



Embedded Navigation Solutions

VN-100, VN-200 & VN-300 Development Board User Manual



VectorNav Technologies
10501 Markison Road
Dallas, Texas 75238
United States of America



Contact Info

Phone +1 512-772-3615
Email support@vectornav.com
Website www.vectornav.com

Document Information

Title	VN -100, VN-200, VN-300 SMD Development Board User Manual
Subtitle	Development Board User Manual
Document Type	User Manual
Document Number	UM002
Document Status	Released



Table of Contents

Contents

1	Introduction	5
1.1	BOARD CONFIGURATION	5
	<i>30-Pin Header (J1)</i>	6
	<i>USB (J2 and J3)</i>	6
	<i>DB-9 (J4)</i>	6
	<i>ANTA/ANTB (J5/J6)</i>	6
	<i>B1</i>	6
1.2	INDICATOR LIGHTS	7
2	Push Buttons	8
2.1	RESET (S2)	8
2.2	TARE/RFS (S1)	8
2.3	COMM CONFIG (S3)	8
2.4	MISC CONFIG (S4)	8
3	Notes on operating the Dev board	10
3.1	BATTERY BACKUP	10
3.2	POWER	10
3.3	COMMUNICATION CONFIGURATION	11
4	30 Pin header pin descriptions	12
5	Connector Identification - Quick Reference	Error! Bookmark not defined.
6	Mechanical Drawings	13
7	Schematic	14



VectorNav Technical Documentation

In addition to our product specific technical data sheets, the following manuals are available to assist VectorNav customers in product design and development.

- **VN-100/200/300 User Manuals:** The user manual provides a high-level overview of product specific information for each of our inertial sensors. Further detailed information regarding hardware integration and application specific use can be found in the separate documentation listed below.
- **Hardware Integration Manual:** This manual provides hardware design instructions and recommendations on how to integrate our inertial sensors into your product.
- **Application Notes:** This set of documents provides a more detailed overview of how to utilize many different features and capabilities offered by our products, designed to enhance performance and usability in a wide range of application-specific scenarios.

Document Symbols

The following symbols are used to highlight important information within the manual:



The information symbol points to important information within the manual.



The warning symbol points to crucial information or actions that should be followed to avoid reduced performance or damage to the navigation module.

Technical Support

Our website provides a large repository of technical information regarding our navigation sensors. A list of the available documents can be found at the following address:

<http://www.vectornav.com/support>

If you have technical problems or cannot find the information that you need in the provided documents, please contact our support team by email or phone. Our engineering team is committed to providing the required support necessary to ensure that you are successful with the design, integration, and operation of our embedded navigation sensors.

Technical Support Contact Info

Email: support@vectornav.com

Phone: +1.512.772.3615



1 Interfaces

1.1 Board configuration

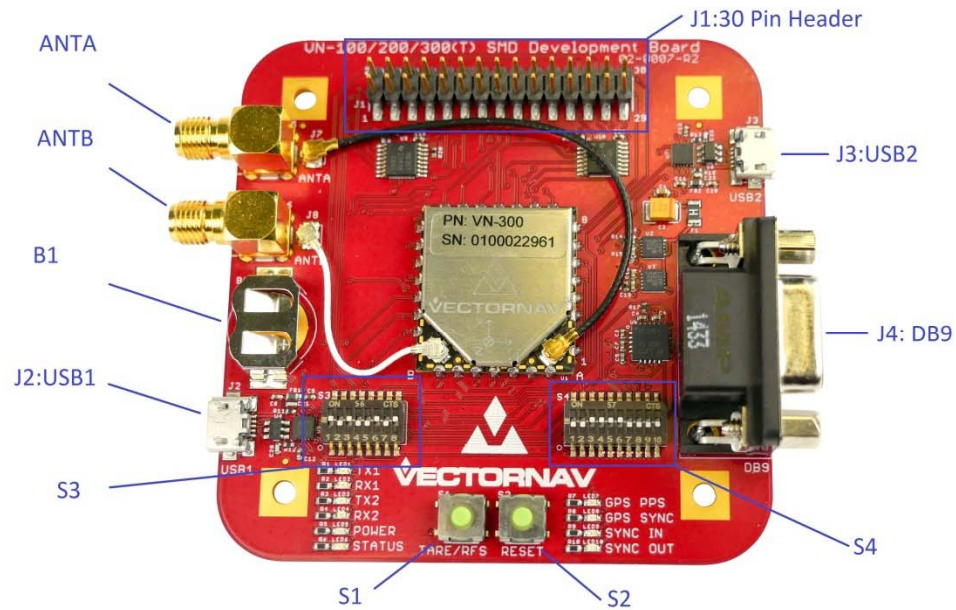


Figure 1 – Top View of Development Board

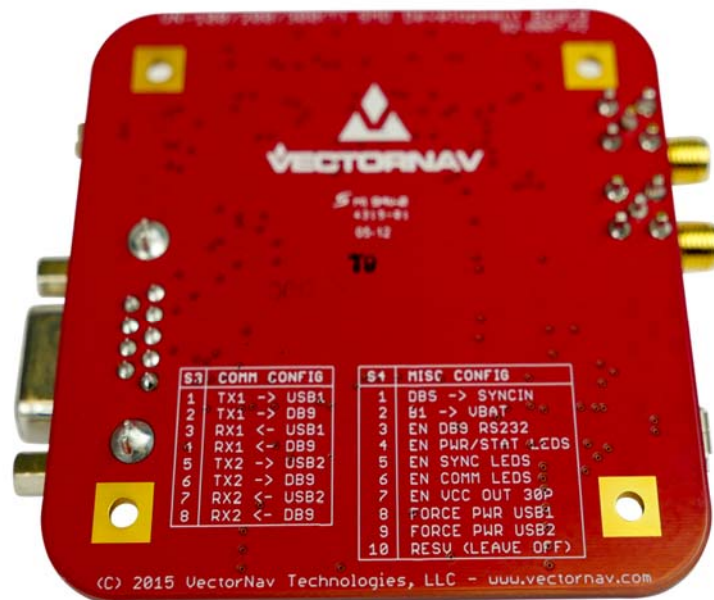


Figure 2 – Bottom View of Development Board



1.2 Connectors

To get started with your development board you can simply connect the USB cable provided in the Development kit to J2-USB1 and to your Windows PC. The Red LED will turn on indicating the power status of the board and green LEDs will indicate communication with your PC. Wait for the FTDI drivers to be installed and a new COM port will be available to the system. You can for Example use the provided Sensor Explorer program to now connect to your device. Please see the quickstart guide for step to step instructions.

1.2.1 30-Pin Header (J1)

The 30-pin header J1 is connected directly to the VN-300-SMD pins with the same pin mapping (ie, Pin 1 on J1 maps to the VN-300-SMD Pin 1). The exception to this is Pin 10 (VIN) which is not connected directly (see power supply options) in order to provide supply isolation for the voltage sources connected. When using J1 directly, care should be taken to avoid conflict with other components on the development board. The following pins are never connected to components on the development board and are thus safe to use regardless of the DIP switch configuration settings: 11, 14, 15, 16, 17, 18, 19, 23, 26, 27.

1.2.2 USB (J2 and J3)

There are two micro-B USB jacks on the Development Board. These connectors have positive locking to prevent loss of connection from vibration, and have today become a common interface for also supplying power. For good power transfer, it is recommended to only use high quality USB cables such as the ones included in the development kit. Each USB port has ESD protection and a ferrite bead to reduce noise on the USB bus. When connected to a PC or other device capable of supplying power the Development Board a Red LED will be illuminated. An FTDI FT232R USB interface IC is used to connect the serial port #1 and serial port #2 of the VectorNav sensor to the USB ports. Drivers for the USB to UART must be installed for proper operation of this port. These are supplied with the documentation for the board or they can be downloaded at <http://www.ftdichip.com/FTDrivers.htm>. Typically they are installed automatically on Windows computers when connecting the device.

1.2.3 DB-9 (J4)

The DB-9 port provides a RS-232 logic level interface to either serial port #1 or #2 of the VectorNav sensor. The RS-232 line driver supports speeds up to 1 Mbit. The RS-232 interface requires the Development Board to be powered to function properly. When using only the DB9 port for communication, the adjacent USB port (J3) is commonly used to supply power.

1.2.4 ANTA/ANTB (J5/J6)

These SMA connections are provided for connection to the external active antennas. U.FI jumper wires are used to relay the GPS RF signal to the chip. Please note that the VN-100 does not have any onboard GPS receivers and thus does not utilize any of these ports. The VN-200 has 1 GPS receiver and will come configured with a U.FI jumper to ANTA. The VN-300 will have both ANTA and ANTB U.FI jumpers present.

1.2.5 B1

This battery holder allows a size 1225 or 3V coin cell battery used to supply backup power to the GPS receiver(s) for hot-starting after being powered down. To use the supplied battery, insert it in the



development board battery holder (Note: battery positive side should face up) and connect the battery holder (B1) to the VBAT pin using the appropriate switch in S4. See the Battery Backup section for more details. By default the battery is best left disconnected by S4 for longer periods of storage.



S4 –Switch 2 must be set to on for proper operation of the battery.

1.3 Indicator lights

The development board comes with an array of LED indicators which can be used to visually verify configuration and characteristics of the board's operation. See Table 1 for more details.

Table 1

Name	Color	Function
POWER	Red	Active when power is present on the board
STATUS	Blue	Reserved for future use
TX1	Green	Active when data is sent on UART1
RX1	Green	Active when data is received on UART1
TX2	Green	Active when data is sent on UART2
RX2	Green	Active when data is received on UART2
SYNC IN	Yellow	Active when a positive signal is present on the SYNC IN line
SYNC OUT	Yellow	Active when a positive signal is present on the SYNC OUT line
GPS PPS	Yellow	Active when a positive signal is present on the GPS PPS line. By default will pulse at 1 Hz after power up.
GPS SYNC	Yellow	Active when a positive signal is present on the GPS SYNC line. By default will pulse at 1 Hz only after GPS 3D fix is valid.



2 Push Buttons

2.1 RESET (S2)

This button is used for re-setting the VN-100, VN-200 or VN-300 SMD. Pressing the button at any time while the board is running will trigger a hardware reset the VN module.

2.2 TARE/RFS (S1)

If held during power on (or reset), the device will restore its configuration to factory defaults, overwriting any user settings. If pressed at least 0.5 seconds after power on (or reset), will function as a tare command. Tare functionality is only applicable for the VN-100.

2.3 COMM CONFIG (S3)

This 8-position DIP switch enables users to configure the VN-100, VN-200 or VN-300 UART lines to the USB and RS232 ports on the Development board in a variety of ways. By default, the development board is shipped in a configuration which is backwards compatible with the previous development board, with the USB port on the left side of the board connected to UART1 and the DB9 on the right connected to UART2. See Table 2 for a detailed description of the switch positions.

2.4 MISC CONFIG (S4)

This 10-position DIP switch enables users to configure several other settings and features. See Table 3 for a detailed description of the switch positions.



Note: For quick reference, a short description of the S3/S4 switch positions is printed on the bottom of the development board. To prevent damage to the components on the board only change the DIP switch settings when the board is not powered and using the included DipStick or other non-conductive device

Table 2 - S3 - COMM CONFIG Description

Position	Function when in ON position	Default
1	Connect TX1 signal to USB1 (J2) USB interface	ON
2	Connect TX1 signal to DB9 (J4) RS-232 interface	OFF
3	Connect RX1 signal to USB1 (J2) USB interface	ON
4	Connect RX1 signal to DB9 (J4) RS-232 interface	OFF
5	Connect TX2 signal to USB2 (J3) USB interface	OFF
6	Connect TX2 signal to DB9 (J4) RS-232 interface	ON
7	Connect RX2 signal to USB2 (J3) USB interface	OFF
8	Connect RX2 signal to DB9 (J4) RS-232 interface	ON

Table 3 - S4 - MISC CONFIG Description

Position	Function when in ON position	Default
1	Connect RS-232 input signal on DB9 (J4) Pin 4 to SYNC IN signal. This allows using a RS-232 level input signal with the TTL level SYNC IN input on the module.	OFF
2	Connect battery B1 to VBAT signal, supplying the GPS receiver(s) with the battery backup supply. Applies to the VN-200 and VN-300 only.	OFF
3	Enable power to the RS-232 converter connected to DB9 (J4). When not using the RS-232 interface, it can be disabled to save power.	ON
4	Enable power to the POWER and STATUS LEDs. Can be disabled to save power and/or reduce visual distraction.	ON



5	Enable power to the SYNC IN, SYNC OUT, GPS PPS, and GPS SYNC LEDs. Can be disabled to save power and/or reduce visual distraction.	ON
6	Enable power to the TX1, RX1, TX2, RX2 LEDs. Can be disabled to save power and/or reduce visual distraction.	ON
7	Allow power to be pulled out of the board through VIN (Pin 10) on the 30-pin header (J1). Used for supplying low-power external circuits or logic. See the Power section for more details.	OFF
8	Override automatic USB power detection on USB1 and supply board power through connector (J2). Enable when supplying power from a non-standard supply. (See the Power section for more details.)	OFF
9	Override automatic USB power detection on USB2 and supply board power through connector (J3). Enable when supplying power from a non-standard supply. (See the Power section for more details.)	OFF
10	Reserved, must be left OFF for normal operation.	OFF

3 Notes on operating the Development Board

3.1 Battery Backup

The battery backup (Vbat pin) enables users to provide backup power to the GPS receiver(s), which enable hot starting the receivers when the GPS is subsequently turned on. With other power sources removed, the VBAT pin will consume approximately 30uA. With the CR1225 lithium cell battery supplied in the development kit, this will provide approximately two months of continuous backup time at room temperature. This number may vary based on battery age and temperature. Note that the ephemeris data stored in memory will only be useful for a few hours, so it is recommended to remove or disconnect the battery when not using the device for prolonged periods of time.

3.2 Power

The VN-100, VN-200 and VN-300 SMD can be powered from the VIN pin on J1 or one of the micro USB connectors (J2/J3). Current overload is provided by an onboard self-resetting thermal fuse designed to trip under persistent short-circuit conditions. Valid voltage input range is 3.3V - 5.5V and supplied voltage should not exceed these ranges under any conditions.

The power inputs are isolated from each other, so it is safe to connect multiple power inputs at the same time (even at different voltages). The VN-100, VN-200 and VN-300 SMD will be powered from the highest voltage, potentially sharing current from multiple ports at the same voltage.





The power draw on the USB ports follows the USB specification for a high power device. It will only draw power under several conditions:

- the device is enumerated by the USB host and granted the requested power allocation
- the device is connected to a USB power device identifying itself as a dedicated charging port

In some cases, the development board may be connected to a power source which is not a USB host and does not support the dedicated charger specification. In this case, the development board can be forced to pull power from the port by a switch setting on S4. This setting should only be used if necessary, as it will be out of spec with low-power USB hosts which cannot power the VN-100, VN-200 and VN-300 SMD.

When using one of the micro USB connectors for power input, the input voltage bus may be passed out the VIN pin on J1. This can be useful for powering small interface electronics. Care must be taken not to exceed the limits of the power supply or the internal resettable fuse.



We recommend only using the VIN pin as a power source if the Development Board is at least connected to a USB device identifying itself as a dedicated charging port, allowing 500mA. If a power supply is used it should be current limited at 500mA. This allows a maximum 250mA at VIN pin which should never be exceeded. Do not attempt to draw power from VIN if the device is connected to and enumerated by a USB host as it will only negotiate for 250mA.

The J1 header provides a complete interface to all the pins on the VectorNav sensor. Each pin is directly mapped to the corresponding pin on the sensor, except pin 10 VIN.

3.3 Communication Configuration

UART1 and UART2 are both connected to the 30-pin header J1. UART1 can be connected to the USB1 and DB9 interfaces. UART2 can be connected to the USB2 and DB9 interfaces. Multiple interfaces may be connected to a signal as long as only one signal is driving the line. For example, connecting TX1 to a receiver via the 30-pin header and to the USB1 and DB9 interfaces is okay since only TX1 is driving the line. Connecting the same interfaces to RX1 is not okay since the USB1 and DB9 interfaces will conflict in trying to drive the RX1 line simultaneously.



Here are some configurations to avoid as they will cause incorrect operation of the device:

- Do not connect TX1 and TX2 to the RS232 at the same time.
- Do not connect RX1 or RX2 to the USB and RS232 interfaces at the same time.
- Do not connect RX1 or RX2 to the USB or RS232 interfaces if they are also being driven by a device connected to the 30-pin header.



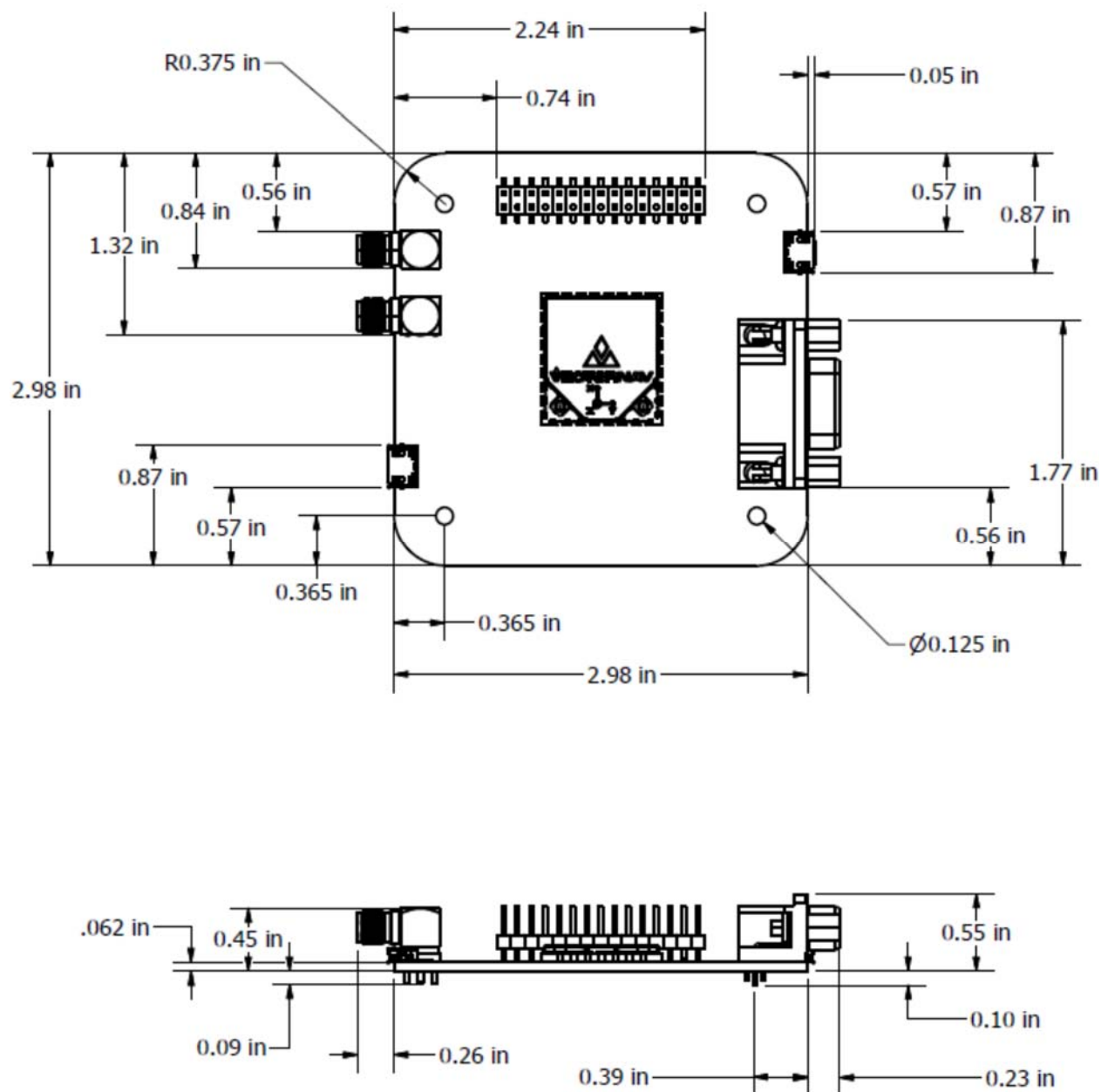
4 J1 - 30 Pin header Pin Descriptions

Pin #	Pin Name	Description
1	GND	Ground.
2	GND	Ground.
3	GND	Ground.
4	GND	Ground.
5	TX2	Serial UART #2 data output. (sensor)
6	RX2	Serial UART #2 data input. (sensor)
7	TARE/RESTORE	Normally used to zero (tare) the attitude. To tare, pulse high for at least 1 μ s. During power on or device reset, holding this pin high will cause the module to restore its default factory settings. Because of this, the pin cannot be used for tare until at least 5 ms after a power on or reset. Internally held low with 10k resistor.
8	NC	Not used.
9	SYNC_OUT	Time synchronization output signal. See Synchronization Control in sensor manual for more details.
10	VIN	3.2 - 5.5V input.
11	ENABLE	Leave high for normal operation. Pull low to enter sleep mode. Internally pulled high with pull-up resistor.
12	TX1	Serial UART #1 data output. (sensor)
13	RX1	Serial UART #1 data input. (sensor)
14	RESV	Reserved for future use. Leave pin floating.
15	SYNC_IN_2	Reserved for future use. For backwards compatibility with older hardware revisions this pin can be configured in software to operate as the time synchronization input signal. For new designs it is recommended that SYNC_IN (pin 22) is used instead. See Synchronization Control in sensor manual for more details.
16	SPI_SCK	SPI clock.
17	SPI_MOSI	SPI input.
18	GND	Ground.
19	SPI_MISO	SPI output.
20	REPRGM	Used to reprogram the module. Must be left floating or set to low for normal operation. Pull high on startup to set the chip in reprogram mode. Internally held low with 10k resistor.
21	NRST	Microcontroller reset line. Pull low for > 20 μ s to reset MCU. Internally pulled high with 10k.
22	SYNC_IN	Time synchronization input signal. See Synchronization Control in sensor manual for more details.
23	SPI_CS	SPI slave select.
*24	GPS_PPS	GPS time pulse. One pulse per second, synchronized at rising edge. Pulse width is 100ms.
*25	VBAT	Optional GPS RTC battery backup. 1.4V – 3.6V input.
26	RESV	Reserved for future use.
27	RESV	Reserved for future use.
28	GND	Ground.
*29	GPS_SYNC	Configurable Output. Defaults to 1 PPS after 3D GPS fix. RESV on both VN-100 and VN-200.
30	GND	Ground.

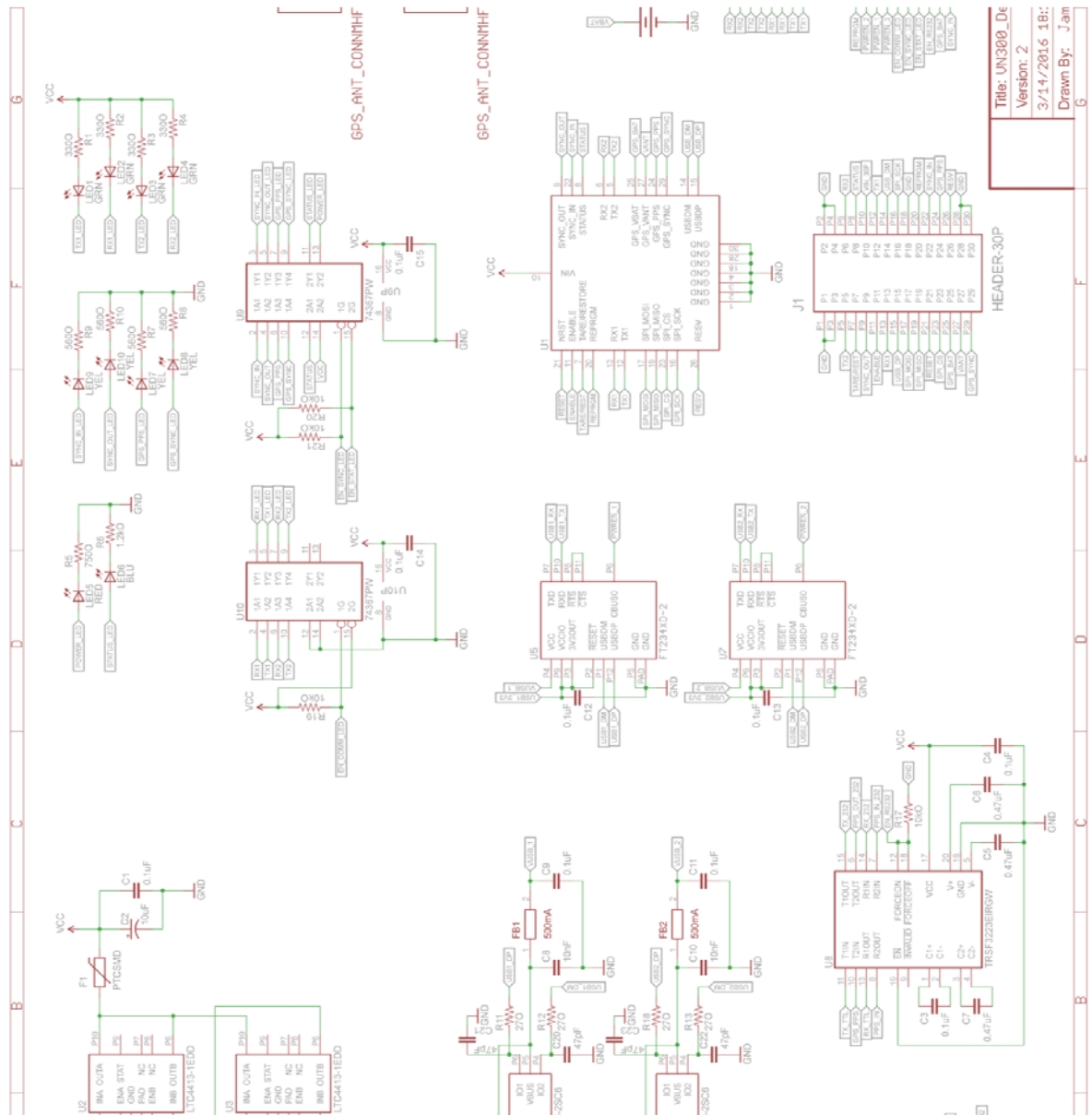


Pins with (*) are reserved for future use on the VN-100 sensor

5 Mechanical Drawings



6 Schematic



Please Read Carefully:

Information in this document is provided solely in connection with VectorNav products. VectorNav Technologies (VN) reserves the right to make changes, corrections, modifications, or improvements to this document, and the products and services described herein at any time, without notice.

All VN products are sold pursuant of VN's terms and conditions of sale.

No license to any intellectual property, expressed or implied, is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by VN for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

Information in this document supersedes and replaces all information previously supplied.

The VectorNav logo is a registered trademark of VectorNav Technologies. All other names are the property of their respective owners.

© 2009 VectorNav Technologies – All rights reserved

