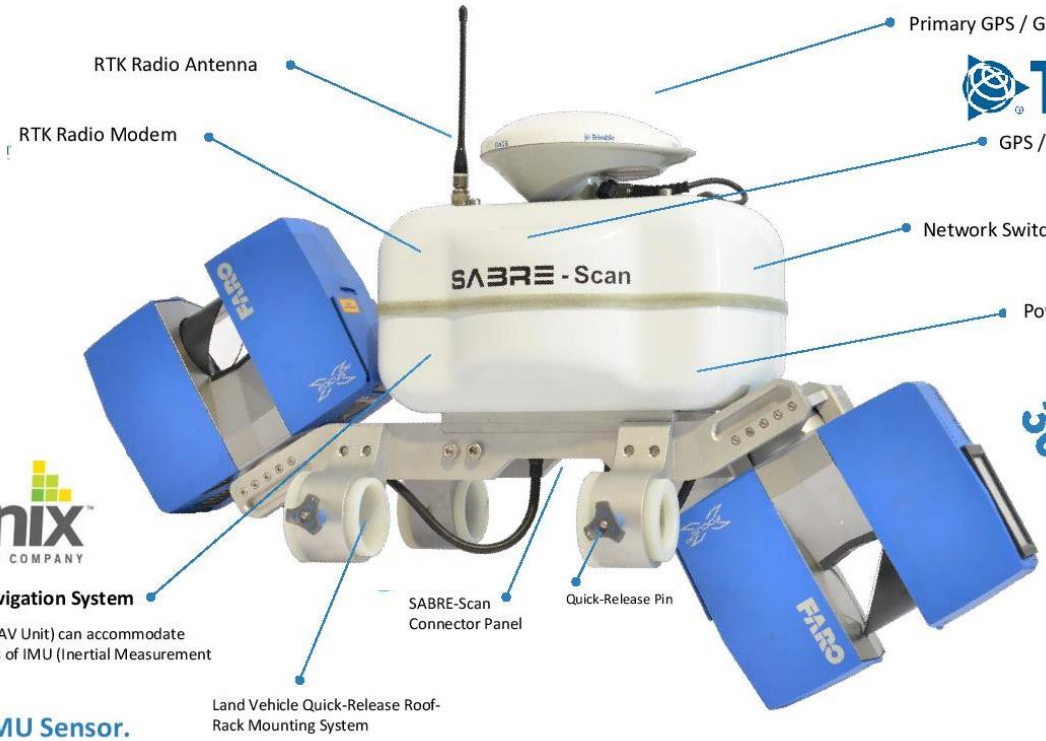
# USE YOUR FARO FOCUS for LiDAR Mobile Mapping!

**For More Information Please Visit www.sabresurvey.com**
**Contact Us at sales@sabresurvey.com**

# SABRE - Scan™ | Product Outline |

## Mobile Mapping Kit




applanix A TRIMBLE COMPANY

**INS - Inertial Navigation System**

The SABRE-Scan (i-NAV Unit) can accommodate wide range of grades of IMU (Inertial Measurement Unit) Sensor.

Upgradable IMU Sensor.

FARO Example of the SABRE-Scan Shown above with Twin FARO Laser Scanner Focus 3D X330 Lasers Heads Fitted

FARO applanix A TRIMBLE COMPANY FLIR QPS QINSy

SABRE ADVANCED 3D SURVEYING SYSTEMS SABRE Sky-3D™ UAV LIDAR

SABRE

ADVANCED 3D SURVEYING SYSTEMS

# SABRE-Scan Mobile Mapping Kit

CE FC

SABRE-Scan Product Compliance



## SABRE-Scan Case


Primary GPS
Trimble® Zephyr™ Model 2

SABRE-Scan
Dual i-NAV Unit

applanix
POSLV™ INS
Position and Orientation
Inertial Navigation system

Optional:
DMI Wheel Odometer Kit

RTK Radio
Whip Antenna

Quick-Release Pins

## SABRE-Scan Kit Case


Interface Box to Laptop
(USB & Network)

Deployment Kit
Tools, Spare's & other Parts.

Twin-Antenna GAMS GPS
Trimble® Zephyr™ Model 2

SABRE-Scan
Single Cable Harness

SABRE
MM Simple Capture™
Technology

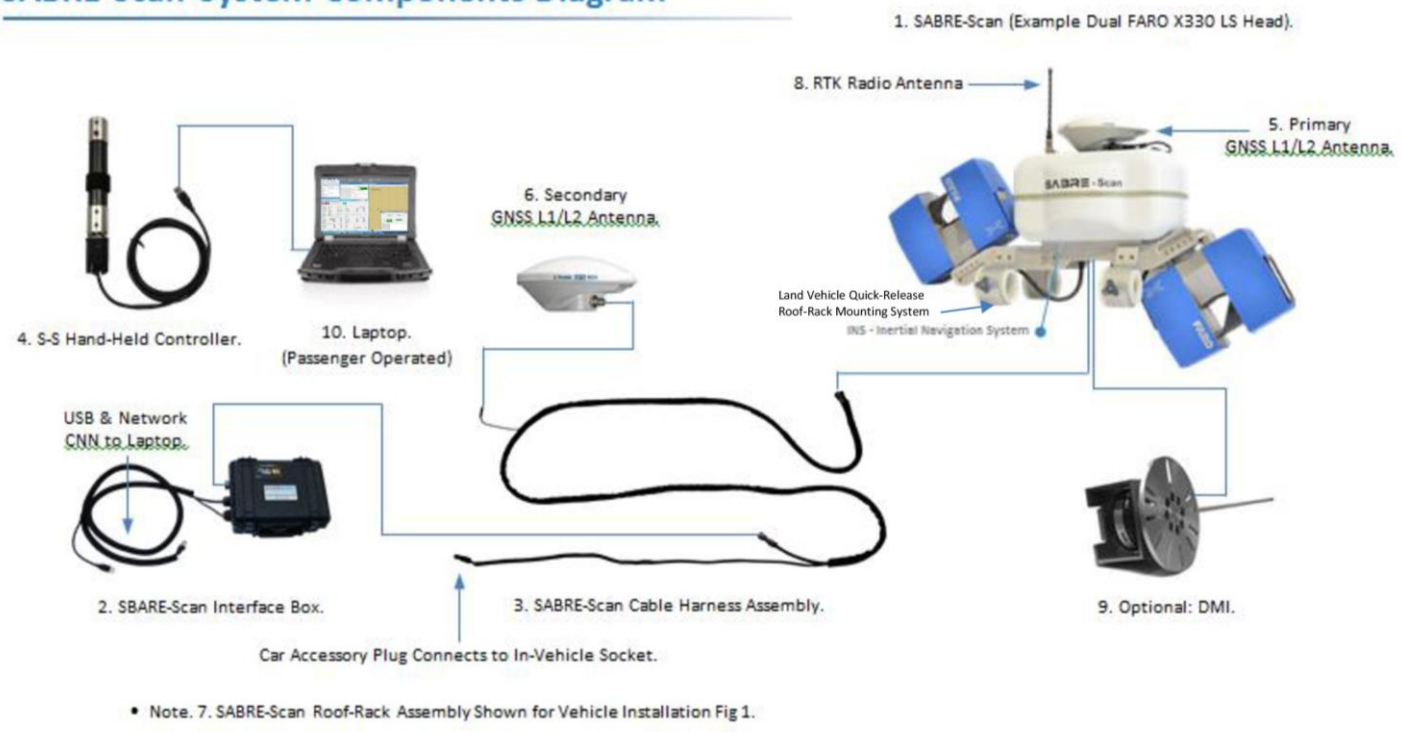
Hand-Held Control

**SABRE-Scan Kit Includes:**
Applanix™ POSPac™ MMS
Post-Processing Software

## To Find Out More Please Visit Us at www.sabresurvey.com

## SABRE-Scan System Interconnection

### SABRE-Scan System Components Diagram




- Note. 7. SABRE-Scan Roof-Rack Assembly Shown for Vehicle Installation Fig 1.

Fig 2: SABRE - Scan Mobile Mapping LiDAR System Components Diagram.

- SABRE-Scan Operated from the passenger front seat from a Laptop and/or via a Hand-Held Controller that plugs into one of the Laptops USB Ports.

**SABRE-Scan System Components:**

1. SABRE-Scan *'i-Nav' Unit* (Example Shown: DUAL FARO Focus 3D X330, X Series).
   **Compatible with FARO Focus Range of Laser scanners.**
2. SABRE-Scan Interface Box.
3. SABRE-Scan Cable Harness Assembly.
4. SABRE-Scan Remote Controller.
5. External Primary GNSS Antenna (Removable from SABRE-Scan POD).
6. External Secondary GNSS Antenna.
7. SABRE-Scan Rack Assembly.
8. RTK Radio Antenna.
9. Optional Externally Wheel Mounted DMI – Distance Measurement Instrument.
10. SABRE-Scan Field Operations Laptop (Interface Box USB and Network Plug Connections).

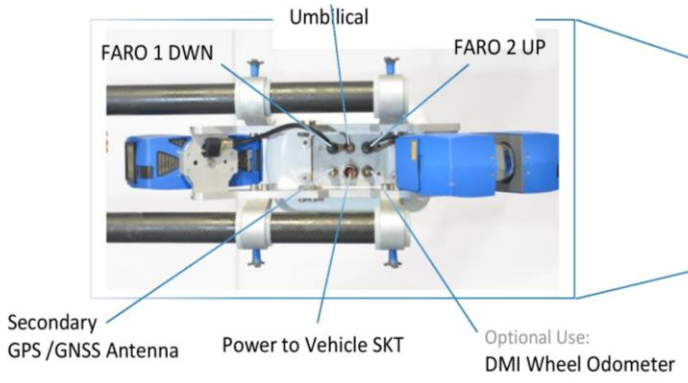
**SABRE-Scan Cabling**

Bundled Cable Assembly Consists of the following separate Shielded cables:-

| Cable | Description | Length (m) |
|---|---|---|
| SABRE-Scan Power Cable | Power Cable with Vehicle Accessory Plug (16A Ceramic/Continental Style Safety Fuse fitted). | 6.0 |
| SABRE-Scan Umbilical | Connects SABRE-Scan to Interface Box (USB and Network to Laptop). | 5.5 |
| SABRE-Scan GAMS GNSS ANT Cable | Secondary Twin-Antenna Coaxial cable. | 2.6 |
| | | |

Note: Connectors Military Spec, Amphenol and LEMO.

### SABRE-Scan Connector Panel




**ADDITONAL ACQUISITION AND POST-PROCESSING SOFTWARE TO COMPLEMENT THE SABRE SUITE**

**Full Software for Real-Time and Post-Processed Solution**

**Applanix™ POSPac™ MMS Software**

applanix

POSPac Mobile Mapping Suite

**QPS QINSy Software**

QPS QINSy

## SABRE - Scan

### Mobile Mapping Kit Accessories

**Accessory: Ladybug®5 Panoramic Video Camera**

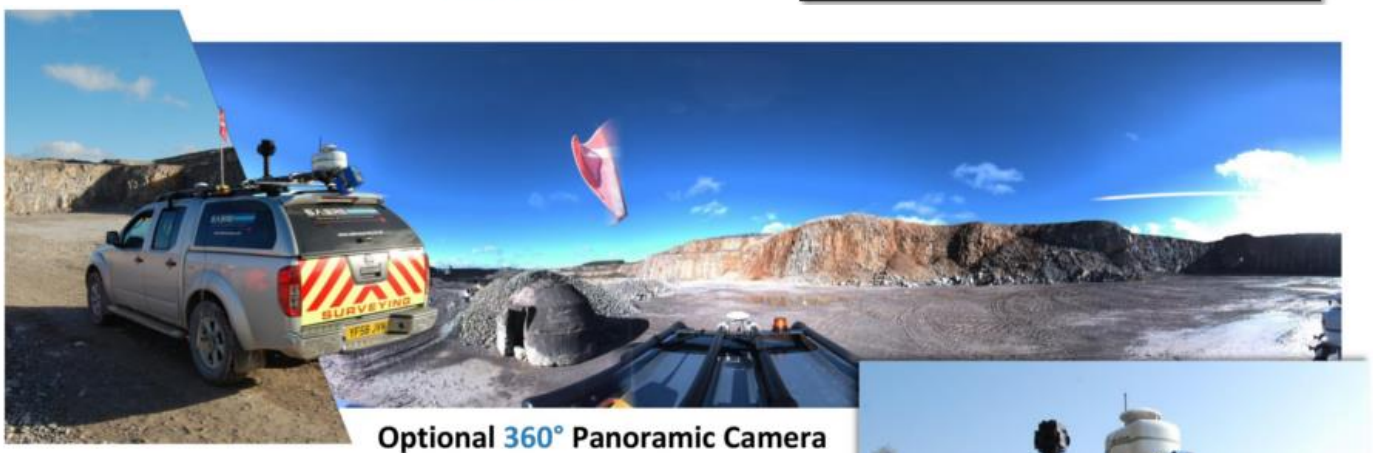
FLIR POINT GREY 360°


30 MP 360° USB 3.0 Camera

30 MEGAPIXELS USB 3.0 5.0 Gbps Super Speed

Ladybug®5 Images Geo-Referenced with

**SABRE-Scan GPS Time-Tagged Positioning**



**Optional 360° Panoramic Camera**

■ Ladybug 5 Panoramic Video Camera

Optional Ladybug 5 Camera with SABRE Time-Tagged GPS Position.

USB 3.0

- USB 3.0 COMS PC Interface
- Power 12-24VDC

**30 MEGAPIXEL CAMERA**

IP65 Certified

■ LadybugCapPro Software

■ SABRE Time-Tagging and Software Interface

SABRE

*POINT STREAM MM ™*

- Ladybug 5 GPS Referenced Images with SABRE-Scan GPS Time-Tagged Positioning Software Interface.

## Optional: DMI -Distance Measurement Instrument Wheel Odometer


## Optional: DMI Kit Contents

- DMI - Distance Measurement Instrument Wheel Odometer Sensor and attachment Kit.

Optional:
DMI Wheel Odometer Kit

DMI Rod

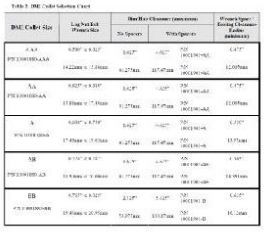
Bracket, DMI Fender, Permanent Fixing Kit.

Optional Non-Permanent Magnetic DMI Rod Mount Available.

DMI Wheel Collets

Collet Size Selection Chart

- Collet Size selected to suit specific Wheel and Hub Lug Nut/Bolt Dimensions for the vehicle attached on.



Driver, Nut, 7/16".

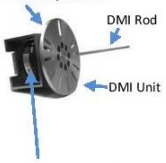
Optional DMI Kit Parts:
Collet Spacer Kit required for specific vehicle wheel mountings.

DMI Unit

DMI Cable (7.7m)

## Hardware Components, installation and Setup

DMI Hub Adapter Plate




DMI Unit Wheel Odometer Encoder Sensor.

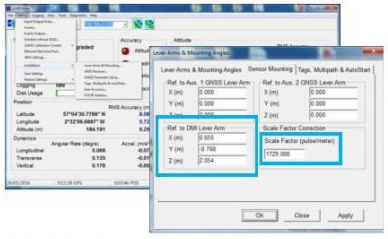
Figure 2: DMI (Distance Measuring Instrument).Components

Optional:
Removable Magnetic Mount Rod Bracket

Permanent DMI Rod Mount Recommended over non-permanent magnetic mount due to its security.

Figure 3: DMI Rod Mounting Bracket Options.

applanix LV-POSView™ (controller software)



- DMI setup LV-POSView
- Enable DMI Use
- Enter DMI Lever Arms and DMI Scale Factor

Figure 4: DMI Activation, Lever Arm and Scale Factor Setup.

# SABRE - Scan™ Mobile Mapping Product

Compatible With FARO Focus

## ONE SYSTEM: SINGLE or DUAL FARO Laser Scanner Head Mounting

### > SABRE-Scan Product Technical Information Overview

| | |
|---|---|
| **Product:** | **SABRE-Scan Dual** (the Dual SABRE-Scan can be run with Single or Dual FARO Focus Laser Scanners). |
| **Main Purpose:** | Ground-based LiDAR Mobile Mapping System. |
| **Optional;** | Panoramic Video/Imagery with Time-Tagged GPS Position and Orientation. |
| **Main Equipment:** | SABRE-Scan (i-NAV) Unit, Optional FARO Focus Laser Scanners, Cabling, Interface Box. |
| **Applications:** | 3-D data acquisition; topographical survey, flood plain mapping, road ways, infrastructure, asset management. |

## SABRE-Scan™ FARO Focus Laser Scanners

Available for purchase with/without the FARO Focus Lasers!

**FARO Focus Laser Scanner/s Range for use with the SABRE-Scan™ Mobile Mapping System.**

***NEW*** **SABRE-Scan™ V3 MMS for FARO Focus S**

Please Enquire,
For FARO Focus S Compatibility

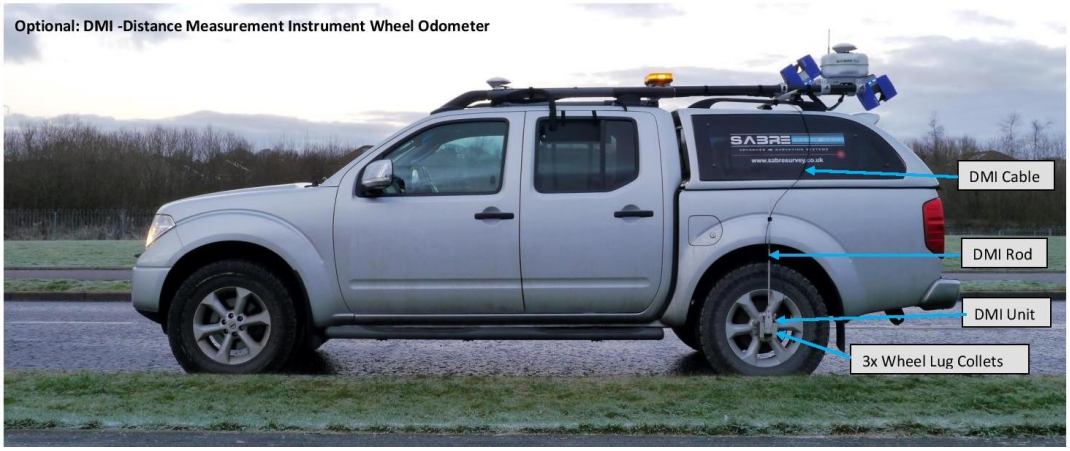
FARO Laser Scanner Focus3D

X330 X130 X30 S120

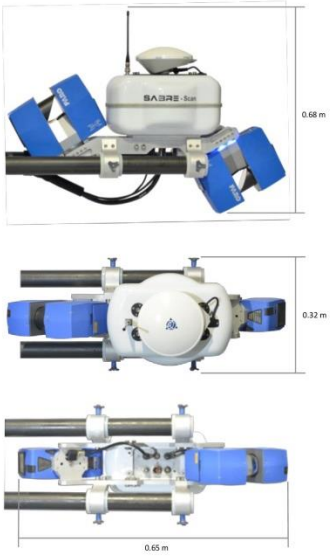
# Mobile Mapping Product Kit

- Compact and light-weight kit-solution for High-Resolution High Quality 3D Data Capture
- Enabling Rapid Deployment Capability










SABRE - Scan™ i-NAV™ Unit Profile Views

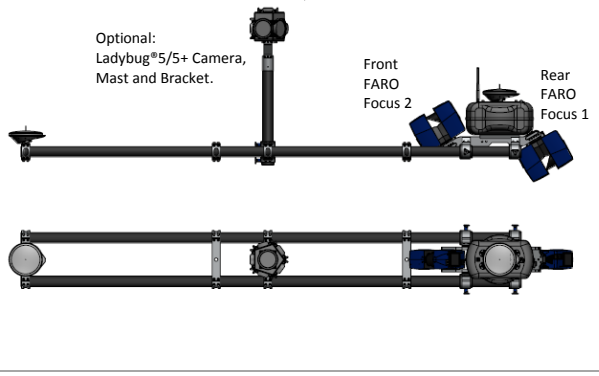



Figure 1: SABRE-Scan™ Elevation and Plan View.

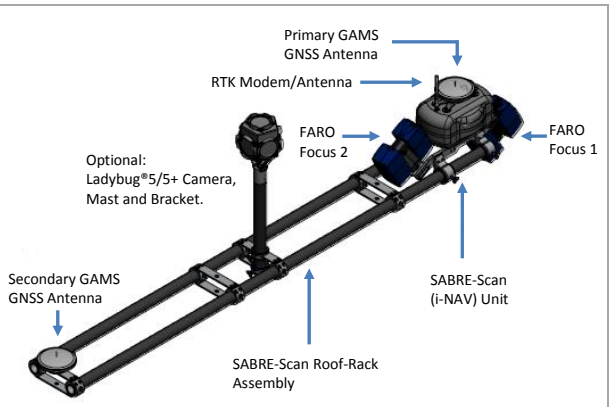



Figure 2: SABRE-scan™ Dual-FARO Oblique View.


Figure 3: SABRE-Scan Roof-Rack Assembly. Options: Single & Splitable.


Figure 4: SABRE-scan Interface Box.

| SABRE-Scan System Physical Characteristics | |
|---|---|
| • Chassis and attachment for land vehicle (composite chassis and housing).<br>• Laser Integration chassis, standard 30 degree offset angle for each forward and rear FARO laser scanner. | |
| SABRE-Scan (i-NAV) Unit Enclosure Type | Carbon Fibre Chassis Aluminium Alloy |
| SABRE-Scan Rack | Cross-Brace Brackets Aluminium alloy<br>2m Tubes Carbon Fibre |
| SABRE-Scan Interface Box | |

| SABRE-Scan Main Equipment | |
|---|---|
| SABRE-Scan (i-NAV) Unit | |
| SABRE-Scan Mounting Options: | FARO Laser Scanners 1 / 2 |
| SABRE-Scan Roof-Rack Assembly | Options: Single Piece or 2-Piece Split-able |

| SABRE-Scan Roof Mounting and Installation Method | |
|---|---|
| Minimum Installation Requirements | 2 Sturdy Roof Bars to mount the SABRE-Scan |
| SABRE-Scan Roof-Rack Assembly | Options: Single Piece or 2-Piece Split-able |
| SABRE-Scan Roof-Bar Mounting Attachment | Options: Jubilee®-Clips or SABRE Quick-Clamps |

| SABRE-Scan Cabling | | |
|---|---|---|
| Cable | Description | Length (m) |
| SABRE-Scan Power Cable | Power Cable with Vehicle Accessory Plug (16A Ceramic/Continental Style Safety Fuse fitted). | 6.0 |
| SABRE-Scan Umbilical | Connects SABRE-Scan to Interface Box (USB and Network to Laptop). | 5.5 |
| SABRE-Scan GAMS GNSS ANT Cable | Secondary Twin-Antenna Coaxial cable. | 2.6 |
| | | |
| Note: Connectors Military Spec, Amphenol and LEMO. | | |

**General SABRE-Scan™ Specification**

| SABRE-Scan™ Laser Head Configuration |
|---|
| The SABRE-Scan™ System (i-NAV) Unit has Dual Laser Scanner Adaption Plates to be able to mount 1 or 2 FARO Focus LS (Laser Scanner) Heads. The table below shows the DC Input Voltage and Power requirements for both configurations. |

| SABRE-Scan™ External Power Supply Input Specification: | |
|---|---|
| • The SABRE-Scan™ Mobile mapping system can be run on 12 to 32 volt power supply via vehicle power system or a standalone battery pack. | |
| Power Supply/Source Connection Requirements: | Single Vehicle Accessory Socket. |
| Connection to External Power Source: | Vehicle Accessory Power Plug (Car Cigarette Style Plug) |

SABRE-Scan™ Configuration Power Requirements

Single Focus ↓ Dual Focus

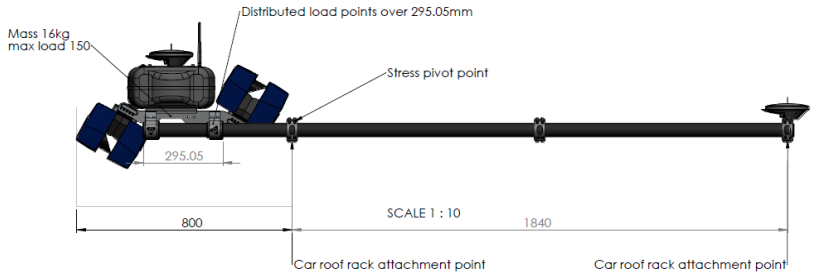
| SABRE-Scan™ Configuration: | Single FARO Focus LS Head | Dual FARO Focus LS Heads |
|---|---|---|
| DC ⎓ Voltage Input Range: | 12 – 32 V | 15 – 32 V |
| Input Current: | 5.0A @13.0V, 2.0@30.0V | 6.8A @15.0V, 2.9A@30.0V |
| Input Power Consumption: | 65W@13.0V, 60W@30.0V | 102W@15.0V, 87W@30.0V |
| Technical data for the SABRE-Scan™ power supply unit: | | |
| Power Supply Protection | Reverse voltage protection parallel diode | |
| Safety Fuse | Recommended input fuse (slow blow): 16 A | |

**General Dimensions and Weights**

| Equipment/Configuration | Size: External Dimensions (L X W X H) (m) | Weight (Kg) |
|---|---|---|
| SABRE-Scan™ (i-Nav) | L 0.50 m x W 0.32 m x H 0.28 m | 7.6 |
| SABRE-Scan™ (i-Nav) External Dimensions with 1 FARO Laser Scanner Installed). | L 0.65 m x W 0.32 m x H 0.52 m | 11.8 |
| SABRE-Scan™ (i-Nav) External Dimensions with 2 FARO Laser Scanners Installed). | L 0.65 m x W 0.32 m x H 0.68 m | 16.0 |
| SABRE-Scan™ Roof Rack Assembly (Single Piece) | L 2.0 m W x 0.28 m H x 0.09 m | 5.0 |
| SABRE-Scan Roof-Rack Assembly (2-Piece Split) | 2m Total Length, 2 Parts below: L 1.0 m W x 0.28 m H x 0.09 m | 6.5 |

**SABRE-Scan™ Roof Rack Assembly**

| Equipment | Rating | Weight (Kg) |
|---|---|---|
| SABRE-Scan™ Support Bars | Maximum Load | 150Kg |




| Environmental Characteristics | |
|---|---|
| Ambient Temperature Ranges<br>Operating Temperature<br>Storage Temperature | 5°C to +40°C (41°F to 104°F)<br>–20°C to +45°C (4°F to 113°F) |
| Operating Humidity | Non-Condensing, 0% ~ 90% |
| Altitude: | < 2000m |

**General**

| | |
|---|---|
| Servicing | Annual Manufacturer Service and Calibration |
| Data Handling and Control | Scanner Control Via Laptop |
| Data Storage | |
| Laser Scanner Memory | SD-Card (32GB/64GB Capacity) |
| Inertial Navigation System Memory | Internal Memory See AP Specification |

## SABRE-Scan™ GNSS-INS IMU Options

- AP20 Performance SABRE-Scan™ IMU
- AP15 Entry-Level SABRE-Scan™ IMU
- Ask for further information regarding IMU Options or custom Solutions.

**SABRE-Scan™ i-NAV internal IMU Option 1 - AP 20 IMU AIMU-M2, Type 42 Sensor Specifications**

- SABRE-Scan™ Upgradable to accommodate other available Applanix™ IMU Sensors.
- Inertial navigation sensor IMU (Customer to select their IMU requirements, please see the specification).
- Please see Technical specifications (IMU comparison).

- Advanced Applanix™ IN-Fusion™ GNSS-Inertial integration technology
- Advanced Trimble Maxwell® 6 Custom GNSS survey technology (two chipsets)
- 220 Channels: (per chipset)
  - GPS: L1 C/A, L2C, L2E (Trimble method for tracking unencrypted) L5
  - GLONASS: L1 C/A and unencrypted P code, L2 C/A and unencrypted P code, L3 CDMA9
  - BeiDou: B1, B2
  - GALILEO10: L1 CBOC, E5A, E5B, E5AltBOC9
  - QZSS: L1 C/A, L1C, L1 SAIF, L2C, L5, LEX11
  - SBAS: L1 C/A (EGNOS/MSAS), L1 C/A and L5 (WAAS)
  - L-Band: OmniSTAR VBS, HP, XP and G2, Trimble CenterPoint RTX
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Proven Trimble low elevation tracking technology
- Support for optional Distance Measurement Indicator (DMI) input
- Support for optional GNSS Azimuth Measurement System (GAMSTM)
- Support for optional POSPac™ Mobile Mapping Suite post-processing software

| | |
|---|---|
| Manufacture | Applanix™ (A Trimble Company) |
| System/Model | **Applanix™ POS™** (Position and Orientation System) IMU Sensor AP 20 IMU AIMU-M2, Type 42 |
| Type of positioning system: | MEMS IMU (MICROELECTROMECHANICAL GYRO) |
| Data Rate (Hz) | raw IMU data (200 Hz), raw GNSS data (1 Hz) |

| **High-Lighted Performance Specification** | | | |
|---|---|---|---|
| Condition | No GNSS Outages Terrestrial*1* Applications | RTK (RMS Error) | Post-Processed (RMS Error) |
| | Positional Accuracy (m) | 0.02-0.1 | 0.02-0.05 |
| | Velocity (m/s) | 0.010 | 0.010 |
| | Roll & Pitch (deg) Max RMS error | 0.020 | 0.015 |
| | True Heading*2* 2m base line (deg) Max RMS error | 0.050 | 0.025 |
| | | | |
| Condition | Terrestrial Applications*1*, 60 second GNSS outage (Typical INS error over time interval without GNSS) | RTK (RMS Error) | Post-Processed (RMS Error) |
| | Positional Accuracy*2* (m) | 0.35-0.69 | 0.13-0.24 |
| | Roll & Pitch (deg) Max RMS error | 0.020 | 0.020 |
| | True Heading*1* 2m base-line (deg) Max RMS error | 0.100 | 0.060 |
| | True Heading*2* 2m base-line (deg) Max RMS error | 0.070 | 0.030 |
| | | | |

Performance: Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects.
Refer to the manufacturer's technical data specifications for the AP 15 IMU sensor Full and most recent specs.

Note:
(1) *With DMI option*
(2) *With GAMS option, 2 m base-line*

**SABRE-Scan™ i-NAV internal IMU Option 2 - AP 15 IMU AIMU-M5, Type 69 Sensor Specifications**

- SABRE-Scan™ Upgradable to accommodate other available Applanix™ IMU Sensors.
- Inertial navigation sensor IMU (Customer to select their IMU requirements, please see the specification).
- Please see Technical specifications (IMU comparison).

- Advanced Applanix™ IN-Fusion™ GNSS-Inertial integration technology.
- Solid-state MEMS IMU with Applanix™ SmartCalTM™ compensation technology.
- Advanced Trimble Maxwell 6 Custom GNSS survey technology (two chipsets).
- 220 Channels (per chipset):
  - GPS: L1 C/A, L2C, L2E (Trimble method for tracking unencrypted L2P), L5
  - GLONASS: L1 C/A, L1 P, L2 C/A L2 P code
  - Galileo9: L1 CBOC, E5A, E5B & E5AltBOC
  - QZSS: L1 C/A, L1 SAIF, L2C, L5
  - SBAS: L1 C/A (EGNOS/MSAS), L1 C/A and L5 (WAAS)

- L-Band: OmniSTAR VBS, HP, XP and G2, Trimble CenterPoint RTX

- High precision multiple correlator for GNSS pseudorange measurements.
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response.
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth.
- Proven Trimble low elevation tracking technology.
- Two antenna heading aiding (GNSS Azimuth Measurement System, GAMSTM).
- Support for optional Distance Measurement Indicator (DMI) input.
- Support for optional POSPac™ Mobile Mapping Suite post-processing software.
- No export permit required.

| | |
|---|---|
| Manufacture | Applanix™ (A Trimble Company) |
| System/Model | Applanix™ **POS™** (Position and Orientation System) IMU Sensor AP 15 IMU AIMU-M5, Type 69 |
| Type of positioning system: | MEMS IMU (MICROELECTROMECHANICAL GYRO) |
| Data Rate (Hz) | raw IMU data (200 Hz), raw GNSS data (1 Hz) |

**High-Lighted Performance Specification**

| Condition | No GNSS Outages Terrestrial1 Applications | RTK (RMS Error) | Post-Processed (RMS Error) |
|---|---|---|---|
| | Positional Accuracy (m) | 0.02-0.05 | 0.02-0.05 |
| | Velocity (m/s) | 0.015 | 0.015 |
| | Roll & Pitch (deg) Max RMS error | 0.03 | 0.025 |
| | True Heading2 2m base line (deg) Max RMS error | 0.09 | 0.06 |
| | | | |
| Condition | Terrestrial Applications1, 1 km or 1 minutes GNSS outage (Typical INS error over time/distance interval without GNSS) | RTK (RMS Error) | Post-Processed (RMS Error) |
| | Positional Accuracy2 (m) | 1-2 | 0.2-0.8 |
| | Roll & Pitch (deg) Max RMS error | 0.09 | 0.05 |
| | True Heading2 2m base-line (deg) Max RMS error | 0.30 | 0.20 |

Performance: Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects.
Refer to the manufacturer's technical data specifications for the AP 15 IMU sensor Full and most recent specs.

Note:
(1) *With DMI option*
(2) *With GAMS option, 2 m base-line*

**Primary and Secondary GNSS Antenna L1/L2 Frequencies**

| | |
|---|---|
| Trimble® Zephyr™, Model-2 GNSS Antenna | See Trimble Zephyr Model 2 Data Sheet for Full Spec. |
| SABRE-Scan™ Dual GNSS antenna array with 2m base-line (optional 1.5m available) | |

**Example Laser Scanner Option - Highlighted Specs FARO Focus3D X330**

| | |
|---|---|
| Laser Scanners can be source from resellers calibrated with the SABRE-Scan™ system. | |
| Manufacturer | FARO Technologies |
| Laser Scanner Model | FARO Laser Scanner Focus3D X330 |
| Eye Safety: Laser CLASS and Wavelength | CLASS 1 LASER PRODUCT — Laser CLASS 1 Eye-Safe, Wavelength 1550nm |

**High-lighted Performance Specification**

| | |
|---|---|
| Ranging Distance Max. Range (indoor or outdoor with upright incidence to a 90% reflective surface) | 330m |
| Minimum Range | 0.6m |
| Range Accuracy/Error | +/-2mm |
| Range Resolution | 1mm |
| Max Angular Field of View | 300° (SABRE-Scan™ Dual Laser 360 FOV with Overlap) |
| Angular Accuracy | 0.009° |
| Effective Measurement Rate (Points per Second) | 500kHz (*) |
| Scanning Speed Max. vertical scan speed (rpm or Hz) | lines/second |
| Returns | 1 |
| Laser (see Laser Technical specification on selected model). Refer to the FARO Technologies technical data sheet specifications for the Full and most recent FARO Focus Specs. | |

**SABRE-Scan™ FARO Focus3D Average Point Cloud Data Density at 2m**

| Vehicle Speed Km/h | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80 |
|---|---|---|---|---|---|---|---|---|---|
| Dual Laser Scanner | 11,346 | 7,564 | 5,672 | 4,538 | 3,782 | 2,836 | 2,268 | 1,890 | 1,418 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| pts/sqm @ 2m range | | | | | | | | | |

# SABRE-Scan™ FARO Focus3D Laser Scanners

- **The complete FARO Focus Laser Scanners Range can be used with the SABRE-Scan™ Mobile Mapping System.**

## Available for purchase with/without the FARO Focus Lasers!

| Laser Scanners sourced from FARO resellers and then calibrated with the SABRE-Scan™ system. | | | | |
|---|---|---|---|---|
| Manufacturer | FARO Technologies | FARO Technologies | FARO Technologies | FARO Technologies |
| Laser Scanner Model | FARO Laser Scanner Focus3D X330 | FARO Laser Scanner Focus3D X130 | FARO Laser Scanner Focus3D X30 | FARO Laser Scanner Focus3D S120 |
| |  |  |  |  |
| Laser CLASS and Wavelength | Laser CLASS 1 eye safe<br>Wavelength 1550nm<br>CLASS 1 LASER PRODUCT | Laser CLASS 1 eye safe<br>Wavelength 1550nm<br>CLASS 1 LASER PRODUCT | Laser CLASS 1 eye safe<br>Wavelength 1550nm<br>CLASS 1 LASER PRODUCT | Laser CLASS 3R<br>Wavelength 905nm<br>INVISIBLE LASER RADIATION AVOID DIRECT EYE EXPOSURE CLASS 3R LASER PRODUCT IEC 60825-1:2007 P0=20mW; λ=905nm Max. Pulse = 0.0054sec |
| **High-lighted Performance Specification** | | | | |
| Ranging Distance (indoor/outdoor with upright incidence, 90% reflective surface) | 330m | >130m | 30m | 120m |
| Ranging Error | ±2mm | ±2mm | ±2mm | ±2mm |
| Ranging noise | 0.15mm @25m - noise compressed | 0.15mm @25m - noise compressed | 0.15mm @25m - noise compressed | 0.5mm @25m - noise compressed |
| Vertical Field of View | 300° | 300° | 300° | 305° |
| Step size - Angular Resolution | 0.009° (40,960 3D-Pixel on 360°) | 0.009° (40,960 3D-Pixel on 360°) | 0.009° (40,960 3D-Pixel on 360°) | 0.009° (40,960 3D-Pixel on 360°) |
| Points per Second | max 976,000 points/sec | max 976,000 points/sec | max 976,000 points/sec | max 976,000 points/sec |
| Returns | 1 | 1 | 1 | 1 |
| Max. vertical scan speed: | 5.820rpm or 97Hz | 5.820rpm or 97Hz | 5.820rpm or 97Hz | 5,820rpm or 97Hz |
| Ambient temperature: | 5° - 40°C | 5° - 40°C | 5° - 40°C | 1 |
| Humidity: | Non-condensing | Non-condensing | Non-condensing | Non-condensing |
| | | | | |
| Latest FARO Laser Scanner Information (see Laser Technical data sheets for specification on selected model).<br>Please Refer to the FARO Technologies technical data sheet specifications for the Full and most recent FARO Focus Specs. | | | | |

**RTK Radio Module (Built-in as Standard to the SABRE-Scan™)**

| Note: All the SABRE ADVANCED 3D systems come standard with a RTK radio which allows you to use your own base station to acquire positional accuracies. Using the SABRE-Scan™ Applanix™ POSPac™ processing software is an option however, and it may provide a more consistent result (see technical specifications). | |
|---|---|
| ADL Foundation Radio<br>Frequency Options 430-470 MHz | SABRE-Scan™ RTK Radio Whip Antenna Options:<br>Quarter-Wave Flexible Antenna<br>TNC-M 2.4db Gain<br>Option 1: Frequency range (MHz) 450-470 MHz<br>Option 2: Frequency range (MHz) 420-450 MHz |
| Refer to the Pacific Crest technical data specifications for the Full and most recent ADL Foundation Radio. | |

**SABRE-Scan™ Shipping / Transit Case Dimensions and Weights**

| SABRE-Scan™ and Kit Transit Cases | Main Items | Size: External Dimensions (L X W X H) (m) | Weight |
|---|---|---|---|
| SABRE-Scan™ (i-NAV) Case<br>SABRE PN 07-00-0001-01-00<br>ZARGES CASE MPN 345294 | • SABRE-Scan™ (i-NAV™) Dual FARO<br>• Primary GNSS Antenna<br>• DMI Unit | L 0.90 x W 0.50 x H 0.38 (m), | 28.5 kg (Empty Case 12.0 kg) |
| SABRE-Scan™ Kit Case<br>SABRE PN 07-00-0002-01-00<br>ZARGES CASE MPN 40702 | General Kit and Equipment | L 0.60 x W 0.40 x H 0.34 (m), | 12.0 kg (Empty Case 6.0 kg) |

**Compliance**

| | |
|---|---|
| Certifications/Marks | CE FC |
| Safety | Standards:<br>EN61010-1: 2010 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements. |
| EMC | Standards:<br>EN61326-1: 2013 Electrical equipment for measurement, control and laboratory use – Electromagnetic Compatibility (EMC)<br>CISPR11: 2009 +A1:2010<br>EN55011: 2009 +A1: 2010<br>EN61000-3-2: 2006 + A1:2009 + A2: 2009<br>EN61000-3-3: 2008<br>EN61000-4-2: 2009<br>EN61000-4-3: 206 + A1: 2008 + A2: 2010<br>EN/IEC61000-4-8: 2010<br>EN61000-4-4: 2004 + A1: 2010<br>EN61000-4-5: 2006<br>EN61000-4-6:2009<br>FCC Standards:<br>Equipment Classification: FCC Class A, CFR47: 2011 Part 15 Sub part B (US Federal code or regulation) consisting of Clause 15.109 (Class A). 15.109 Radiated emission limits. |

**Software**

The following software comes as standard with a purchased SABRE-Scan™ System.

| Software Application | Type of Licence |
|---|---|
| SABRE-Scan™ **SABRE *Point-Stream MM*™** Controller Software<br>• SABRE Point stream (Positioning and laser processing software).<br>• **SABRE *GTT*™** Sabre time-tagging software.<br>• Sabre point stream (Sabre sonar/Laser/positioning software). | Micro Dongle |
| QPS QINSY Software | Micro Dongle |
| Applanix™ POSPac™ Post-Processing Software | Micro Dongle / Node-Locked Licence |
| Pacific Crest ADL Foundation Radio Module Configuration Software | Software available for download on the Pacific Crest Website. |

**Other Kit Items**

Overview of equipment included with the kit:

- 2 Boxes and a Come as Standard with the SABRE-Scan™ System.
- Choice of Rack Options Available.

**Optional Equipment**

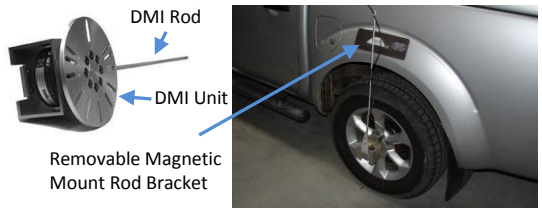



Figure 5: DMI (Distance Measuring Instrument).

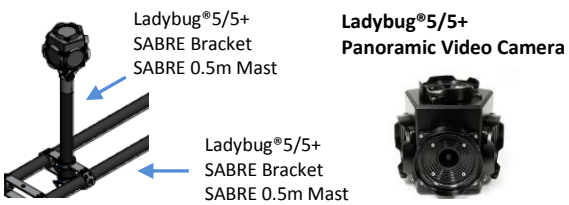



Figure 6: Ladybug®5/5+ Camera and SABRE attachments.

**Camera System/Equipment**

Recommended 360 Camera Options to use with the SABR-Scan™ mobile mapping systems:

360 Camera Imagery – Georeferenced with the SABRE-Scan™ **SABRE *Point-Stream*™ *MM*™**

- Common Camera Options available: Ladybug®5/5+ and Ladybug®3 Cameras
- Alternatively other cameras can be integrated (e.g. other machine vision cameras, etc)

In the table below high-lighted technical specification data attributes below;

| **Product Name/Description:** | **Ladybug®5 - 30 MP, 360 Video Streaming** | **Ladybug®3 Camera 360 Video Streaming** |
|---|---|---|
| Brand: | FLIR POINT GREY | FLIR POINT GREY |
| Photo resolution [mp] : | 30 MP (5 MP x 6 sensors) | 12 MP (2 MP x 6 sensors) |
| Number of lenses: | 6 | 6 |
| Geo-referencing of images: | Y with SABRE-Scan™ | Y with SABRE-Scan™ |
| | | |
| **Imaging Optics and Sensor** | | |
| Camera sensor Type | Sony ICX655 CCD, 2/3", | Sony ICX274 CCD x6, 1/1.8", |
| MP per sesnor | 5.0MP per sensor | 2.0MP per sensor |
| Shutter Type: | Global Shutter | Global Shutter |
| Spectral Bands [PAN, RGB, NIR, CIR]: | RGB | RGB |
| Resolution per Sensor size [.. x .. pixels]: | 2048 x 2448 px | 1600 x 1200 px |
| Pixel size [micrometer]: | 3.45 µm | 4.4 µm |
| FoV per camera [deg]: | 113.4 | >80% of full sphere |
| Maximum frames/sec. per camera : | 10 fps | 6.5 fps |
| Focal length of lenses [mm]: | 4.4mm | 3.3mm |
| Export formats: | *.PGR *.JPEG | *.PGR *.JPEG |
| | | |
| **General** | | |
| Weight [kg]: | 3 kg | 2.414 kg |
| Length [m]: | 0.197 mm | 0.122 mm (without lens hoods) |
| Width [mm]: | 0.197 mm | 0.122 mm (without lens hoods) |
| Depth [mm]: | 0.160 mm | 0.141 mm (without lens hoods) |
| Environmental protection: | IP65 | WEATHER-RESISTANT |
| | | |
| **Power Supply** | | |
| External power requirements | 12-24V | 12V |
| Power consumption [W]: | 13W | 7.2W |
| | | |
| **Data Storage, Software and Connectivity** | | |
| USB: | Y - USB 3 | FireWire 800 (1394b) cable |
| Image data output and formats: | RAW (*.PGR) or JPEG | RAW (*.PGR) or JPEG |
| | | |
| **Main applications:** | Applications in geographic information systems (GIS); mobile vehicle-based photogrammetry. Georeferenced imaging. | wide variety of industries, including: large scale GIS systems for location-based visualizations, such as street-level viewing, and geographical mapping; high end security and surveillance applications; city planners for inventory and traffic scene analysis; and the entertainment industry for lighting models, full dome projection content, and other immersive experiences. |

**Other Optional Accessories**

| **Optional: DMI (Distance Measurement Instrument)** |
|---|
| DMI (computes wheel rotation information to aid vehicle positioning.<br>DMI Unit with wheel fitment kit specific to the wheel and stud size. and DMI Cable assembly to connect to SABRE-Scan™ (i-NAV) Unit<br><br>DMI Vehicle Attachment Options: Permanent Vehicle Arch Fixing Kit provided with SABRE-Scan™ Kit or Optional Removable Magnetic Mount available. |
| **Optional: Ladybug®5/5+ Panoramic Video Camera Compatible with SARBE Time-Tagging** |
| 360 panoramic camera :<br>The high-resolution Ladybug®5/5+ panoramic camera system has 6 5 Mega-Pixel cameras that enable the system to collect images for more than 80% of a full sphere. Images are fully synchronized and geo-referenced.<br><br>SABRE Ladybug®5/5+ Bracket and SABRE 360 Camera 0.5m Mast.<br>SABRE Ladybug®5/5+ Custom Mounting, to be used/fitted on SABRE-Scan™ Roof-Rack Assembly. |
| **Field Operations Work Station Laptop** |
| |
| **Optional**: RTK Radio Link and GNSS Base Station Equipment |
| |

*Notes:*

*(*)* *Measurement Speed (pts/sec): 500,000 for standard used FARO Focus Quality and Resolution Settings*

* *Product appearance and Specifications subject to change without notice.*

*FARO Focus Weight Without Battery 4.2 Kg*

Abbreviations/Acronym: LiDAR Light Detection And Ranging, DMI (Distance Measurement Instrument),

SABRE mnemonics: i-NAV Unit (Inertial Navigation Unit).

SABRE

ADVANCED 3D SURVEYING SYSTEMS

Land Mobile Mapping and Unmanned Aerial survey Systems

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