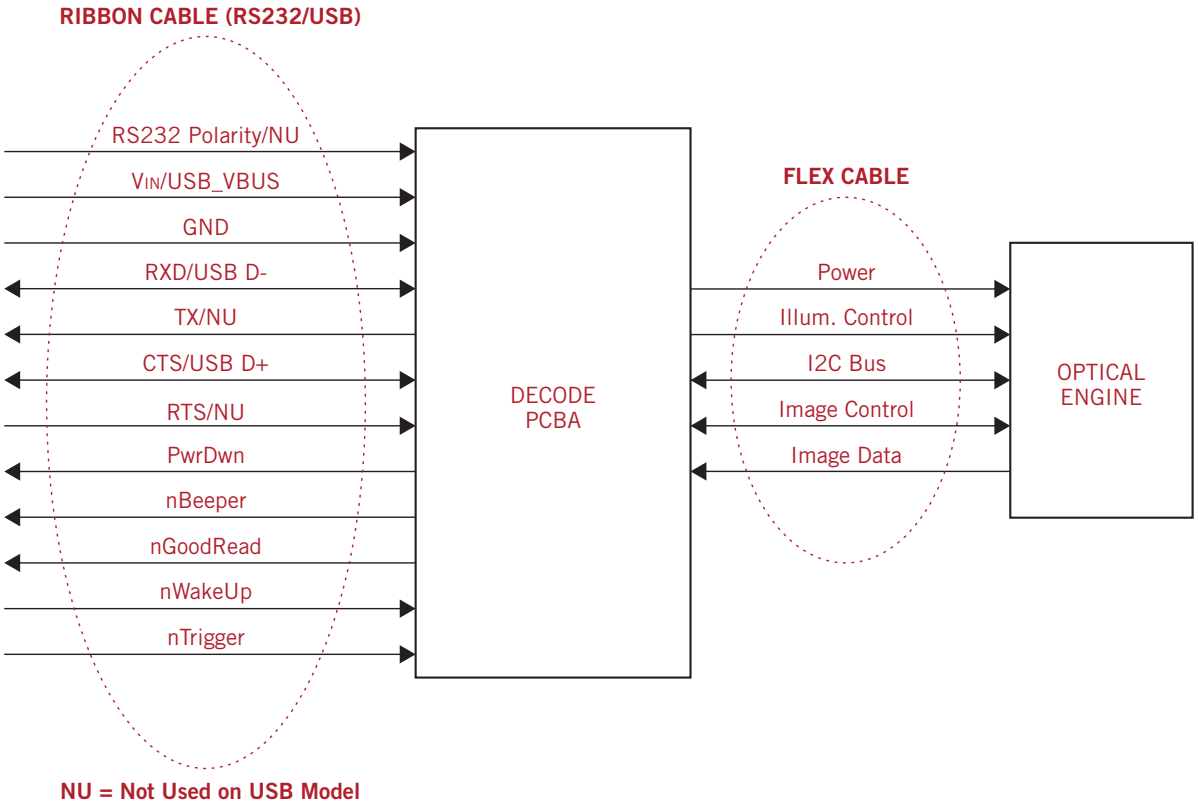
Power Sequencing: There is no special power sequence needed for the CR822x as long as the max and min voltage and current specifications are met. However, if the voltage on a pin is greater than VIN, such as when powering on, then current will flow from the pin to VIN through the pull up resistors.

Thermal Requirements: The operating temperature range for the CR822x is -20 ºC to 55 ºC (-4º F to 131 ºF) unenclosed. Special care should be taken to ensure the temperature at the image sensor does not exceed 70 ºC and the temperature at the processor does not exceed 100 ºC.

4.2 – Electrical System Block Diagram

The CR822x is a complete barcode scanning system that can be easily integrated into any device.

The block diagram below shows the main components of the system.



4.3 – Host Interface Pinouts (CR8222 RS232)

Pin	Name	Type	Description	Note
1	RS232 Polarity	Input	RS232 polarity control. When high, all RS232 signals have their normal polarity. When low, all RS232 signals have inverted polarity. For inverted polarity on all RS232 signals, tie this pin to Gnd. This pin is GPIO dual function; high impedance (2k Ohm protection impedance that can be swapped out in final design).	
2	VIN	Power	Power supply voltage input	
3	Gnd	Power	Power supply and signal ground	
4	RxD	Input	RS232 receive data, TTL level	1
5	TxD	Output	RS232 transmit data, TTL level	1
6	CTS	Input	RS232 Clear to Send, TTL level	1
7	RTS	Output	RS232 Request to Send, TTL level	1
8	PwrDwn	Output	Power down indicator	1
9	nBeeper	Output	Feedback indicator (success, error, etc.); active low	1
10	nGoodRead	Output	Indicates a successful decode; active low	1
11	nWakeUp	Input	Bring the unit out of sleep state; active low	1,2
12	nTrigger	Input	Activate image acquisition, decode; active low	1

Notes: 1. Pin has a weak pull up to VIN.
2. If not actively controlling sleep mode, leave unconnected. Do not tie low.

4.4 – Host Interface Pinouts (CR8221 USB)

Pin	Name	Type	Description	Note
1	NU	N/A	Not used	
2	USB_VBUS	Power	Power supply voltage input	
3	Gnd	Power	Power supply and signal ground	
4	D-	Bidirectional	USB D- signal	
5	NU	N/A	Not used	
6	D+	Bidirectional	USB D+ signal	
7	NU	N/A	Not used	
8	PwrDwn	Output	Power down indicator	1
9	nBeeper	Output	Feedback indicator (success, error, etc.); active low	1
10	nGoodRead	Output	Indicates a successful decode; active low	1
11	nWakeUp	Input	Bring the unit out of sleep state; active low	1,2
12	nTrigger	Input	Activate image acquisition, decode; active low	1

Notes: 1. Pin has a weak pull up to VIN.
2. If not actively controlling sleep mode, leave unconnected. Do not tie low.

4.5 – Electrical Control Signals

The CR822x is equipped with inputs and outputs that allow the user to control the reader and get certain status information via hardware signals. A brief description of each signal is given in this section. For additional details on the interaction and timing of these signals, refer to the Timing Diagrams and Tables in the sections that follow.

Pin 8 - Power Down (output): The status of PwrDwn is unknown until the system has booted and is ready for commands. At that point, the PwrDwn signal will transition LOW to indicate the CR822x is ready to receive commands. Thereafter, the PwrDwn signal will indicate that the CR822x is either consuming power in an idle or active mode (when asserted LOW) or is in a low power state like sleep mode (when assserted HIGH). The different power modes are described in more detail in Section 4.6.

Pin 9 – Beeper (output): The nBeeper line is used to indicate a successful decode, completion of the boot process, errors, and certain other conditions or events. nBeeper can be configured to transition to a LOW state for a specified length of time or to output a series of pulses of a specified duration on a successful decode or on certain error conditions. Default behavior for this signal is two "beeps" on startup, one "beep" for a good decode, two "beeps" for a successful configuration barcode read, and four beeps if a configuration was not applied successfully.

Pin 10 - Good Read (output): The nGoodRead line is used to indicate a successful decode. Upon the completion of a successful scan and decode, the nGoodRead line will be asserted LOW.

Pin 11 – Wakeup (input): The nWakeUp line is used to change the state of the reader from Sleep to Idle. Once the CR822x has entered the sleep state, it may be awakened by asserting nWakeUp with a LOW pulse. Note that nWakeUp must be HIGH when the CR822x enters the sleep state in order for nWakeUp to awaken the CR822x on assertion. Also note that when the sleep state is not being used, this pin should be left open, not tied low. Please note that the Sleep state is only valid for CR8222.

Pin 12 – Trigger (input): The nTrigger line is used to activate the reader. To activate the CR822x, pull the nTrigger line LOW. This is normally used to cause the reader to scan for a barcode. The Trigger line can also be used to wake a CR822x from sleep.

Note: When Vin is initially supplied, PwrDwn will stay LOW until the processor begins booting and will return low when the booting is complete. If the unit is put to sleep, the PwrDwn signal will then return high. The other outputs will be LOW for a few milliseconds until the main processor has completed part of its boot process. These signals should be ignored until the processor has completed its boot sequence, which will take a maximum of two (2) seconds, or before the PwrDwn signal has transitioned low after waking from sleep. See startup timing diagram below for details.

4.6 – Power Modes

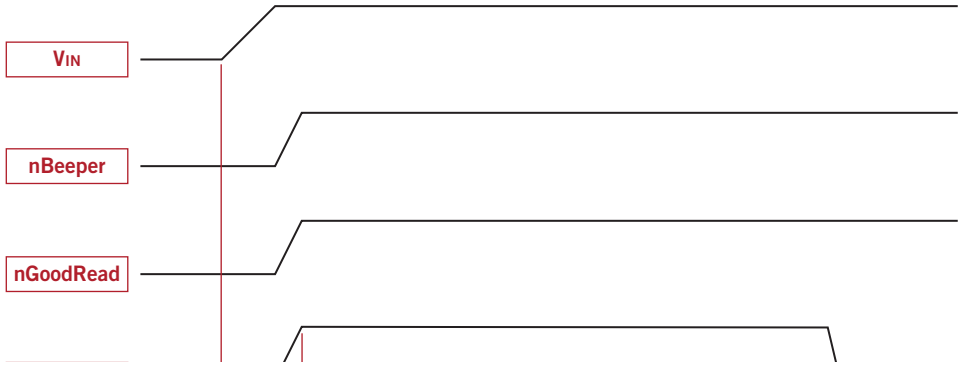
Active Mode: In Active Mode the unit is capturing images and initiating the decode process and/or storing images. The unit transitions to Active Mode from Idle Mode when a trigger event is received.

Idle Mode: In Idle Mode the unit is not actively capturing images. The processor is fully functioning and communication can take place, upgrades can be performed, and scripts can be run. Idle Mode is entered from Boot Mode after power on, from Active Mode after a register defined timeout in which there are no trigger events, and from Sleep Mode on receipt of a wake up.

Sleep Mode (CR8222 only): The imager, illumination, and most of the processor is powered down. The CPU wake up circuitry, the memory, and the input/output buffers are powered. The unit enters the sleep state after a register defined timeout of inactivity. On receipt of a wake up on the *nWakeUp* pin, the processor restores the run environment and enters Idle Mode.

4.7 – Power On (Boot) Timing Diagram

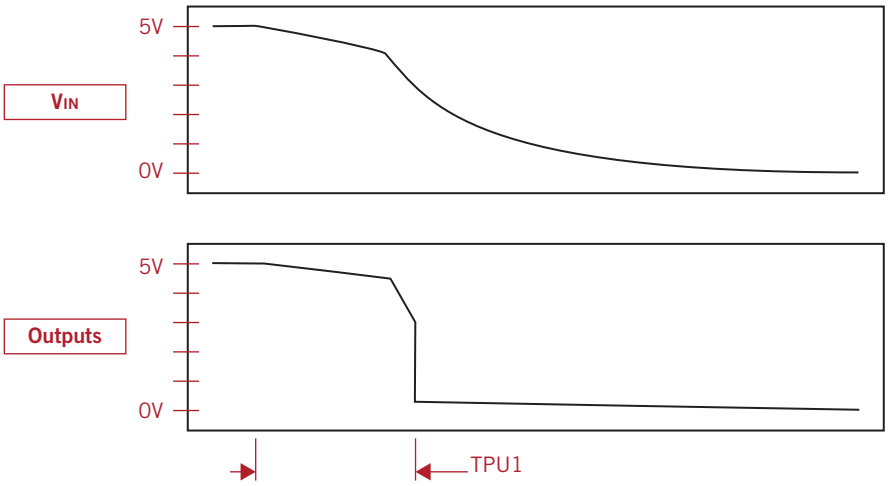
The **PwrDwn** signal will transition to HIGH shortly after VIN is applied and will remain HIGH until the reader is ready.



Parameter	Symbol	Min	Typical	Max	Unit
Time from Power On to firmware ready to receive commands	TPU	350	1500	3000	msec

4.8 – Power Down Timing Diagram

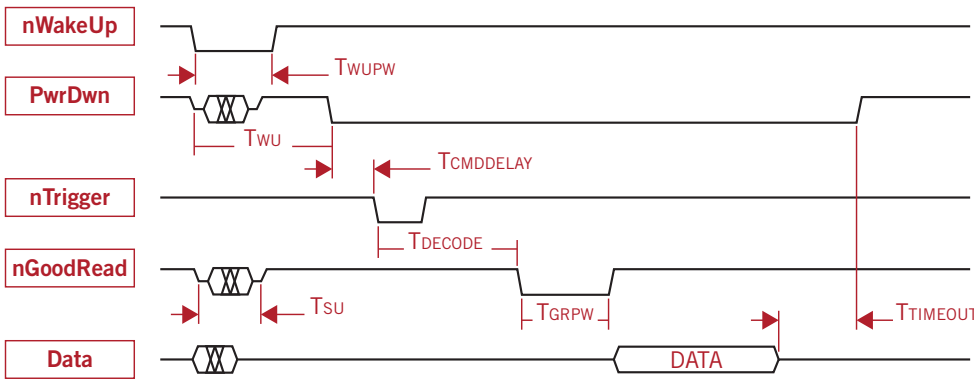
Power (VIN) can be removed at any time except when the unit is performing an upgrade. Removing power during an upgrade may cause the unit to become unusable.



Outputs: PwrDwn, nGoodRead, nBeeper

Parameter	Symbol	Min	Typical	Max	Unit	Note
Time from Power Off to all outputs low	TPD1		0.62		msec	

4.9 – Sleep to Wakeup Timing Diagram



Wake-Up Barcode Read Timing Diagram

Signal	Description	Min	Typical	Max	Unit
TWUPW	*nWakeUp* pulse width	10	10		msec
TWU	Time between *nWakeUp* asserted and CR822x ready	10	11	12	msec
TREADY	Time between CR822x ready and when *nTrigger* can be asserted	0	0	0	msec
TDECODE	Time between *nTrigger* asserted and *nGoodRead* asserted (decode time)		99		msec
TGRPW	*nGoodRead* pulse width	Programmable			
TTIMEOUT	Time between data transfer and sleep state	Programmable			msec

Notes: Trigger can also be used to wake unit.

4.10 – Image Capture Timing Diagram

Image acquisition and decoding can be started from either the nTrigger line or via a communications channel command. The time required to capture an image can vary depending on the size of image selected, the confirmation time configuration, and where the imager is in the capture cycle. The time to decode an image can depend on the image quality, complexity of the barcode, etc. The maximum time spent trying to decode an image defaults to 320ms and can be controlled by a configuration command.

Image Capture and Timing

Parameter	Symbol	Min	Typ	Max	Unit	Note
Time from Trigger Accepted to Image Capture Complete	TIC	5	32	100	msec	1
Minimum Trigger duration	TTMIN	10	20	N/A		2
Trigger Confirmation Time	TTCT	0	0	see note	msec	3

Notes: 1. Tic is dependent on image size.
2. Trigger must be asserted for Trigger Confirmation Time.
3. Trigger Confirmation Time defaults to zero and is adjustable.

4.11 – Ribbon Cable Diagram (Decode Board to Host Interface)

Our ribbon cables have the following characteristics:

1: Bottom contact on mating end

2: 12 pin

3: 0.5 mm pitch

4: 0.3 mm thickness with stiffener

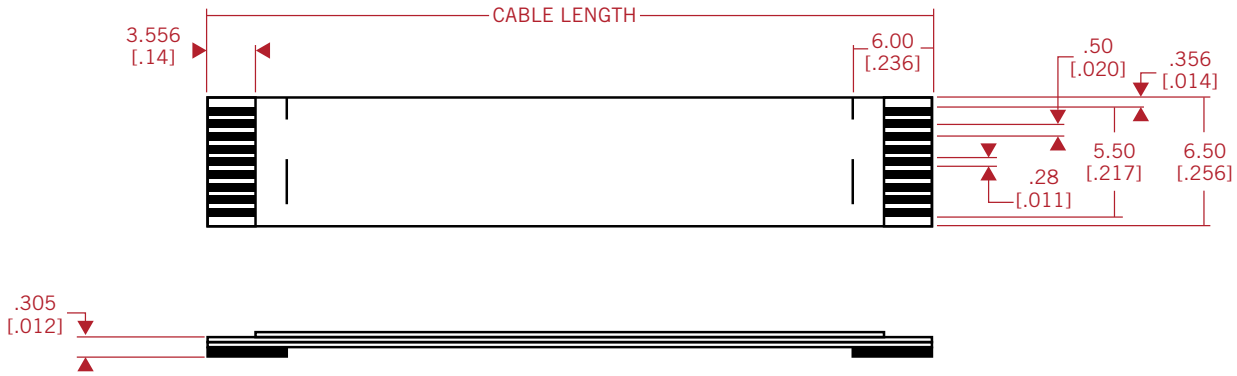
Our ribbon cables have contacts on the same side of each end. Please take this into account with respect to the control signals when designing the mating connector pinout on the host interface.

The Development Kits, CR822x-DKX, use a ribbon cable with opposite side contacts.

3.3V operation is only possible with 152.4 mm [6.0”] or shorter ribbon cable.

Three ribbon cables are available with the following SKUs and lengths:

SKU	Length
C800	50.8 mm [2.0”]
C801	152.4 mm [6.0”]
C802	304.8 mm [12.0”]



4.12 – Electrical Characteristics (DC) – Absolute Ratings (Min and Max)

Parameter	Symbol	Min	Max	Unit	Note
DC Supply Voltage (RS232)	V_{IN}	2.97	3.63	V	
DC Supply Voltage (USB)	V_{IN}	4.75	5.25	V	
Output source or sink current	Io		330	mA	1

Notes: 1. nBeeper sinks the most current. Other outputs sources a max of 16 mA.

4.13 – Electrical Characteristics – Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Note
RS232						
DC Supply Voltage, RS232	V_{IN}	2.97	3.3	3.63	V	
High level input voltage	V_{IH}	2.0			V	
Low level input voltage	V_{IL}			0.8	V	
High level output voltage	V_{OH}	2.4		V_{IN}		1
Low level output voltage	V_{OL}			0.55	V	
Active operating current	I_A			475	mA	2,5
Sleep current	I_S			150	uA	3,4
Inrush current	I_R			600	mA	6
USB						
DC Supply Voltage, USB	V_{IN}	4.75	5.0	5.25	V	
USB high level input voltage	V_{USBIH}	2.0			V	
USB low level input voltage	V_{USBIL}			0.8	V	
USB static output high	V_{USBOH}	2.8		3.6	V	
USB static output low	V_{USBOL}			0.3	V	
Active operating current	I_A			325	mA	2,5
Inrush current	I_R			600	mA	6
RS232 and USB						
Output leakage current	I_{OZ}			10	uA	
Idle operating current	I_I		95		mA	

Notes:
1. *100 Kilo-ohm pull-up to V_{IN} on open drain output; actual voltage will depend on external impedance connected to pin*
2. *Depends on the brightness level of the illumination LEDs*
3. *Assumes inputs and outputs are tri-stated or high. If pulled low, current through pull up resistors will need to be added*
4. *The USB model does not support sleep mode*
5. *Continuous scan*
6. *Duration above max operating current is 32 uS.*

4.14 – Decode PCB to Imager PCB Connector

Pin	Name	Type	Description	Note
1	VIN (RS232) / USB_ VBUS (USB)	Power	VIN power to Optical Engine	
2	VIN (RS232) / USB_ VBUS (USB)	Power	VIN power to Optical Engine	
3	1.8V	Power	1.8V power to Optical Engine	
4	2.8VImagerEnable	Output	Imager 2.8V enable	
5	Gnd	Power	Power and signal ground	
6	ExtClk	Output	External clock to imager	
7	Gnd	Power	Power and signal ground	
8	PixClk	Input	Pixel clock	
9	Gnd	Power	Power and signal ground	
10	FrameValid	Input	Vsync from imager	
11	LineValid	Input	Hsync from imager	
12	Gnd	Power	Power and signal ground	
13	Dout4	Input	Imager pixel data 4	
14	Dout5	Input	Imager pixel data 5	
15	Dout6	Input	Imager pixel data 6	
16	Dout7	Input	Imager pixel data 7	
17	Dout8	Input	Imager pixel data 8	
18	Dout9	Input	Imager pixel data 9	
19	Dout10	Input	Imager pixel data 10	
20	Dout11	Input	Imager pixel data 11	
21	nImagerReset	Output	Imager reset, active low	
22	Imager_Flash	Output	Imager flash	
23	Sdata	Input/Output	I2C bus data line	
24	Sclk	Output	I2C bus clock line	
25	Gnd	Power	Power and signal ground	
26	IllumPwm0	Output	PWM illumination signal	
27	TargetLed	Output	Targeting LED control signal	
28	n1.8VImagerEnable	Output	Imager 1.8V enable (active low)	
29	5.0VImagerEnable	Output	Optical Engine 5V enable	
30	Imager_Trigger	Output	Imager trigger	

Physical Characteristics	Specification
CR822x Dimensions	0.81" W x 0.65" D x 0.47" H
	20.50 mm W x 16.46 mm D x 11.90 mm H
CR822x with Tabs Dimensions	1.24" W x 0.65" D x 0.47" H
	31.60 mm W x 16.46 mm D x 11.90 mm H
CR822x Reader with Tabs Weight	0.10oz. (3.0g) est.
CR822x Reader without Tabs Weight	0.09oz. (3.0g) est.

Performance Characteristics	Specification	
Field of View	0100 - 51° horizontal by 39.4° vertical	0300 - 66.6° Horizontal by 50° Vertical
Focal Distance	0100 - Approximately 130 mm	0300 - Approximately 90mm
Sensor	CMOS 1.2 Megapixel monochrome	
Optical Resolution	1280 x 960	
Pitch	± 65° (from front to back)	
Skew	± 60° (side-to-side)	
Rotational Tolerance	± 180°	
Symbol Contrast	15% minimum reflectance difference	
Target Beam	Single, blue targeting bar, 470 nm LED	
Ambient Light Immunity	Sunlight: Up to 9,000 fc (96,890 lux)	
Power Requirements	Reader @ 5vdc: Maximum=330 mA; Idle=1 mA; Sleep=0.5 mA	
Communication Interfaces	USB, TTL RS232	

User Environment	Specification
Operating Temperature	-20 ° to 55 °C / -4 ° to 131 °F
Storage Temperature	-30 ° to 55 °C / -22 ° to 149 °F
Humidity	5% to 95% non-condensing
1D Barcodes	BC412, Codabar, Code 11, Code 32, Code 39, Code 93, Code 128, IATA 2 of 5, Interleaved 2 of 5, GS1 DataBar, Hong Kong 2 of 5, Matrix 2 of 5, MSI Plessey, NEC 2 of 5, Pharmacode, Plessey, Straight 2 of 5, Telepen, Trioptic, UPC/EAN/JAN
Stacked 1D Barcodes	Codablock F, Code 49, GS1 Composite (CC-A/CC-B/CC-C), MicroPDF, PDF417
2D Barcodes	Aztec Code, Data Matrix, Han Xin, MaxiCode, Micro QR Code, QR Code, Grid Matrix
Postal Barcodes	Australian Post, Canada Post, Intelligent Mail, Japan Post, KIX Code, Korea Post, Planet, Postnet, UK Royal Mail, UPU ID-tags
Proprietary 2D Barcodes	GoCode® (Additional License Required)

6 – Reading Range Specifications

The following table summarizes the reading distances for the specified barcodes.

	Standard Single Field Optics (S=0100)		Wide Angle Single Field Optics (S=0300)	
Test Barcode	Min inches (mm)	Max inches (mm)	Min inches (mm)	Max inches (mm)
7.5 Mil Code 39	2.0” (50mm)	9.6” (245mm)	1.0” (25 mm)	7.08” (180 mm
10.5 Mil GS1 Databar	1.4” (35mm)	8.9” (225mm)	1.0” (25 mm)	7.48” (190 mm)
13 Mil UPC	1.6” (40mm)	14.6” (370mm)	1.0” (25 mm)	10.23” (260 mm)
5.8 Mil PDF417	3.3” (85mm)	6.1” (155mm)	1.1” (27 mm)	5.03” (128 mm)
6.7 Mil PDF417	2.6” (65mm)	6.9” (175mm)	1.0” (25 mm)	5.51” (140 mm)
5 Mil Data Matrix	3.0” (75mm)	3.5” (90mm)	1.3” (34 mm)	3.54” (90 mm)
6.3 Mil Data Matrix	2.8” (70mm)	5.3” (135mm)	1.0” (25 mm)	4.33” (110 mm)
10 Mil Data Matrix	2.0” (50mm)	8.1” (205mm)	1.0” (25 mm)	6.57” (167 mm)
20.8 Mil Data Matrix	1.2” (30mm)	15.7” (400mm)	1.0” (25 mm)	11.53” (293 mm)

Note: All samples were high quality barcodes and were read along a physical center line at a 10° angle. Default AGC settings were used. Accuracy = +/- 10%.

7 - Warranty

The CR822x carries a one year limited warranty as described herein.

Limited Warranty. Code warrants each Code product against defects in materials and workmanship under normal use for the Warranty Coverage Term applicable to the product as described at www.codecorp.com/legal/warranty/term.php. If a hardware defect arises and a valid warranty claim is received by Code during the Warranty Coverage Term, Code will: i) repair a hardware defect at no charge, using new parts or parts equivalent to new in performance and reliability; ii) replace the Code product with a product that is new or refurbished product with equivalent functionality and performance, which may include replacing a product that is no longer available with a newer model product; or ii) in the case of failure with any software, including embedded software included in any Code product, provide a patch, update, or other work around. All replaced products become the property of Code. All warranty claims must be made using Code's RMA process.

Exclusions. This warranty does not apply to: i) cosmetic damage, including but not limited to scratches, dents, and broken plastic; ii) damage resulting from use with non-Code products or peripherals, including batteries, power supplies, cables, and docking station/cradles; iii) damage resulting from accident, abuse, misuse, flood, fire or other external causes, including damage caused by unusual physical or electrical stress, immersion in fluids or exposure to cleaning products not approved by Code, puncture, crushing, and incorrect voltage or polarity; iv) damage resulting from services performed by anyone other than a Code authorized repair facility; v) any product that has been modified or altered; vi) any product on which the Code serial number has been removed or defaced. If a Code Product is returned under a warranty claim and Code determines, in Code's sole discretion, that the warranty remedies do not apply, Code will contact Customer to arrange either: i) repair or replace the Product; or ii) return the Product to Customer, in each case at Customer's expense.

Non Warranty Repairs. Code warrants its repair/replacement services for ninety (90) days from the date of shipment of the repaired/replacement product to the Customer. This warranty applies to repairs and replacements for: i) damage excluded from the limited warranty described above; and ii) Code Products on which the limited warranty described above has expired (or will expire within such ninety (90) day warranty period). For repaired product this warranty covers only the parts that were replaced during the repair and the labor associated with such parts.

No Extension of Term of Coverage. Product that is repaired or replaced, or for which a software patch, update, or other work around is provided, assumes the remaining warranty of the original Code Product and does not extend the duration of the original warranty period.

Software and Data. Code is not responsible for backing up or restoring any of software, data, or configuration settings, or reinstalling any of the foregoing on products repaired or replaced under this limited warranty.

Shipping and Turn Around Time. The estimated RMA turn-around time from receipt at Code's facility to shipment of the repaired or replaced product to Customer is ten (10) business days. An expedited turn-around time may apply to products covered under certain CodeOne Service Plans. Customer is responsible for shipping and insurance charges for shipping Code Product to Code's designated RMA facility and repaired or replaced product is returned with shipping and insurance paid by Code. Customer is responsible for all applicable taxes, duties, and similar charges.

Transfer. If a customer sells a covered Code Product during the Warranty Coverage Term, then that coverage may be transferred to the new owner by written notification from the original owner to Code Corporation at:

CodeOne Service Center
12393 South Gateway Park Place, Suite 600
Draper, UT 84020 USA

Limitation on Liability. Code's performance as described herein shall be Code's entire liability, and the Customer's sole remedy, resulting from any defective Code product. Any claim that Code has failed to perform its warranty obligations as described herein must be made within six (6) months of the alleged failure. Code's maximum liability related to its performance, or failure to perform, as described herein shall be limited to the amount paid by Customer for the Code product that is subject to the claim. In no event will either party be liable for any lost profits, lost savings, incidental damage, or other economic consequential damages. This is true even if the other party is advised of the possibility of such damages.

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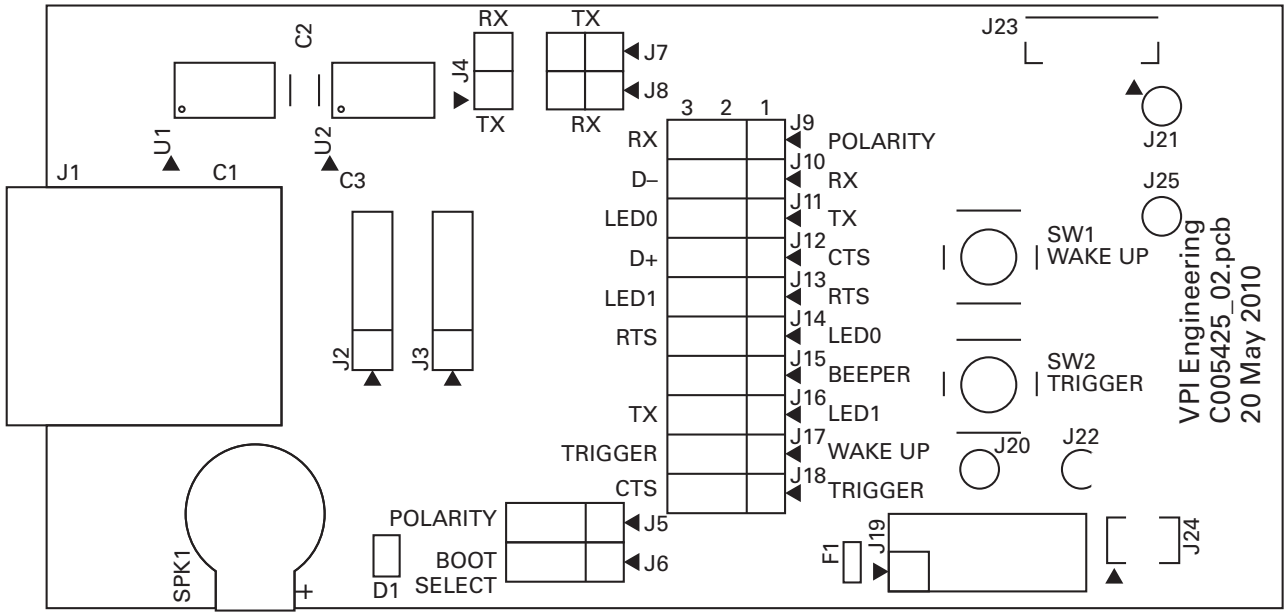


8.1 – CR8000 Development Kit User Guide

Development Kit Overview

The development kit includes everything needed to integrate the Scan Engine into a target design. We provide a complete Scan Engine, development breakout board and all documentation required to quickly evaluate and integrate the Scan Engine.

NOTE: The CR8000 Development kit can be used with the CR8221 and CR8222. If evaluating the CR8222 with a CR8000 development kit, then extra caution must be taken to ensure supply voltages do not drop below the specified 2.97 V. Going below the specified minimum voltage will cause a reset on the CR8222.

Scan Engine

The development kit comes with a complete Decoded Scan Engine that includes the imager and decoder board integrated into a single assembly. Please see the Mechanical Specifications section for details on this assembly.

Development Board

The development board is the main user interface to the kit. It provides access to all features of the Scan Engine including the debug and development resources available.

Interface

The CR822x connects to the development board via J23.

Trigger/Wake Up Switches

SW1 and SW2 allow the user to wake the unit from Sleep Mode and trigger a barcode read, respectively. If the unit is in a sleep state when the trigger is pushed, the Scan Engine will automatically wake up before performing a barcode read.

Scan Interface

J1 interfaces to an RJ-50 connector that carries both USB and RS232 signals to an external interface. The connector also provides a trigger signal to activate the CR822x remotely.

Indicators

The development board includes a speaker (SPK1) for audible indication as well as a bi-color LED (D1) for visual indication.

Configuration Jumpers

A group of jumpers allow the development board to re-configure and access different features of the CR822x. J7 and J8 configure auxiliary serial port features that appear on J2 and J3. J5 configures serial port polarity. Finally, the CR822x host port configuration can be changed via the jumper block J9-J18.

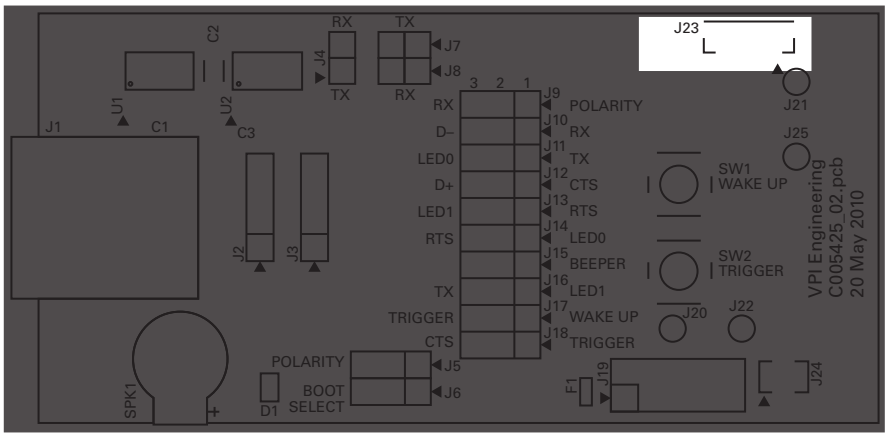
Auxiliary Headers

J2 and J3 provide auxiliary and debug serial communications to the CR822x.

8.2 – Development Board Connections

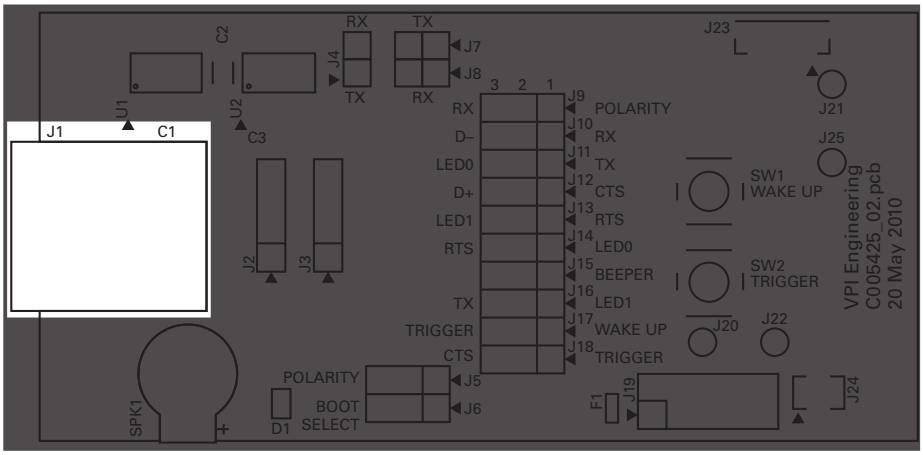
Connections

The CR822x connects to the development board via J23.



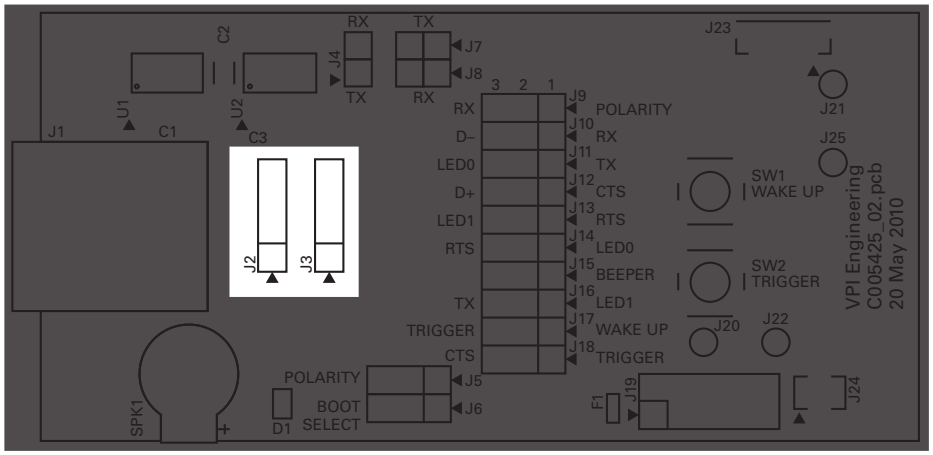
RJ-50 System Header

The majority of system communication goes through the RJ-50 System Header. The RJ-50 cable provides power to the development kit and is available in RS232 or USB version. There is also the ability to trigger through this connection.



Auxiliary and Debug Serial Headers

J2 and J3 provide auxiliary communications to the CR822x for development and test purposes. J2 is a serial console interface to the engine, and J3 is attached to RS232 Port 4.

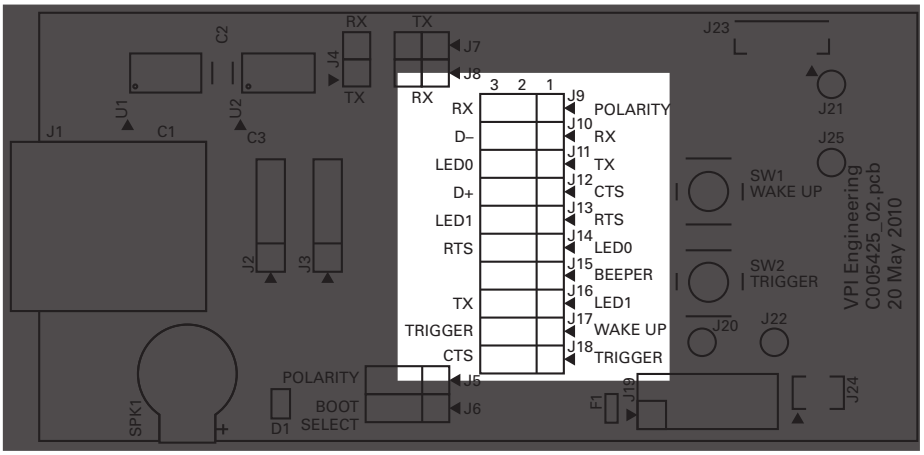


8.3 – Development Board Jumpers

Interface Header

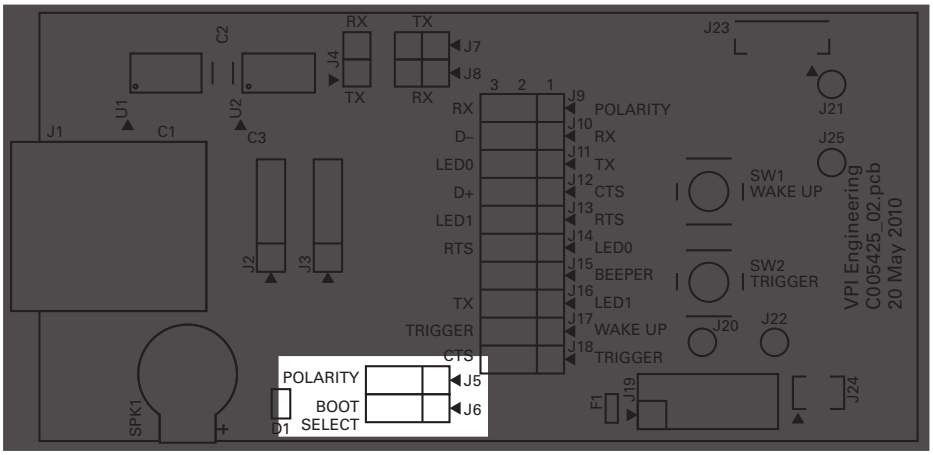
The jumper block of J9-J18 configures the signals between the CR822x and RJ-50 connector. This is done by shorting pins 1-2 or 2-3 on each jumper. Refer to the table below for configuring these pins for each interface:

Jumper	RS232 Kit	USB Kit
J9	1-2	1-2
J10	1-2	2-3
J11	1-2	1-2
J12	1-2	2-3
J13	1-2	1-2
J14	1-2	1-2
J15	1-2	1-2
J16	1-2	1-2
J17	1-2	1-2
J18	1-2	1-2



Serial Polarity and Boot Select Jumpers

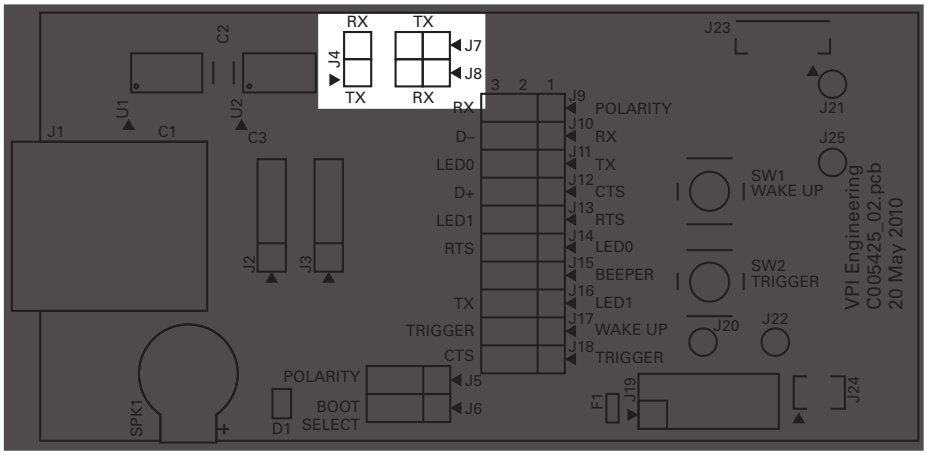
J5 selects whether or not the primary RS232 data are inverted, and the combination of J6 and SW2 will select the boot mode the kit comes up in. The RS232 data will be inverted if J5 has pins 2-3 bridged. For non-inverted, do not populate. Placing a jumper between 1-2 may damage the CR8200.



8.3 – Development Board Jumpers (continued)

Serial Debug Jumpers

The serial debug jumper block of J4, J7 and J8 determine whether or not RS232 Port 4 is routed to J3, and allows a user to tap off of the debug port on J2. J7 and J8 are shorted to connect CR822x RS232 Port 4 to J3.



8.4 – Development Board Fuses

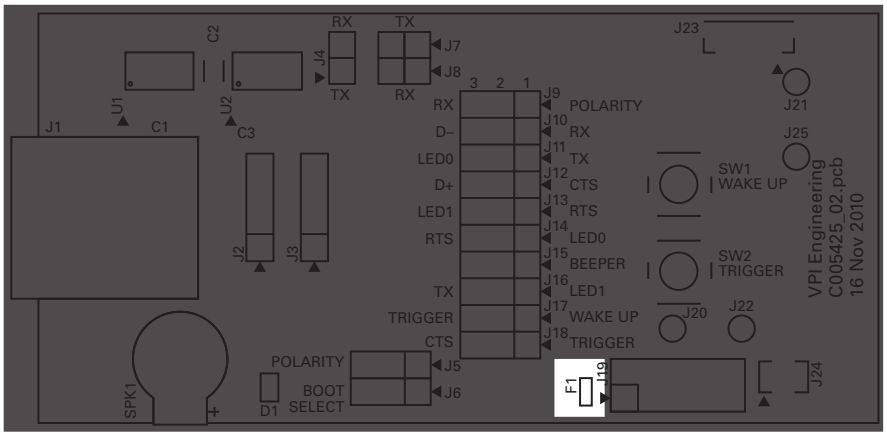
There are two fuses on the development board. Both are used to protect the input voltage line, VIN, but for different connection options.

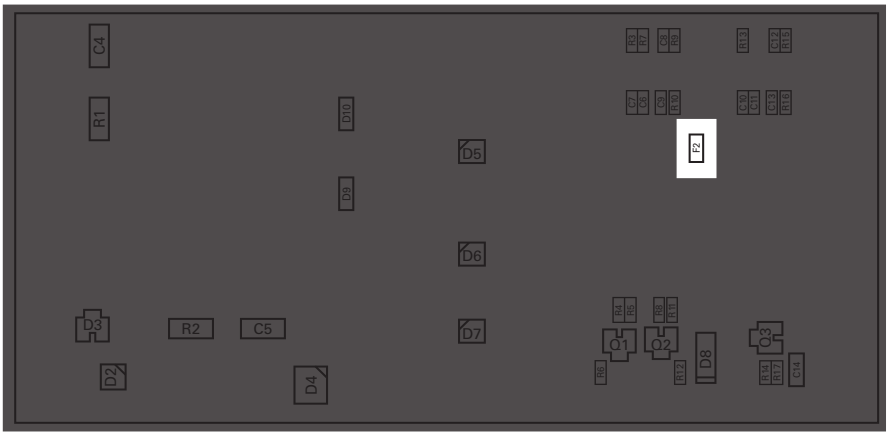
The standard cables provide VIN through the RJ-50 connector, J1. The fuse that protects the circuit when using the J1 connection is F2. F2 is located on the back side of the board, under the RJ-50 connector, J1.

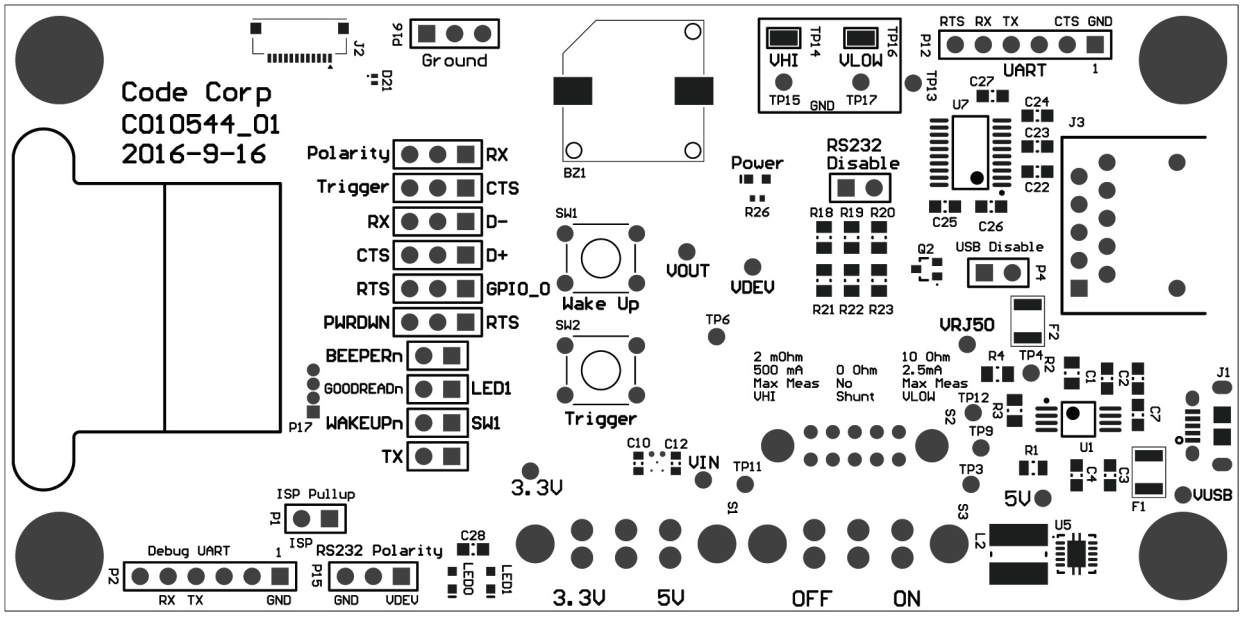
If power is supplied through the Expanded Illumination header (J19), the appropriate fuse is F1. F1 is located on the front side of the board next to J19.

Both fuses have the same part number:

- Code P/N: V005953
- Description: Fuse, 0.75 Amp 0603
- Manufacturer: Littelfuse
- Manufacturer P/N: 0467.750NR







Development Kit Overview

The development kit includes everything needed to integrate the CR82XX Scan Engine into a target design. We provide a complete Scan Engine, development breakout board and all documentation required to quickly evaluate and integrate the CR82XX Scan Engine.

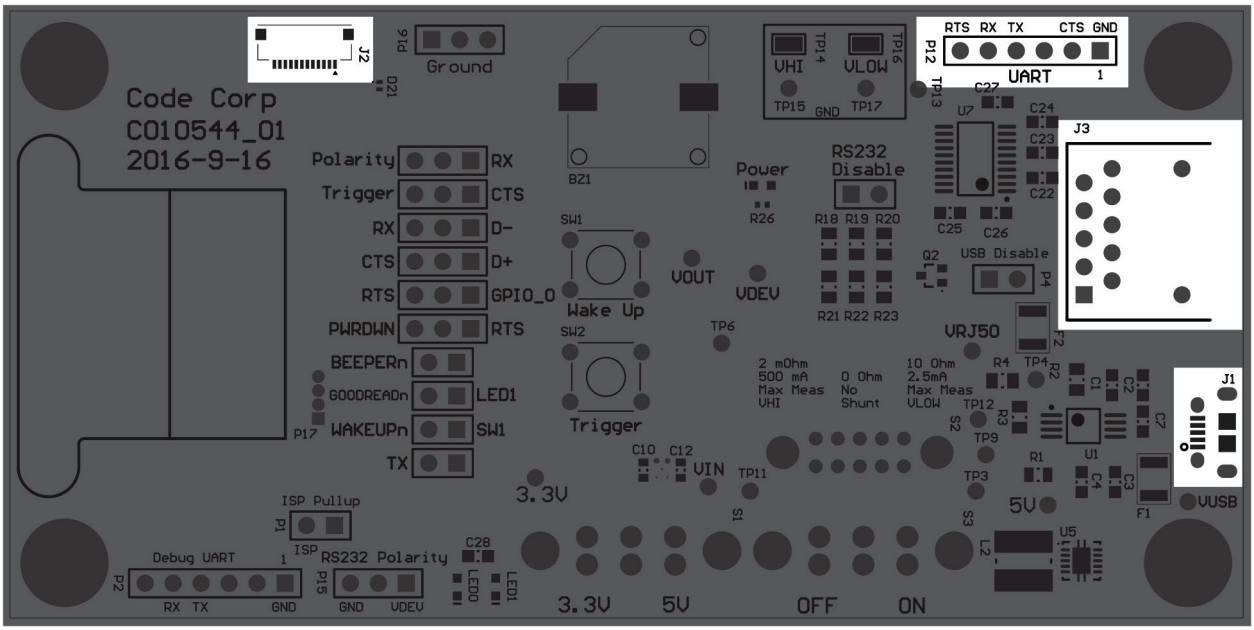
Scan Engine

The development kit comes with a complete Decoded Scan Engine which includes the imager and decoder board integrated into a single assembly. Please see the Mechanical Specifications section for details on this assembly.

Development Board

The development board is the main user interface to the kit. It provides access to all features of the Scan Engine including the debug and development resources available.

9.1 – Interface



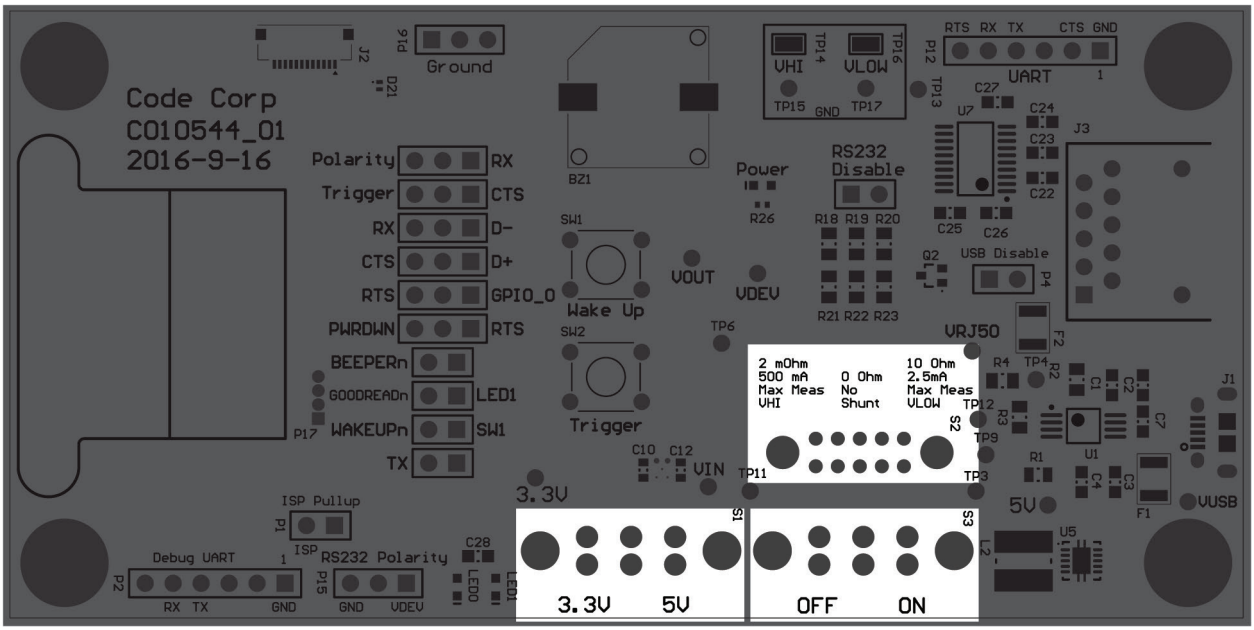
J3 is the standard Code RJ50 interface which supports RS232 using the CRA-C501 cable and USB using the CRA-C500 cable. The connector also provides a trigger signal to activate the engine remotely.

J1 provides a micro-USB interface for the CR8221 and CR8211. If both the RJ50 and micro-USB cables are attached, micro-USB will be used for communication. However, if power is connected to the RJ50 cable, the development board will select it as the power source over micro-USB.

P12 provides a header to connect an FTDI cable for RS232 communication on the CR8222 and CR8212. When using this communication method, a jumper must be placed on the “RS232 Disable” header in order to turn off the MAX3223 transceiver. The system can be powered from either J3 or J1.

J2 is a 12 pin 0.5mm pitch ribbon connector that is used to connect the engine. A reversed cable must be used such as 687712100002 made by Wurth Electronics.

9.2 – Power System



The S1 switch selects which voltage to run the engine and development board on, 3.3V or 5V. The development board provides both 3.3V and 5V regulators to provide a consistent power source to the engine.

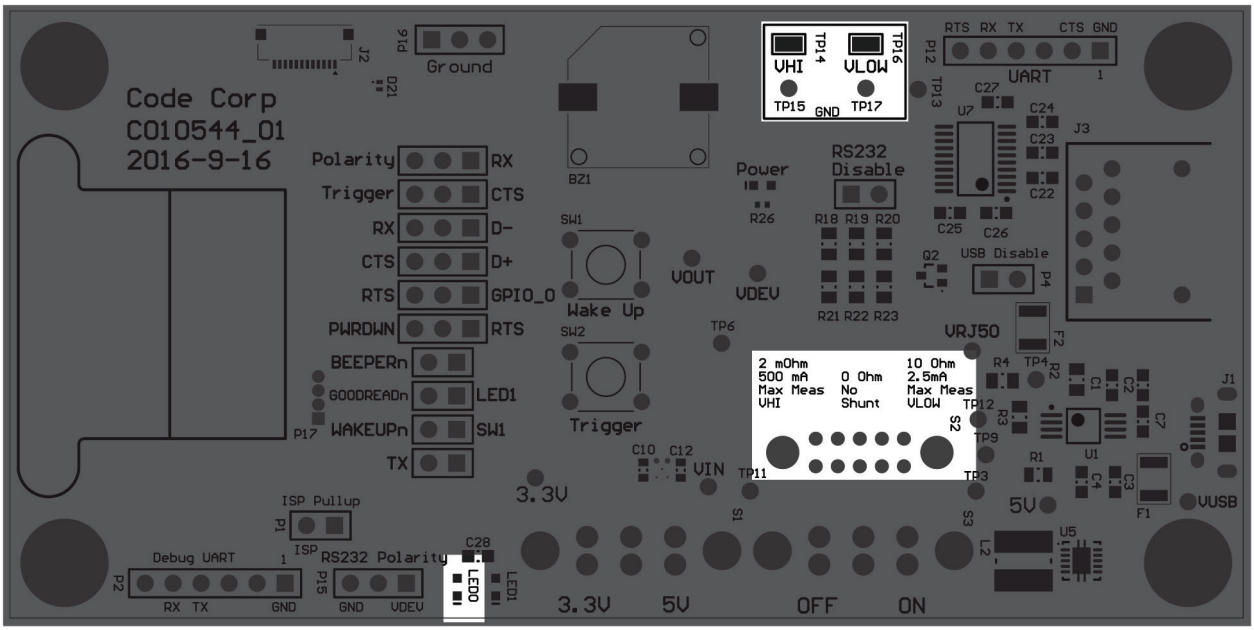
For the CR8221, the switch must be set at 5V.

For the CR8222, the switch must be set at 3.3V.

The S3 switch turns the system on.

The S2 switch is used to select which current measurement path to use. For normal operation, the switch must be set in either the left position closest to the engine or the center position. See the next section for performing power measurements on the engine.

9.3 – Power Measurements



The development board provides current shunt amplifiers for two different ranges to perform power measurements on the engine. Switch S2 will select which path the current to the engine is routed.

The center position of S2 has no shunt, and directly connects VDEV (the voltage selected by S1, 3.3V or 5V) to VOUT (the voltage to the engine provided through J2).

Using an oscilloscope capable of math functions, such as the Keysight InfiniiVision MSOX3104T, and two voltage probes, the engine's power can be easily measured in the operating and sleep states. Measure VOUT and multiply with the calculated current to get power.

Operating Current

The left position of S2, closest to the engine, has a 2mΩ shunt between VDEV and VOUT. The shunt has an integrated current shunt amplifier that provides a factory calibrated gain of 2.0V/A. The voltage output of this amplifier can be read from VHI on TP14 or TP15. To convert from the voltage output to a current, divide the output by 2. This amplifier is capable of measuring up to 500mA with a max VHI of 5V.

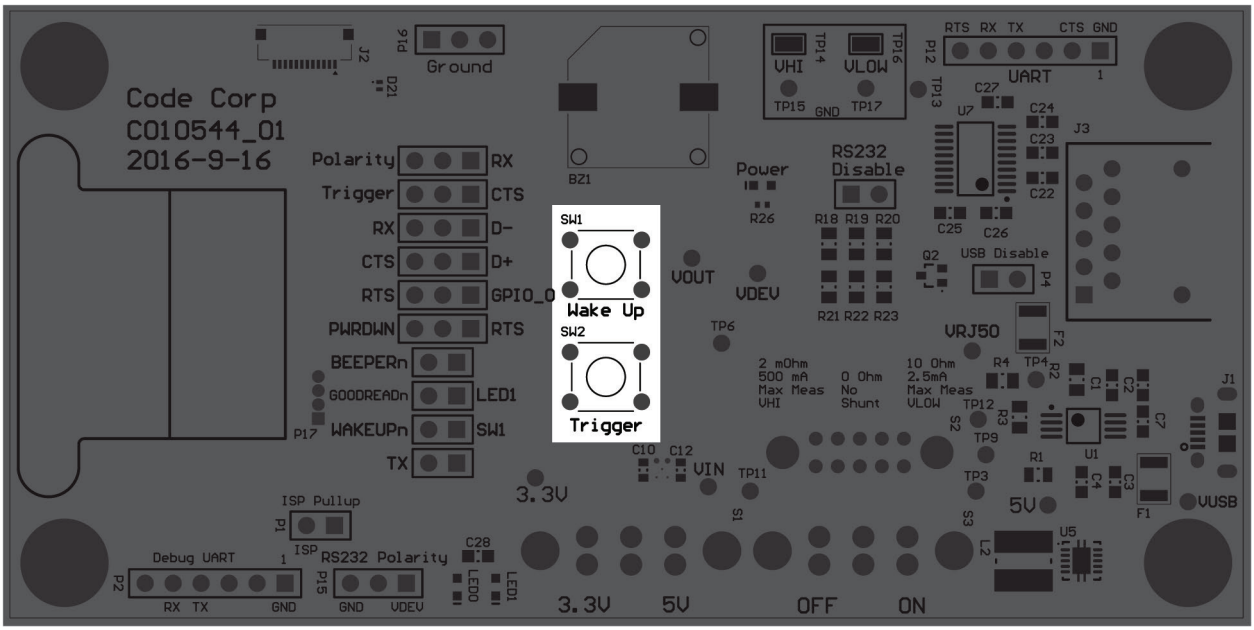
Sleep Current

To measure the current when the engine is asleep, first the offset of the system needs to be measured. Disconnect the engine from the development board by disconnecting the ribbon cable from J2. Turn on the development board, set the desired voltage on S1, then set S2 in the rightmost position closest to the RJ50 connector. Use a multimeter or oscilloscope to measure the VLOW voltage on TP16 or TP17. This voltage is the offset of the measurement.

To perform a sleep current measurement, start with S2 in either the left or center position. Wait until the engine sleeps or put it to sleep. LED0 will be off if the engine is asleep and on if it is awake. When the engine is asleep, move S2 to the right position closest to the RJ50 and USB connectors. This will route the current to the engine through a 10Ω shunt attached to a current shunt amplifier with a gain of 100V/V. The output of the amplifier can be read from VLOW on TP16 or TP17. To convert from voltage to current, subtract the offset you measured earlier from VLOW and divide by 1000. The silkscreen on Rev 01 PCB's does not show the correct formula or range. The max range for the low current path measurement is 5mA with a max VLOW of 5V.

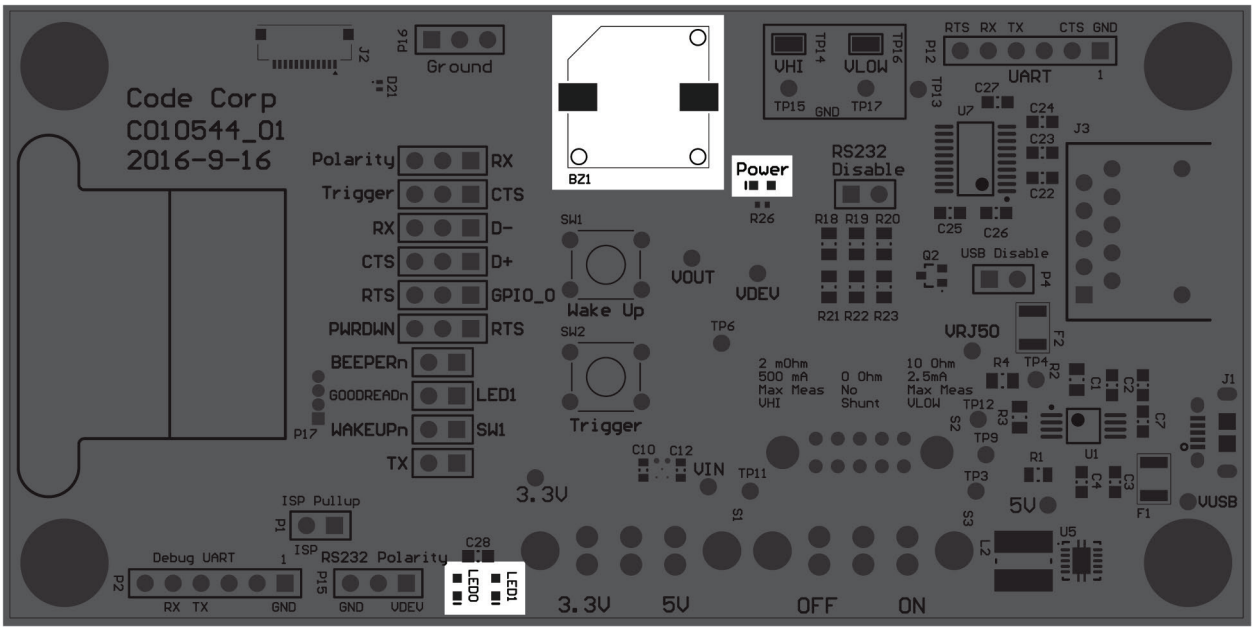
Note: The silkscreen on Rev 01 PCB's does not show the correct formula or range.

9.4 – Trigger/Wake Up Switches



SW1 and SW2 allow the user to wake the unit from Sleep Mode and trigger a barcode read, respectively. If the unit is in a sleep state when the trigger is pushed, the Scan Engine will automatically wake up before performing a barcode read.

9.5 – Indicators



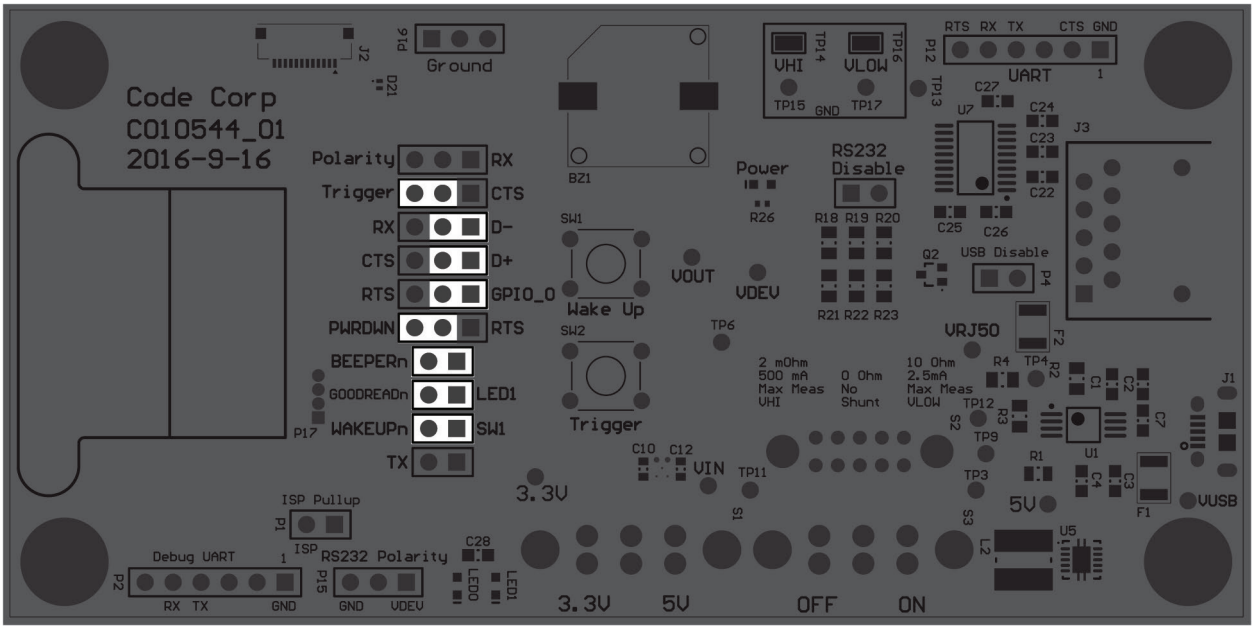
The development board includes a speaker (BZ1) for audible indication as well as two LED's for visual indication. LED0 connects to PWRDWN and is on when the engine is awake, off when it is asleep. LED1 connects to GOODREADn and will flash when a barcode is successfully decoded. The power LED indicates that the development board is powered. It will be on if power is connected and S3 is in the ON position.

9.6 – Development Board Jumpers

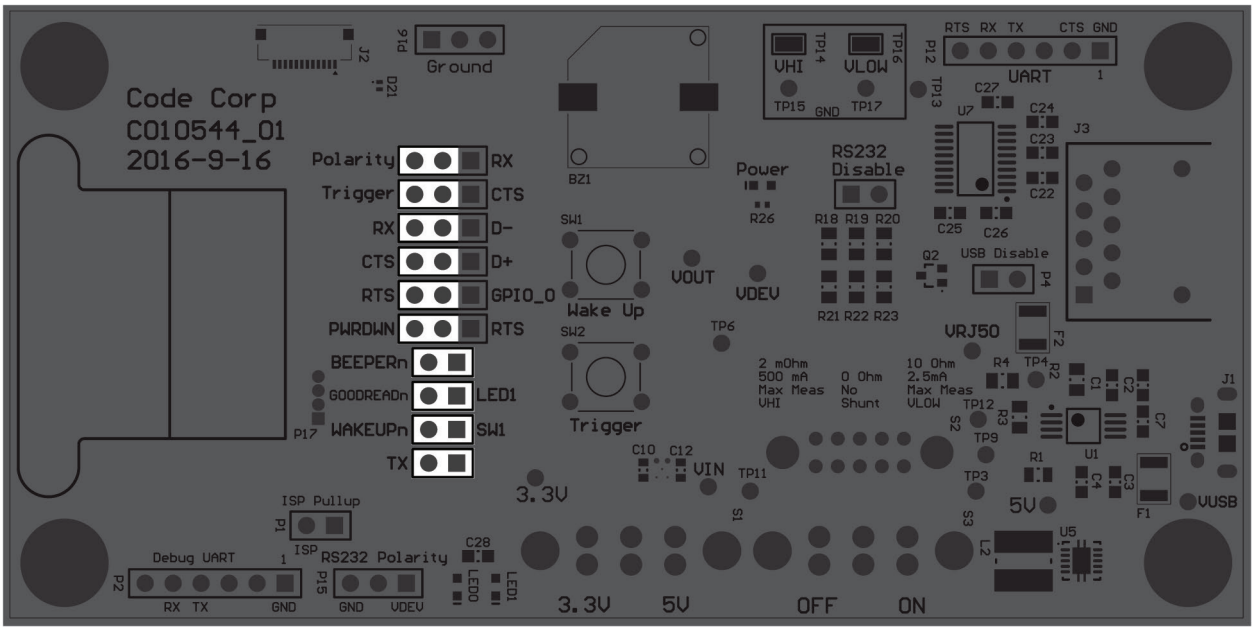
Interface Header

The jumper block located just to the right of the engine configures the signals between the CR82xx and RJ-50, FTDI, and USB connector. This is done by shorting pins 1-2 or 2-3 on each jumper. Refer to figures below for setting up each configuration.

CR82X1 USB

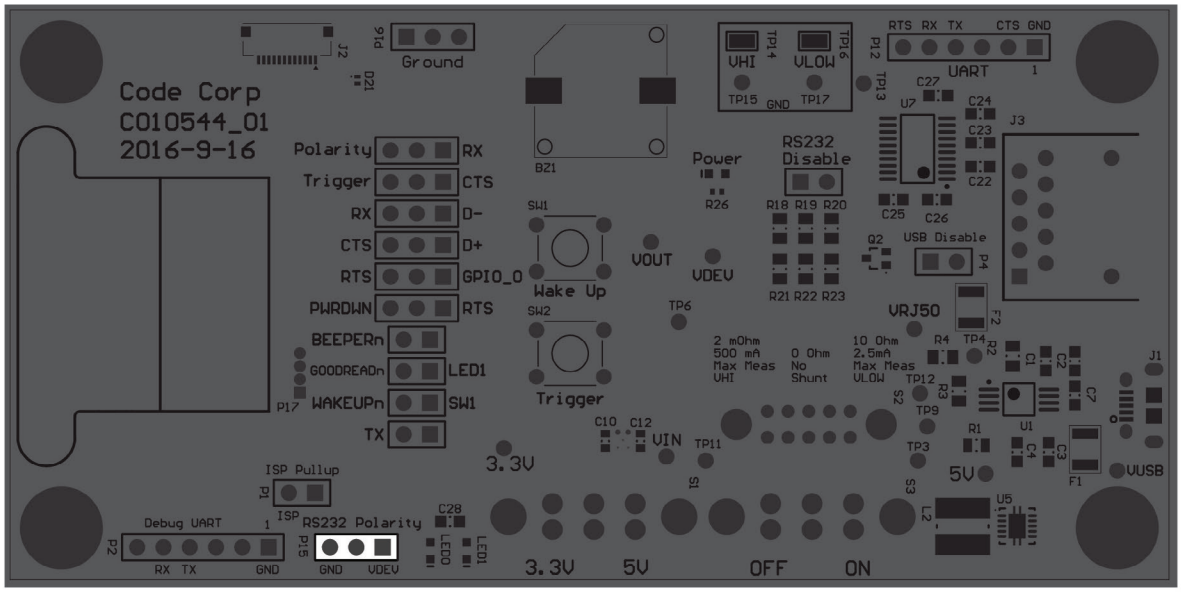


CR82X2 RS-232



9.6 – Development Board Jumpers (continued)

Serial Polarity Jumper



P15 selects whether or not the primary RS-232 data are inverted. The RS-232 data will be inverted if P15 has pins 1-2 bridged (GND and the center pin). The CR82XX engines have an internal pullup on the polarity input and default to non-inverted signaling.